Cover photo (tinted): Before the earthquake in 1906, Memorial Church, dedicated 1903, was surmounted with a clock tower, and at the entrance to the Quadrangle stood a massive arch built in 1899. After construction of the arch, a frieze of 12-foot-high figures depicting "the progress of civilization in America" was sculpted on it. Both arch and steeple were damaged beyond repair in the earthquake. Photo courtesy of the Stanford University Archives.

Design by Stanford Publication Services.
STANFORD UNIVERSITY

COURSES AND DEGREES 1990-91

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
Courses and Degrees may be purchased from the Stanford Bookstore, or by sending a $5.00 check or money order (payable to Stanford University) to the address below. California residents add $.35 state sales tax; add $2.40 if domestic first class mail desired.

Catalog Mailing
Old Union, Stanford University
Stanford, California 94305-3005

Summer Session and Information may be obtained free from the above address or at the Registrar’s Information Window, Old Union.
ACADEMIC CALENDAR 1990-91

AUTUMN QUARTER, 1990

Sep 24-25 (Mon-Tue) Sign class lists; last days to arrange payment of University fees
26 (Wed) Instruction begins
27 (Thu) Conferral of degrees - Summer Quarter
Nov 22-25 (Thurs-Sun) Thanksgiving recess (no classes)
30 (Fri) Last day for filing A.B., B.S., and B.A.S. application for January (Autumn Quarter) conferral
Dec 7 (Fri) Last day for filing candidacy applications for Educational Specialist or Engineer degree for April (Winter Quarter) conferral
7 (Fri) Last day for filing University thesis, D.M.A. final project, Ph.D. dissertation, and Notice of Intention for conferral of January (Autumn Quarter) degree
10-14 (Mon-Fri) End-Quarter examinations

WINTER QUARTER, 1991

Jan 7 (Mon) Sign class lists; last day to arrange payment of University fees
8 (Tue) Instruction begins
10 (Thu) Conferral of degrees - Autumn Quarter
21 (Mon) Observance of Martin Luther King Day (holiday, no classes)
30 (Wed) Last day for filing graduate "Notice of Intention" for June commencement diploma
30 (Wed) Last day for filing A.B., B.S., and B.A.S. application for April (Winter Quarter) and June (Spring Quarter) conferral
Feb 18 (Mon) Observance of Presidents' Day (holiday, no classes)
Mar 10 (Sun) Observance of Founders' Day
15 (Fri) Last day for filing candidacy applications for Educational Specialist or Engineer degree for June (Spring Quarter) conferral
15 (Fri) Last day for filing University thesis, D.M.A. final project, Ph.D. dissertation, and Notice of Intention for conferral of April (Winter Quarter) degree
18-22 (Mon-Fri) End-Quarter examinations

SPRING QUARTER, 1991

Apr 1 (Mon) Sign class lists; last day to arrange payment of University fees
3 (Tue) Instruction begins
4 (Thu) Conferral of degrees - Winter Quarter
25 (Wed) Filing deadline for undergraduate financial aid applications for matriculated undergraduates
May 27 (Mon) Memorial Day (holiday, no classes)
June 5 (Wed) Last day for filing candidacy applications for Educational Specialist or Engineer degree for September (Summer Quarter) conferral
5 (Wed) Last day for filing University thesis, D.M.A. final project, Ph.D. dissertation, and Notice of Intention for conferral of June (Spring Quarter) degree
7-12 (Fri-Wed) End-Quarter examinations
15 (Sat) Baccalaureate Saturday and Senior Class Day
16 (Sun) Commencement

SUMMER QUARTER, 1991

Jun 24 (Mon) Sign class lists; last day to arrange payment of University fees
25 (Tue) Instruction begins
July 4 (Thu) Independence Day (holiday, no classes)
Aug 16-17 (Fri-Sat) Eight-week term examinations
17 (Sat) Eight-week term closes
30 (Fri) Last day for filing candidacy applications for Educational Specialist or Engineer degree for January (Autumn Quarter) conferral
30 (Fri) Last day for filing University thesis, D.M.A. final project, Ph.D. dissertation, and Notice of Intention for conferral of October (Summer Quarter) degree

Sep 3 (Tue) Quarter closes

<table>
<thead>
<tr>
<th>1991-92</th>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
<th>Summer (8-week term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First day of classes</td>
<td>Oct 2</td>
<td>Jan 7</td>
<td>March 31</td>
<td>June 23</td>
</tr>
<tr>
<td>Last day of finals</td>
<td>Dec 20</td>
<td>Mar 20</td>
<td>June 10</td>
<td>Aug 15</td>
</tr>
<tr>
<td>Commencement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONTENTS

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

DEGREES .............................................. 8
Undergraduate Degrees ................................ 8
Undergraduate Study at Stanford ..................... 10
Advanced Degrees ................................... 14

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

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

SCHOOL OF EARTH SCIENCES ......................... 22
Applied Earth Sciences ................................ 23
Environmental Studies ................................ 35
Geology .............................................. 36
Geophysics .......................................... 47
Petroleum Engineering ................................ 53

SCHOOL OF EDUCATION ................................... 63

SCHOOL OF ENGINEERING ................................ 86
Aeronautics and Astronautics ....................... 102
Chemical Engineering ................................ 116
Civil Engineering .................................... 120
Computer Science .................................... 135
Electrical Engineering ................................ 153
Engineering-Economic Systems .................... 172
Industrial Engineering and Engineering Management ........................................... 181
Materials Science and Engineering ............... 187
Mechanical Engineering ............................. 193
Operations Research ................................ 216
Scientific Computing and Computational Mathematics Program .................. 222

SCHOOL OF HUMANITIES AND SCIENCES ................. 224
African and Afro-American Studies, Undergraduate Program in .................. 225
African Studies ...................................... 229
American Studies .................................... 234
Anthropology ........................................ 238
Applied Physics ...................................... 251
Art ................................................... 257
Asian Languages ...................................... 271
Astronomy Course Program ......................... 281
Athletics, Physical Education, and Recreation ............................................... 284
Biological Sciences .................................. 295
Division of Marine Biology ......................... 309
Black Performing Arts, Committee on ............ 311
Chemistry ............................................ 312
Chicano Fellows Program ............................ 319
Classics .............................................. 320
Communication ...................................... 330
Comparative Literature ............................. 338
Cultures, Ideas, and Values, Program in (CIV) ........................................ 350
Drama ............................................... 352

East Asian Studies, Center for (CEAS) ............ 361
Economics ............................................ 370
English .............................................. 387
Ethics in Society, Program in ....................... 405
Feminist Studies, Program in ....................... 407
Food Research Institute ............................ 415
French and Italian .................................. 419
German Studies ..................................... 437
History .............................................. 448
History of Science, Program in ..................... 465
Human Biology, Program in ........................ 467
Humanities Special Programs ....................... 477
International Policy Studies (IPS) ................ 479
International Relations ............................. 481
Jewish Studies, Program in ........................ 495
Latin American Studies, Center for ............... 497
Linguistics .......................................... 501
English as a Foreign Language ...................... 511
Literature in Translation ........................... 512
Mathematical and Computational Science .............. 514
Mathematics ........................................ 515
Medieval Studies .................................... 526
Modern Thought and Literature .................... 528
Music ............................................... 533
Overseas Studies Program ......................... 543
Philosophy .......................................... 553
Physics .............................................. 569
Political Science .................................... 579
Population and Resource Studies, Morrison Institute for ........................ 595
Psychology .......................................... 596
Public Policy Program .............................. 610
Religious Studies .................................... 614
Russian and East European Studies, Center for (CRES) ............................ 621
Slavic Languages and Literatures ................... 623
Sociology .......................................... 632
Space Sciences and Astrophysics, Center for .......... 645
Spanish and Portuguese ............................. 647
Statistics .......................................... 659
Structured Liberal Education, Program in ........ 667
Symbolic Systems, Program in ..................... 667
Urban Studies, Program in ......................... 671

SPECIAL PROGRAMS .................................. 677
Individually Designed Majors, Program for .................. 677
Innovative Academic Courses ....................... 678
Freshman-Sophomore Seminar Programs .............. 679
SWOPSI (Stanford Workshops on Political and Social Issues) .................. 679
Undergraduate Special Courses ..................... 680
Public Service, Haas Center for ..................... 680
Teaching and Learning, Center for (CTL) .......................... 680
Undergraduate Research Opportunities (URO) .................. 682
Washington, Stanford in ........................................ 683

SCHOOL OF LAW .............................................. 684

SCHOOL OF MEDICINE ......................................... 686
Combined Admissions Mode in Biological and Biomedical Sciences .................. 687
Biochemistry ................................................. 688
Cell Biology ................................................ 690
Developmental Biology ........................................ 692
Diagnostic Radiology and Nuclear Medicine ......................... 693
Genetics ...................................................... 694
Health Research and Policy .................................... 695
Medical Information Sciences Program ............................. 697
Microbiology and Immunology .................................... 701
Molecular and Cellular Physiology ................................. 704
Neurobiology .................................................. 706
Pathology ...................................................... 707
Pharmacology .................................................. 709
Radiation Oncology ............................................ 711

DEAN OF GRADUATE STUDIES .................................. 712
INTERDISCIPLINARY PROGRAMS AND COMMITTEES ............... 712
Biophysics Program ........................................... 712
Cancer Biology Program ........................................ 714
Graduate Division Special Program ................................. 715
Immunology Program ........................................... 716
Neurosciences Program ......................................... 718

CENTERS
Chicano Research, Stanford Center for (SCCR) .................. 723
Humanities Center, Stanford ..................................... 723
Research on Women and Gender, Institute for .................... 724

INDEPENDENT RESEARCH LABORATORIES, CENTERS, AND INSTITUTES ...... 725
Economic Policy Research, Center for (CEPR) ................... 725
Ginzton Laboratory, Edward L .................................... 726
Hansen Experimental Physics Laboratory, W. W. ................. 726

International Studies, Institute for (IIS) ........................ 726
Chinese Language Studies in Taipei, Inter-University Program for .................. 729
Japanese Language Studies in Yokohama, Inter-University Center for ................ 729
Language and Information, Center for the Study of (CSLI) ....... 730
Materials Research, Center for (CMR) .......................... 730
Mathematical Studies in the Social Sciences, Institute for (IMSSS) .......... 731
Stanford Linear Accelerator Center (SLAC) ....................... 731
Stanford Synchrotron Radiation Laboratory (SSRL) ................ 732

LIBRARIES ..................................................... 733
Hoover Institution on War, Revolution, and Peace ................. 733
University Libraries ............................................ 735

LIBRARIES AND INFORMATION RESOURCES ....................... 737
Academic Information Resources (AIR) .......................... 737
Library Information Systems ..................................... 739
Networking and Communication Systems .......................... 739
Stanford Data Center ........................................... 739

UNDERGRADUATE INTER-SCHOOL PROGRAM ....................... 745
Values, Technology, Science, and Society, Program in (VTSS) ....... 745

CONTINUING STUDIES PROGRAM ................................ 755

STATEMENTS OF NONDISCRIMINATORY POLICY ................. 755

POLICY ON THE USE OF VERTEBRATE ANIMALS IN TEACHING ACTIVITIES .......... 756

UNIVERSITY PUBLICATIONS ..................................... 757

APPENDIX
Distribution Requirements ......................................... 759

INDEX .......................................................... 769
Stanford University is celebrating its "Centennial Years" (1985-1991), a period for reflection upon its past, a clearer understanding of its present, and exceptional opportunities to plan its future.

On November 14, 1885, Senator and Mrs. Leland Stanford executed the Founding Grant of The Leland Stanford Junior University. Three days later they called together the 24 prominent men who had been chosen to become the University's first trustees and presented them with this historic document, which Leland Stanford himself had dictated. The 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 16th 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 Stanford's 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 men and women 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, 10-year job of organizing the departments into schools. Several regroupings occurred thereafter, but since 1948 the school organization has been as follows: Business, Earth Sciences, Education, Engineering, Humanities and Sciences, Law, and Medicine.

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

Stanford early acquired a reputation as a regional institution, especially at the undergraduate level, but it was not until the mid-1950s, 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 1986 it was 517.

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 Autumn Quarter 1989 totaled 13,354, of whom 6,505 were undergraduates and 6,849 were graduate students. Blacks, Hispanics, Puerto Ricans, and Native Americans numbered 1,220 undergraduates and 581 at the graduate level. Stanford awarded 4,130 degrees in 1988-89, of which 1,621 were baccalaureate and 2,499 were advanced degrees.

Among the 1,324 faculty, there are 8 Nobel laureates, 84 members of the National Academy of Sciences, 134 members of the American Academy of Arts and Sciences, 62 members of the National Academy of Engineering, 12 members of the National Academy of Education, 16 winners of the National Medal of Science, 21 members of the American Philosophical Society, and 5 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 succeeded 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 may be obtained in libraries and some bookstores are:

- Clark, G. T., *Leland Stanford*, 1931
- Elliott, O. L., *Stanford University: The First Twenty-five Years*, 1937

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 six million items.
The following description of academic degree requirements applies to all students of Stanford University. For departmental or school requirements, please see the appropriate department and school sections in this bulletin.

To supplement information provided here, please see the *Information* issue of the Stanford University Bulletin. *Information* is published each March and is available, without charge, from the Registrar's Information Window, Old Union lobby, or from Catalog Mailing, Old Union, Stanford University, Stanford, CA 94305-3005. It provides details on Stanford University's organization as well as descriptions and practices regarding matters such as registration, tuition and fees, leaves of absence, academic standing, student services, and the Fundamental Standard and Honor Code.

**UNDERGRADUATE DEGREES**

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

Stanford University confers the degree of Bachelor of Arts (A.B.) or the degree of Bachelor of Science (B.S.) upon those candidates who have been recommended by the Committee on Academic Appraisal and Achievement (C-AAA), who have applied in advance for conferral of the degree (see the deadlines in the quarterly *Time Schedule* calendar), and who have fulfilled the following requirements:

1. Minimum of 180 units of University work.
2. Writing, Distribution, and Language Requirements.
3. Curricular requirements of at least one major department or program and the recommendation of the department(s). (Descriptions of curricular and special degree requirements are under each departmental section in this bulletin.)
4. Minimum of 45 units (including the last 15) at Stanford. In special cases, students who have earned at least 135 units in resident work and who have completed Writing, Distribution, and Language Requirements, as well as all major requirements, may petition for a waiver of the last 15 units-in-residence requirement.
5. Minimum of three quarters of study in residence.

Stanford confers the Bachelor of Science degree upon candidates who fulfill these requirements in the School of Earth Sciences, in the School of Engineering, or in the Departments of Applied Physics, Biological Sciences, Chemistry, Mathematics, or Physics in the School of Humanities and Sciences. The University also awards B.S. degrees to candidates in the Program in Values, Technology, Science, and Society; in the Program in Mathematical and Computational Science; in the Program in Symbolic Systems; in the School of Medicine's Department of Microbiology and Immunology; and, when appropriate, in the Program for Individually Designed Majors. Candidates who fulfill these requirements in other schools or departments receive the Bachelor of Arts degree.

The University confers the degree of Bachelor of Arts and Science (B.A.S.) on candidates who have completed two sets of major curricular requirements with no overlapping courses (one set leading to a Bachelor of Arts degree and the other leading to a Bachelor of Science), who have applied in advance for graduation with the B.A.S. degree in lieu of the A.B. or B.S. degree, and who have been recommended by the C-AAA. Candidates for the B.A.S. must fulfill requirements (1), (2), (4), and (5) above in addition to the major requirements.

**DUAL A.B. AND B.S. DEGREE PROGRAMS**

A Stanford undergraduate may work concurrently toward an A.B. and a B.S. degree. A student interested in dual bachelor's degrees should file a statement of intention with the Office of the Registrar's Academic Standing section, Old Union, room 131. A student should submit this statement no later than two quarters in advance of completing the program. The statement should be submitted on a standard petition form along with recommendations of appropriate representatives in the two departments from which the student expects to receive degrees.

In order to qualify for both degrees, a student must complete the University and departmental requirements for each degree and must complete the University residence requirement for dual degrees—fifteen full-tuition quarters or three full-tuition quarters after completing 180 units; a student must complete a minimum of 225 units for the dual degree option.
A student who completes the academic requirements of both an A.B. and a B.S. degree but who does not complete the residence requirements for both may elect to receive a Bachelor of Arts and Science (B.A.S) degree. Students electing the B.A.S. degree must fulfill the requirements of one A.B. and one B.S. major without overlapping courses. The B.A.S. requires the completion of 180 units. Alternatively, a student whose residence is not sufficient for two degrees may elect to receive either the A.B. or the B.S. degree and to have a notation on his or her transcript that the requirements for the other major were also completed. (See the explanation of secondary majors under "The Major" heading to follow.)

If a student fails to meet all graduation requirements after having applied to graduate, he or she must reapply to graduate in a subsequent quarter. Please note that degree candidates may graduate in Autumn, Winter, Spring, or Summer Quarter; but the University awards all diplomas in June. Stanford University awards no honorary degrees.

SECOND BACHELOR'S 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. However, 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 from Stanford may apply for candidacy for a Bachelor of Arts degree. A recommendation of the major department for the second bachelor's degree must accompany the application.

Generally, a student may not apply for a second bachelor's degree after having been a graduate student, although a student may submit a petition for exception; the Office of the Registrar's Academic Standing section in the Old Union, room 131, reviews these petitions. A student approved for this program may register as an undergraduate and is subject to the usual rules and regulations affecting undergraduates. Specific requirements affecting second bachelor's degrees are available from the Office of the Registrar's Graduation Assistant, Old Union, room 142.

CREDIT FOR ACTIVITY COURSES

An undergraduate entering Stanford in September 1986, or thereafter, may apply a maximum of 12 units in activity courses (Physical Education activity or Music activity) to the 180 units required for graduation. An undergraduate who entered Stanford prior to September 1986 is limited to a total of 12 units of Physical Education activity courses and a total of 24 units of ensemble Music courses that can apply toward graduation. The curriculum committee of the Department of Athletics, Physical Education, and Recreation and the Department of Music designate their respective activity courses.

OUTSIDE ACADEMIC CREDIT

Stanford University allows up to 45 units of credit toward graduation for work completed in high school as part of the College Entrance Examination Board (CEEB) Advanced Placement curriculum. The awarding of such credit is based on CEEB Advanced Placement test scores and is subject to University and departmental approval.

Undergraduate students who have attended other colleges or universities may transfer no more than 90 quarter units of credit for work done elsewhere toward a bachelor's degree from Stanford. Further information regarding transfer credit is available from the Office of the Registrar's Transfer Credit Evaluator in the Old Union, room 132.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

The coterminal degree allows undergraduates to study for the bachelor's and master's degrees simultaneously in the same or a different department. Undergraduates with strong academic records may apply for admission to a coterminal master's program as early as the eighth quarter (or upon completion of 105 units) and no later than the end of the 11th quarter of undergraduate study but at least four quarters in advance of the anticipated date of conferral of the master's degree.

To apply for admission to a coterminal master's program, students must submit to the prospective department the following: coterminal application, statement of purpose, program plan, two letters of recommendation from Stanford professors, and current Stanford transcript. GRE scores or other requirements may be specified by the proposed graduate department.

The requirements for a coterminal bachelor's/master's program are: (1) 180 units for the bachelor's degree plus 36 (or the higher departmental requirement) unduplicated units for the master's degree; (2) 15 full-tuition quarters of residency or three quarters after the quarter in which 180 units are completed. The requirements for the coterminal program with two undergraduate degrees are 180 units for the first bachelor's degree, 45 units for the second bachelor's degree, 36 or 45 units for the master's degree, and re-
sidency of six full-tuition quarters after the quarter in which 180 units were completed, or a total of 18 full-tuition quarters.

Of the 36-unit University minimum for the master’s degree, all courses must be at or above the 100 level and 50 percent must be courses designated primarily for graduate students (typically at least at the 200 level). Departmental requirements may be higher. Course units may be counted to meet the requirements of only one degree. No units may be double-counted. No courses taken more than two quarters prior to admission to the cotermination’s program may be used to meet the 36-unit University minimum.

For cotermination students, the quarter following completion of 180 units (or 225 units for dual-degree students) is identified as the First Graduate Quarter. Beginning with this quarter, cotermination students are subject to graduate division policies and procedures, as described in the “Advanced Degrees” section of this bulletin. In the First Graduate Quarter, cotermination students are assigned an advisor in the master’s department to assist them in planning a program of study to meet the requirements for the master’s degree. The plan is outlined on the Program Proposal for a Master’s Degree which is approved in the department and submitted to the Graduate Program Office by the end of the First Graduate Quarter.

Authorizations for master’s programs expire three calendar years from the First Graduate Quarter. An extension requires review of academic performance by the department and approval from the Graduate Program Office.

Each degree is applied for separately by the deadlines given in the University Time Schedule and calendars. The master’s degree must be conferred simultaneously with, or after, the bachelor’s degree.

Information and applications for the cotermination degree program are available at the Graduate Program Office. Applications that have been recommended by the undergraduate and graduate departments should be submitted to the Graduate Program Office. Final offers of admission to graduate programs are made by the Dean of Graduate Studies through the Graduate Program Office.

UNDERGRADUATE STUDY AT STANFORD

A LIBERAL EDUCATION

As do all distinguished universities, 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, which significantly deepens understanding of one or two of these areas, and which prepares them for a lifetime of continual learning and application of knowledge to career and personal life. The distinguishing mark of the University is that its faculty is engaged in the discovery and creation of knowledge as well as in its dissemination. 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 pursuit of 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 undergraduate study programs 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 of a major.

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 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 gains 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 FRESHMAN WRITING REQUIREMENT

All instructors expect that students will express themselves effectively in speech and writing. The Freshman Writing Requirement helps students meet that expectation.

All candidates for the bachelor's degree, regardless of the date of matriculation, should satisfy the requirement during their first year at Stanford. Transfer students are individually informed at matriculation of their status vis-a-vis the requirement.

The Writing Requirement can be satisfied in four ways:

1. English 1-2, a two-quarter sequence of composition courses (Note: A few students who demonstrate sufficient skill in the first quarter of the English 1-2 sequence will be exempted from English 2 upon certification by the instructor.);
2. English 3, an intensified one-quarter course open only to students with a score of 4 or 5 on the CEEB Advanced Placement Test;
3. Special writing instruction in connection with the Program in Cultures, Ideas, and Values; the Structured Liberal Education (SLE) track; and the English 7-8-9 track (Literature and the Arts); or
4. Approved transfer credit.

A complete list of Freshman English courses is distributed to all entering undergraduates and is also available at the Freshman English office.

Courses available to fulfill the Freshman Writing Requirement are designated DR:W in this bulletin.

THE DISTRIBUTION REQUIREMENTS

PURPOSE

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 does not provide a student with an adequate general education any more than acquiring the necessary number of units in the major qualifies 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 (C-US), under the authority of the Senate of the Academic Council, certifies courses which fulfill the Distribution Requirements in the required areas of study. Information regarding specific courses that satisfy the Distribution Requirements and regarding individual student distribution status is available at the Registrar's Office. Course planning and advising questions related to the Distribution Requirements should be directed to the Undergraduate Advising Center.

It is the responsibility of each student to ensure 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 Undergraduate Advising Center and in the Time Schedule; final choices should be made only after reviewing these details.

Students should be extremely careful to note which set of Distribution Requirements apply to them. The date of matriculation at Stanford determines what requirements apply to any individual student. Note that the requirements are measured in courses of at least 3 units each.

CURRENT SYSTEM

To fulfill the Distribution Requirements, undergraduates who entered Stanford in Autumn Quarter 1980 and thereafter must take 10 courses certified for this purpose in eight areas as follows:

Three sequential courses in the Program in Cultures, Ideas, and Values. 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 2 through 8 and the following note on the non-Western culture requirement.

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

Area 1: Cultures, Ideas, and Values (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:8)

Note: At least one course must be certified as concentrating on a non-Western culture. The non-Western requirement may be satisfied by completing one course from among those courses certified for Areas 2-8 and designated with an asterisk, e.g., (DR:3*), or by completing one course on a list of routine substitutes drawn up annually by the Dean of Undergraduate Studies based on information provided by the departments and approved by the C-US Subcommittee on Distribution Requirements.

Courses certified as meeting the Distribution Requirements must carry a minimum of 3 units of credit. Normally, a single course is certified as fulfilling only one area of the Distribution Requirements. 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 Distribution Requirements are annotated according to the symbols above to show how they fulfill the Distribution Requirements. A completed list of courses appears as an Appendix at the back of this bulletin.

CREDIT TRANSFER

Where students propose to use work taken at another college or university to satisfy a Distribution Requirement, the Office of the Registrar’s Credit Evaluation staff determines, after appropriate faculty consultation, whether the work is comparable to any of the specifically certified courses or course sequences.

PETITION

Students who have reason to believe their undergraduate program objectives are served by using some course(s) other than those specifically certified as satisfying the Distribution Requirements may present petitions, endorsed by their academic advisors and the Registrar’s Graduation Assistant, to the Academic Standing Office, room 131, Old Union.

UNDERGRADUATES WHO ENTERED PRIOR TO AUTUMN 1980

Stanford has a long tradition of assuring curricular breadth through some system of requirements, variously described as “distribution requirements,” “general studies requirements,” or “general education requirements.” Students returning to Stanford to complete interrupted degree programs can satisfy either the distribution program in place at the time of their matriculation or the current program of requirements. Such students should consult the Stanford University bulletin appropriate to their original entrance year or seek the advice of the Registrar’s Graduation Assistant, room 142, Old Union.

THE LANGUAGE REQUIREMENT

Undergraduates who entered Stanford in September 1982 or thereafter are required to complete at least one year of college level study in a single foreign language. 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

The primary purpose of the major is to encourage each student to explore a subject area in considerable depth. This in-depth study complements the breadth of study promoted by the Distribution Requirements and, in many cases, by a 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 is shaped by time and circumstances.

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, and upper-division courses should build upon lower-division courses. The course of study should, if feasible, give the student the opportunity and responsibility of doing original, creative work in the major subject. Benefits of the major program are greatest when it includes a culminating and synthesizing experience such as a senior seminar, an undergraduate thesis, or a senior project.

REQUIREMENTS FOR THE MAJOR

Undergraduates must select a major by the time they achieve junior status (85 units completed). All undergraduate major programs listed in this bulletin, except for certain honors degree programs that require application and admission in advance, are open to all students. Students may change their majors at any time upon request; in some fields, though, a late change could easily result in extending the period of undergraduate study.

Check individual departmental or program listings in this bulletin for the undergraduate degrees offered and for specific major requirements. If a field of study has no baccalaureate degree, that field is not available as a regular undergraduate major.

Faculty set the minimum requirements for the major fields of study in each department. These 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 the major advisor.

The student pursuing a single degree, either the Bachelor of Arts (A.B.) or Bachelor of Science (B.S.), may formally declare more than one major within the degree program. This may be done 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 a degree is formally to reflect more than a single major, the student must meet the following conditions:

1. Satisfy the requirements for each major.
2. The courses proposed as satisfying the requirements of one declared major may not overlap with those of the other declared major, unless
   a) overlapping courses constitute introductory skill requirements (e.g., introductory mathematics or foreign language), or
   b) overlapping courses enable the student to meet school requirements (e.g., for two majors within the School of Engineering).
3. At the time the student applies to graduate, the major departments or programs must be cognizant of the courses the student proposes to satisfy the declared majors and of the limitation of (2) above, and they must attest to the student's having satisfied the pertinent major requirements.

An undergraduate who completes course requirements for more than one major, but with overlapping courses, may elect to receive a degree in one of the majors and to have a notation on his or her transcript that the requirements of the secondary major were also completed. Secondary majors are not noted on the diploma. Specific requirements for secondary majors and for multiple majors with a single baccalaureate program are available from the Registrar's Graduation Assistant, Old Union, room 142.

LIMITS ON REQUIREMENTS FOR MAJORS

In order to achieve the values of study in depth, a well-structured major should constitute approximately one-third of a student's program (55-65 units). To ensure the values of breadth, a major should comprise no more than two-thirds of a student's program (115-125 units). And, 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 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.
For a limited number of qualified students, many departments and programs offer a special program leading to a degree with honors. After declaring a major, students may apply to the major department or program for acceptance into the honors program. Demands on the students vary, but all honors programs encourage creative, independent work at an advanced level in addition to the major requirements.

The guidelines set forth here are deliberately general; 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, after all, 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 Majors” section of this bulletin.

**UNDERGRADUATE ACADEMIC ADVISING**

The objective of the advising program is to assist students in assuming maximum responsibility for their academic programs. The Undergraduate Advising Center (UAC) provides and coordinates information and services which help student and advisor work together toward the establishment and accomplishment of the student's goals.

Freshmen are assigned to general academic advisors according to their residence and their preliminary academic interest. Freshmen advisors work with advisees each quarter to plan their academic programs; advisors must sign Study List cards for each quarter of the students' freshman year.

Sophomores who are undecided about their majors continue to work with the advisors they had as freshmen, and to seek out their advisors' guidance and signatures on their Study Lists. Sophomores whose advisors are no longer advising use the advisors at the UAC until they declare a major. All transfer students are assigned an advisor by the UAC until they declare a major and/or become acclimated. 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.

At the UAC, located on the first floor of Sweet Hall, advisors and students are given answers, or assistance in finding them, to all questions relating to academic matters. The UAC answers questions concerning: course selection, choosing a major, and planning for an academic career; graduate school and funding for graduate study both at Stanford and at other institutions in the U.S.; sophomore and transfer advising; individually designed majors; and preparing for business, law, medical school, or other allied health fields. A collection of graduate and undergraduate catalogs from other institutions is available, as well as reference guides to graduate and professional schools. Special programs run by the UAC are The Majors' Event, and the Women's Science and Engineering Network.

**ADVANCED DEGREES**

**GENERAL REQUIREMENTS**

For each Stanford advanced degree, there is an approved course of study which meets University and departmental requirements.

The minimum unit requirements for Stanford advanced degrees are described later in this section. Where more than one advanced degree is received, each degree must represent at least 36 unduplicated units. The final units of a degree program, whether coursework, directed reading, or research, must be completed at Stanford as a registered student.

Residency for an advanced degree is the time devoted to graduate study measured in tuition payments. The minimum residency requirement for an advanced degree is three full-tuition quarters or the equivalent in partial-tuition quarters. A full-tuition quarter is payment for 11 or more units per quarter during the academic year and 15 units in the Summer Quarter.

Specific departmental degree requirements are provided in the “Graduate Programs” section of each departmental listing in this bulletin. Opportunities for individually designed, interdisciplinary study at the doctoral level are described in the “Graduate Division Special Program” section. Additional information on University requirements and procedures for obtaining advanced degrees is available from the Graduate Program Office, Building 590, room 104.
REGISTRATION REQUIREMENTS

Graduate students must register for all three quarters of the academic year (Autumn, Winter, and Spring) until the degree is conferred. Coursework and research are expected to be done on campus unless the department gives prior approval for study in absentia. Leaves of absence may be requested, in advance of departure, for up to one year.

Registration is required in the current or immediately preceding quarter in which a departmental project, thesis, or dissertation is submitted and/or a Notice of Intention to Complete Advanced Degree Requirements is filed for the conferral of a degree.

The following registration categories are available to graduate students who are in the final stages of their degree programs:

1. Advanced Graduate Registration (AGR)—Doctoral students who have been admitted to candidacy, registered for all required courses, and completed nine quarters of residency may request Advanced Graduate Registration status for 9-unit registration.

2. Terminal Graduate Registration (TGR)—Doctoral students who have been admitted to candidacy, completed all required coursework, accrued 10.5 quarters of residency, and submitted a Doctoral Dissertation Reading Committee form may request Terminal Graduate Registration status to complete their dissertations. Students enrolled in the master's program may qualify for TGR status upon completion of all required coursework and three quarters of residency only if their program requires a thesis or departmental project. TGR status for the Engineer program may be obtained after admission to candidacy, completion of all required coursework, and six quarters of residency.

A one-quarter TGR authorization is available to graduate students who have completed all degree requirements and are returning after a leave of absence or reinstatement to register to take a University Oral Examination, submit a thesis or dissertation, or file a Notice of Intention to Complete Advanced Degree Requirements for conferral of a degree.

3. Graduate Final Requirement Registration—Graduate students who have only a few remaining units to complete degree requirements or to qualify for TGR status may register for one quarter on a unit basis to cover the deficiency. This status may be used only once during a degree program.

Additional information on these registration categories is available from the Graduate Program Office.

ADDITIONAL DEGREES AND CHANGES OF MAJOR OR DEGREE LEVEL

Graduate students who wish to obtain an additional degree or change to a new degree program must obtain departmental and Graduate Studies approval of the Graduate Program Authorization Petition. This form, available from offices in the Graduate Administrative Center, must be submitted to the Associate Dean of Graduate Studies, Building 590.

Students who seek a degree in another department must submit a statement of purpose and current Stanford transcript. Departments may specify other application requirements, such as advanced subject GRE scores and/or letters of recommendation. An additional graduate application fee is not required. Verification of funding to cover the new degree objective is required for international students changing departments or degree programs which will lengthen their stay and for all students seeking admission to doctoral programs in the School of Education and to departments in the School of Humanities and Sciences.

MASTER OF ARTS AND 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 degrees of Master of Arts (A.M.) and Master of Sciences (M.S.) are conferred on students who have satisfactorily completed at least three full-tuition quarters of residency as graduate students in the University and have fulfilled other requirements prescribed by the school or department concerned. The University minimum requirement for the A.M. and M.S. degrees is 36 units earned at Stanford as a graduate student. Most departments require more. Of the 36-unit minimum, all courses must be at or above the 100 level and 50 percent must be courses designated primarily for graduate students (typically at least at the 200 level). Departmental specifications may be higher. Up to 9 units of work done as a graduate student at another university may be used to meet departmental requirements that exceed the 36 unit minimum. The residency requirement of three full-tuition quarters remains unchanged.

In the first quarter of enrollment in a master's program, the department assigns an advisor to master's students to assist them in planning a coherent program of study. The student's master's program is outlined on the Program Pro-
posal for a Master's Degree which must be approved in the department and submitted to the Graduate Program Office by the end of the first quarter. Authorization to register for master's programs expires three years from the first quarter of enrollment in the program. Extensions beyond the third year require review of academic progress and approval by the department and the Graduate Program Office.

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 quarter in which the degree is to be conferred. Directions for the preparation and submission of theses are available in the Graduate Program Office, Building 590, room 104.

A second Stanford master's degree requires an additional 36 unduplicated units and three quarters of residency.

**MASTER OF ARTS IN TEACHING**

Upon recommendation to the Senate of the Academic Council by the faculty of the School of Education and the Committee on Graduate Studies, the Master of Arts in Teaching (M.A.T.) is conferred on candidates who have completed at least three full-tuition quarters of residency as a graduate student at the University and who have fulfilled other requirements prescribed by the School of Education and one of the academic departments participating jointly in the program. The program is designed for experienced teachers or for individuals who have previously completed a program of teacher preparation.

**MASTER OF FINE ARTS**

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 full-tuition quarters of residency, 36 units of study, and other requirements described in the "Art Department" section of this bulletin.

**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 pamphlet.) The requirements for unduplicated units and residency for an A.M. or M.S. degree pursued concurrently with the M.B.A. degree are determined by the department offering the master's degree.

**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 completed three full-tuition quarters of residency and a program of study, as outlined on the Application for Candidacy, of 45 units of coursework at Stanford beyond a master's degree (or its equivalent). A field-based project is also required.

**ENGINEER**

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 been admitted to candidacy and who have satisfactorily completed a minimum of three full-tuition quarters of residency and 36 units at Stanford beyond the master's degree. A thesis is required.

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 in which the degree is to be conferred.

A fee is charged for binding three copies of the thesis. 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 study for the Master of Legal Studies degree (M.L.S.), a nonprofessional degree, is granted to students who hold the Doctor of Philosophy (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.

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 Legal Studies is con-
ferred upon candidates 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.

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 requirements of the School of Education and the University. See the “Doctor of Philosophy General Regulations” section in this bulletin.

DOCTOR OF MUSICAL ARTS

Upon recommendation to the Senate of the Academic Council by the faculty of the Department of Music and the Committee on Graduate Studies, the degree of Doctor of Musical Arts (D.M.A.) is conferred on candidates who have satisfied the requirements of the faculty of the Department of Music and the University. Information on the requirements for the D.M.A. and the Ph.D. in Music may be found in the “Music” section of this bulletin. Also see the “Doctor of Philosophy General Regulations” section of this bulletin.

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 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 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.

The degree is primarily designed for those qualified students who hold a J.D. or its equivalent and 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 Stanford Law School bulletin.

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 the 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 Stanford Law School bulletin.

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. All requirements for the M.D. degree are given in the bulletin School of Medicine.

DOCTOR OF PHILOSOPHY

GENERAL REGULATIONS

Upon recommendation to the Senate of the Academic Council by the faculty of the major department or program 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.

Candidates for the Ph.D. degree must satisfactorily complete a three year program of study that includes 72 units of graduate coursework and research done at Stanford and nine full-tuition quarters of residency. To promote diversity and depth in the doctoral program, at least 3 units must be taken with each of four Stanford faculty members. A doctoral program may include a master's or an Engineer degree.
However, the minimum requirements for a doctoral degree taken after another Stanford advanced degree are three quarters of residency and 36 units of unduplicated work.

A maximum of three quarters of residency and 36 units of work done as a graduate student elsewhere may be applied to the Stanford doctoral program requirements following review by the department and the Graduate Program Office. Students can apply for credit for prior graduate work only after the first quarter at Stanford. Students who wish to receive credit for graduate work done at another institution during the course of their Stanford program must receive prior approval.

CANDIDACY

Admission to candidacy for the doctoral degree is an acknowledgement of the student's potential to complete successfully the requirements for the Ph.D. Students are expected to complete departmental qualifying procedures and apply for candidacy by the end of the second year of doctoral study. The Application for Candidacy specifies a departmentally approved program of study to fulfill degree requirements. If the program includes a minor, approval by the department awarding the minor is also required. Applications for Candidacy are reviewed by the Graduate Program Office and submitted to the Committee on Graduate Studies for approval. Doctoral students are expected to complete their degree requirements in a timely manner. Therefore, candidacy is valid for five years unless terminated by the department for unsatisfactory progress. Extensions of candidacy require review by the department and the Graduate Program Office of a progress report and timetable for completion of the dissertation.

TEACHING REQUIREMENTS

A number of departments require their students to teach for one or more quarters during their doctoral program. Detailed information is included in the departmental sections of this bulletin.

FOREIGN LANGUAGE REQUIREMENT

Some departments require a reading knowledge of one or more foreign languages as indicated in departmental sections of this bulletin. Fulfillment of language requirements is endorsed by the chair of the major department on the Foreign Language Report form.

DOCTORAL DISSERTATION READING COMMITTEE

The Doctoral Dissertation Reading Committee consists of the principal dissertation advisor and two other readers. At least one member must be from the major department. All members must be on the Academic Council. (On occasion, permission for appointment of a reader who is not on the Academic Council may be approved by the Graduate Program Office if that person is particularly well-qualified to consult on the dissertation topic.) The reading committee is endorsed by the chair of the major department on the Doctoral Dissertation Reading Committee form. This form is submitted to the Graduate Program Office before approval of Terminal Graduate Registration (TGR) status or before scheduling a University oral examination that is a defense of the dissertation, whichever comes first in the student’s program. The reading committee may be appointed earlier, according to the departmental timetable for doctoral programs. All subsequent changes to the reading committee must be approved by the chair of the major department.

UNIVERSITY ORAL EXAMINATION

A University oral examination is a requirement of the Ph.D. program. The purpose of the examination is to test the candidate’s command of the field of study and to confirm fitness for scholarly pursuits. Departments determine when during the doctoral program the oral examination is taken. It may be a test of knowledge of the field, a review of a dissertation proposal, or a defense of the dissertation.

The University Oral Examination Committee consists of at least four Stanford faculty members representing the major and minor departments. All members must be on the Academic Council. (Permission for appointment of an examining committee member who is not on the Academic Council may be approved by the Graduate Program Office if that person contributes an area of expertise that is not readily available from the faculty.) In addition, a chair of the examining committee is appointed by the Dean of Graduate Studies through the Graduate Program Office. The chair cannot be from the student’s department or from any department represented by a committee member.

The University Oral Examination Schedule must be submitted to the Graduate Program Office at least three weeks prior to the proposed examination date. The official period for scheduling University oral examinations is from the third week to the last day of classes each quarter. The examination is conducted according to the major department’s adopted practice, but it should not exceed three hours in length and it must include a period of private questioning.

The candidate passes the examination if the examining committee casts four favorable votes out of five or six, five votes out of seven, or six votes out of eight. Five members present and
voting constitute a quorum. If the committee votes to fail a student, the committee chair sends within five days a written evaluation of the candidate’s performance to the major department. Within 30 days and after discussion with the student, advisor, and appropriate faculty members, the chair of the student’s major department must send the student a written statement indicating the final action of the department. Copies of correspondence from the chair of the examining committee and the chair of the department should also be sent to the Dean of Graduate Studies and to the Graduate Program Office.

DISSERTATION

The doctoral dissertation is expected to be an original contribution to scholarship or scientific knowledge and to exemplify the highest standards of disciplines. The dissertation is approved for the school or department by the Doctoral Dissertation Reading Committee. Each member of the reading committee signs the signature page of the dissertation to certify that the work is of acceptable scope and quality. One reading committee member reads the dissertation in its final form and certifies on the Certificate of Final Reading that departmental and University specifications have been met.

Dissertations must be in English. Exceptions are granted by the Graduate Dean only upon submission of a written request from the chair of the student’s major department. Approval for writing the dissertation in another language is normally granted only in cases where the other language or literature in that language is also the subject of the discipline. Dissertations written in another language must include an extended summary in English.

Directions for preparation of the dissertation and abstract are available from the Graduate Program Office. Four copies of the dissertation and an abstract of less than 350 words must be submitted to the Graduate Program Office on or before the last day of classes in the quarter in which the degree is conferred. Two copies of the bound dissertation are sent to the Stanford University Library, and one copy goes to the major department. A fourth copy is sent to University Microfilms in Ann Arbor, Michigan, from whom microfilm copies may be ordered. Additional copies for personal use may be submitted for binding. A fee is charged for microfilming and binding copies of the dissertation and for publishing the abstract.

Ph.D. MINOR

A minor may be offered by any Ph.D. granting department or program. Doctoral students from another department or program may pursue a minor to complement their Ph.D. program. The minor should represent a program of graduate quality and depth, including core requirements and electives or examinations. The department offering the minor establishes the core and examination requirements. Elective courses are planned in conjunction with the minor department and the Ph.D. department.

The minimum University requirement for a Ph.D. minor is 20 units of coursework at the graduate level. If a minor department chooses to require passing of Ph.D. qualifying or field examinations, the unit specification may be reduced. All of the coursework for a minor must be done at Stanford. Courses used for a minor may not also be used to meet requirements for a master’s degree.

A Ph.D. minor form outlining a program of study must be approved by the major and minor departments. This form, which is normally submitted at the time of admission to candidacy, specifies whether representation from the minor department on the University oral examination is required.

NONMATRICULATED GRADUATE STUDY

Graduates of colleges and universities of recognized standing who hold a U.S. bachelor’s degree or its equivalent are eligible to apply for graduate nonmatriculated status. Nonmatriculated status is granted to students of demonstrated ability who are not seeking an advanced degree but who would benefit from coursework at Stanford for a variety of reasons. A 3.0 or "B" letter grade indicator in prior studies is required. Nonmatriculated admission is valid only for a given academic year or a part thereof. Students who wish to enroll in a subsequent academic year must reapply. Nonmatriculated students receive academic credit for courses satisfactorily completed and may obtain an official transcript for the usual fee. They may use University facilities and services. In classes of limited enrollment, students in degree programs have priority. Nonmatriculated students may apply for housing but have a low priority for assignment. No fellowships, assistantships, or Stanford loans are available for nonmatriculated students.

Nonmatriculated students who later apply for admission to a degree program must meet the standard admissions requirements and should not anticipate special priority because of work completed as a nonmatriculated student. Students who are admitted to a degree program may apply a maximum of one quarter of nonmatriculated study toward a master's degree and two quarters toward an Engineer or Ph.D. degree.
COURSES OF INSTRUCTION

1990-91

Note—Unless otherwise specified, courses numbered from 1 to 99 inclusive are primarily for first- and second-year undergraduates; courses numbered from 100 to 199 inclusive are for third- and fourth-year undergraduates; and those from 200 to 499 inclusive are for graduate students.

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

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

SUMMER SESSION

Summer session courses are eight weeks in length, except in certain departments that offer 10-week courses.

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

Dean: A. Michael Spence

Associate Deans: Charles P. Bonini, Paul R. Johnson, James M. Patell, D. John Roberts, Charles W. Sizemore

Assistant Dean: Jeffrey H. Moore


Professor (Teaching): George C. Parker


Courtesy Associate Professors: Timothy F. Bresnahan, Robert I. Sutton

Senior Lecturers: Steven C. Brandt, Kirk O. Hanson


Visiting Professors: Henri-Claude de Bettignies, R. Bruce McKern

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 (M.B.A.) 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 have two or more years managerial experience and to include some mathematics and economics in their undergraduate programs. Possible options within the M.B.A. program include a specialty in Public Management and a program leading to the joint J.D./M.B.A. degree.

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 94305-5015 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, geochemistry, geophysics, petroleum engineering, petroleum geology, geomechanics, geostatistics, engineering geology, hydrogeology, 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 energy and 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 combining degrees in earth sciences, social sciences, physical sciences, or engineering; and a graduate program offering the degrees of Master of Science, Engineer, and Doctor of Philosophy as described below. Details of individual degree programs are found in the section for each department.

UNDERGRADUATE PROGRAM

There are no special examinations or prerequisite course requirements for admission to the School of Earth Sciences. 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 is assigned to an academic advisor who is prepared to discuss career opportunities and courses in the earth sciences. 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 facilitate 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. 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. Each department offers an honors program which involves research during the senior year.

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 towards 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 and no later than the eleventh quarter. 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 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 earn degrees in the same department, in two different departments or even in different schools, e.g., a B.S. in Physics and an M.S. in Geology. 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 one of the four departments. One requirement for admission is submittal of scores on the verbal and quantitative sections 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 the 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 develops a complete plan of study for the degree sought.

Financial Aid—Detailed information on scholarships, fellowships, and research grants are available from the school’s individual departments. Applications should be filed by January 1 for awards which become effective in Autumn Quarter of the following academic year.

APPLIED EARTH SCIENCES

Emeriti: Evan Just, Konrad B. Krauskopf (Affiliated Faculty), Frederick C. Kruger, Charles F. Park, Jr.
Chairman: André G. Journel
Associate Chairman: George A. Parks
Associate Professors: Simon C. Brassell*, Steven M. Gorelick
Courtesy Professor: James O. Leckie†
Senior Lecturer: George Mader

* Joint appointment with Geology
† Joint appointment with Statistics
‡‡ Joint appointment with Civil Engineering

OFFERINGS

Undergraduate—The Department of Applied Earth Sciences offers an undergraduate major in Applied Earth Sciences (A.E.S.) in the following programs:

Earth Resources
Engineering Geology
Environmental Earth Sciences
Land Resources Planning

Graduate—The Department of Applied Earth Sciences offers a graduate major in Applied Earth Sciences in the following programs:

Geologic Remote Sensing
Geomathematics in Process Simulation and Petroleum Resource Analysis
Geomechanics
Geostatistics for Natural Resources
Management
Hydrogeology
Low Temperature Aqueous Geochemistry
Ore Deposits and Exploration

Petroleum Geology
Students who enroll in one of these predefined programs may have the program designated on their diplomas.

A general degree in A.E.S. is available for students with specialized objectives consistent with the scope of the department. The diploma will not list these “special” programs. At the graduate level, the department welcomes applicants from any scientific or engineering discipline who are interested in applied earth sciences.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

EARTH RESOURCES

The Earth Resources program is intended for students whose career objectives include the business and management aspects of earth sciences commodities. The program consists of a basic core and an in-depth option dealing with one of four categories of earth resources commodities. The specializations available are: (1) land, (2) mineral resources, (3) oil and gas, and (4) water. Students from this program have entered graduate work in business, management, law, as well as the earth sciences.

BASIC CORE

Course No. and Subject Qtr. and Units
Mathematics
A.E.S. 190. Fundamentals of Geostatistics A 3-4
Comp. Sci. 105A. Introduction to Computers; or Comp. Sci. 106A. Programming Methodology A,W,S 5
Math. 41, 42, 43. Calculus and Analytic Geometry A,W,S 15
Op. Res. 50, 150, 152; or Engr. 623-4
Stat. 60. Introduction to Statistical Methods I A,W,S,Sum 5
Total .................................................. 31-33

Business and Economics
Econ. 1. Elementary Economics A,W,S 5
Engr. 60. Engineering Economics A,W 3
Indust. Engr. 133. Industrial Accounting A,S 3
Total .................................................. 11

Chemistry and Earth Sciences
A.E.S. 190. Analysis of Geologic Structures S 4
A.E.S. 184. Management of Geologic Hazards A 3
Chem. 31. Chemical Principles A,W,Sum 4
Geol. 1. Interpreting the Earth A,W,S,Sum 4-5
Geol. 90. Rocks and Minerals S 3
Geol. 102. Introduction to Field Geology Sum 3
Total .................................................. 23-24

Earth Resources
A.E.S. 1. Introduction to Earth Resources W 3
A.E.S. 100. Management of Earth Resources S 3
## A.E.S. 145. Mineral Economics

<table>
<thead>
<tr>
<th>Course</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S 3</td>
</tr>
</tbody>
</table>

**Total** 9

### Land

<table>
<thead>
<tr>
<th>Course</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 130, 131, 132. Environmental Earth Sciences</td>
<td>A,W,S 15</td>
</tr>
<tr>
<td>A.E.S. 133. Measurement of the Environment</td>
<td>W 3</td>
</tr>
<tr>
<td>A.E.S. 185. Engineering Geology</td>
<td>S 3</td>
</tr>
<tr>
<td>Urban Studies 170. Introduction to Urban Design</td>
<td>W 5</td>
</tr>
</tbody>
</table>

**Total** 26

### Mineral Resources

<table>
<thead>
<tr>
<th>Course</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 120. Introduction to Mineral Deposits</td>
<td>A 3</td>
</tr>
<tr>
<td>A.E.S. 124. Mineral Processing and Metal Extraction</td>
<td>A 2</td>
</tr>
<tr>
<td>Chem. 33. Structure and Reactivity or Chem. 135. Physical Chemical Principles</td>
<td>W,S 3-4</td>
</tr>
<tr>
<td>Geol. 170. Introduction to the Chemistry of the Earth</td>
<td>A 4</td>
</tr>
</tbody>
</table>

**Total** 12-13

### Oil and Gas

<table>
<thead>
<tr>
<th>Course</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 102. Decision Analysis in Petroleum Resource Exploration</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 251. Oil Field Exploration and Development</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 253. Petroleum Geology and Exploration</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 258. Role of Fluids in Geologic Processes</td>
<td>S 2</td>
</tr>
<tr>
<td>Geol. 151. Sedimentary Geology and Petrography</td>
<td>W 4</td>
</tr>
<tr>
<td>Geophys. 180. Geologic Interpretation of Reflection Seismograms</td>
<td>W 3</td>
</tr>
<tr>
<td>Pet. Engr. 103. Survey of the Energy Industries</td>
<td>S 3</td>
</tr>
</tbody>
</table>

**Total** 24

### Water

<table>
<thead>
<tr>
<th>Course</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 230. Hydrogeology</td>
<td>A 5</td>
</tr>
<tr>
<td>A.E.S. 258. Role of Fluids in Geologic Processes</td>
<td>S 2</td>
</tr>
<tr>
<td>Civ. Engr. 160. Water Resources</td>
<td>W 4</td>
</tr>
<tr>
<td>Civ. Engr. 270. Movement, Fate, and Effects of Contaminants in Surface Waters and Groundwater</td>
<td>A 3</td>
</tr>
<tr>
<td>Engr. 21. Mechanics of Fluids</td>
<td>A,S 4</td>
</tr>
</tbody>
</table>

**Total** 21

### Engineering Geology

The Engineering Geology program is for students interested in the application of earth sciences data and principles to the planning, design, construction, and maintenance of engineering structures and to the development of surface and ground-water resources. An integral part of the engineering geology program is the development of the knowledge and fundamentals to recognize, adequately characterize, and assess the risks associated with natural geologic hazards such as landslides, earthquakes, volcanic activity, floods, and coastal erosion.

### Basic Core

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 180. Analysis of Geologic Structures</td>
<td>S 4</td>
</tr>
<tr>
<td>A.E.S. 184. Management of Geologic Hazards</td>
<td>A 3</td>
</tr>
<tr>
<td>A.E.S. 185. Engineering Geology</td>
<td>S 3</td>
</tr>
<tr>
<td>Chem. 31. Chemistry Principles</td>
<td>A,W,Sum 4</td>
</tr>
<tr>
<td>Civ. Engr. 190. Geotechnical Engineering</td>
<td>A 4</td>
</tr>
<tr>
<td>Civ. Engr. 291. Foundation Engineering and Earth Structures</td>
<td>W 3</td>
</tr>
<tr>
<td>Comp. Sci. 106A. Programming Methodology</td>
<td>A,W,S 5</td>
</tr>
<tr>
<td>Engr. 10. Applied Mechanics: Statics</td>
<td>A,W,S 3</td>
</tr>
<tr>
<td>Engr. 11. Mechanics of Materials I</td>
<td>W,S 4</td>
</tr>
<tr>
<td>Engr. 21. Mechanics of Fluids</td>
<td>A,S 3</td>
</tr>
<tr>
<td>Geol. 1. Interpreting the Earth</td>
<td>A,W,S,Sum 4-5</td>
</tr>
<tr>
<td>Geol. 2. Earth History</td>
<td>A 3</td>
</tr>
<tr>
<td>Geol. 3. Earth History Laboratory</td>
<td>A 2</td>
</tr>
<tr>
<td>Geol. 60. Rocks and Minerals</td>
<td>S 5</td>
</tr>
<tr>
<td>Geol. 102. Introduction to Field Geology</td>
<td>Sum 3</td>
</tr>
<tr>
<td>Math. 41, 42, 43. Calculus and Analytic Geometry</td>
<td>A,W,S 15</td>
</tr>
<tr>
<td>Phys. 51. Mechanics</td>
<td>W 4</td>
</tr>
</tbody>
</table>

One course from the following:

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 230. Hydrogeology</td>
<td>A 5</td>
</tr>
<tr>
<td>A.E.S. 258. Rock Mechanics and Advanced Structural Geology</td>
<td>A 3-4</td>
</tr>
<tr>
<td>Engr. 50. Introduction to Science of Materials</td>
<td>W,S 3</td>
</tr>
<tr>
<td>Geophys. 190. General Geophysics</td>
<td>A 4</td>
</tr>
<tr>
<td>Geophys. 191. Geophysical Field Techniques</td>
<td>A 3</td>
</tr>
<tr>
<td>Mech. Engr. 111. Stress, Strain, and Strength</td>
<td>A 3</td>
</tr>
</tbody>
</table>

**Total** 97-99

### Environmental Programs

Two programs are offered: Environmental Earth Sciences and Land Resources Planning. Both have a common core that provides a basic environmental and geological background and analytical tools. In addition, each has individual requirements consistent with its objectives.

### Common Environmental Core

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 1. Introduction to Earth Resources</td>
<td>W 3</td>
</tr>
<tr>
<td>A.E.S. 130, 131, 132. Environmental Earth Sciences</td>
<td>A,W,S 15</td>
</tr>
<tr>
<td>A.E.S. 184. Management of Geologic Hazards</td>
<td>A 3</td>
</tr>
<tr>
<td>Chem. 31. Chemical Principles</td>
<td>A,W,Sum 4</td>
</tr>
<tr>
<td>Geol. 1. Interpreting the Earth</td>
<td>A,W,S,Sum 4-5</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL EARTH SCIENCES

This program is for students primarily interested in the Earth Sciences aspects of the environment. Former students have entered graduate programs in city and regional planning, engineering, landscape and architecture, law, and sciences.

Course No. and Subject Qtr. and Units
Common Environmental Core 56-57
A.E.S. 134. Environmental Biophysics A,W 3
A.E.S. 180. Analysis of Geologic Structures S 4
A.E.S. 185. Engineering Geology S 3

One course from the following:
Geol. 2. Earth History
or Geol. 150. The Oceans: An Introduction to the Marine Environment 3

Chem. 135. Physical Chemical Principles W,S 3
Civ. Engr. 170. Environmental Science and Technology
or Civ. Engr. 171. Environmental Planning W 4
Hum. Biol. 2A. Genetics, Evolution, and Ecology A 4
Math. 21, 22, 23. Analytic Geometry and Calculus
or Math. 42, 43
9
Phys. 21, 22, 23, 24. Elementary Physics (students intending to enter graduate programs in science and engineering should substitute 2 courses from Phys. 51 series) A,W 8
Urban Studies 170. Introduction to Urban Design W 5

Total ........................................ 102-103

LAND RESOURCES PLANNING

This program prepares students for graduate study in city and regional planning, conservation, landscape architecture, law, resource management, and allied fields. It is not designed for students intending to enter graduate study in engineering or science.

Course No. and Subject Qtr. and Units
Common Environmental Core 56-57
A.E.S. 145. Mineral Economics S 3
Civ. Engr. 130. Introduction to Urban Planning W 3
Civ. Engr. 170. Environmental Science and Technology A 3
Civ. Engr. 171. Environmental Planning W 4
Econ. 1. Elementary Economics A,W,S 5
Geol. 2. Earth History A 3
Geol. 150. The Oceans: An Introduction to the Marine Environment W 3
Urban Studies 170. Introduction to Urban Design W 5

One course from:
Urban Studies 110. Introduction to Urban Studies
Urban Studies 131. Managing Local Government
Urban Studies 171. Urban Design Studio S 5
Urban Studies 184. Facility Siting S 3

One course from:
Anthro. 146. Urban Problems in Anthropological Perspective W 5

One course from:
Art 3. Introduction to the History of Architecture A 4
Art 175A, B. Modern Architecture I or II A,W 4
Art 176. American Architecture and Urbanism S 4

Total ........................................ 123-124

HONORS PROGRAM

The department offers a program leading to the degree of Bachelor of Science in Applied Earth Sciences with Honors. It is available to seniors having letter grade indicators of at least 3.5.

1. Students should find a research project, either theoretical, or field, or experimental.

2. The student submits a proposal to the honors subcommittee, which decides on its suitability as an honors project.

3. Course credit for the project is assigned by the advisor within the framework of A.E.S. 199.

4. Upon completion, a written report of the work is required for honors.

5. Before the end of the year, each honors candidate gives a seminar on his or her work. This seminar is announced publicly and is open to the general audience. The expectation is that the student's advisor along with all the other honors candidates will attend the seminar.

6. The decision as to whether a given independent study project does or does not merit an award of honors is made jointly by the honors subcommittee and the student's advisor. This decision is based on the quality of both the honors work and the entire academic record.

7. The work done on the honors program should not be used as a substitute for regularly required courses.

GRADUATE PROGRAMS

The department's graduate programs prepare students for careers focused on application of the earth sciences in mineral, energy, and water
resources, and environmental management. The programs lead to the degrees of 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.

Graduate students must maintain a letter grade indicator of "B" in the School of Earth Sciences and equivalent status in other schools.

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 are outlined in the "Advanced Degrees" section of this bulletin.

Applied Earth Sciences (A.E.S.) requires a minimum of 45 units of coursework including the departmental Core Curriculum. A thesis or Master's Report is required, but no more than 15 units of thesis research may be used to satisfy the 45-unit basic requirement. Some students will be required to make up background deficiencies. No more than 9 units of deficiencies may be applied toward satisfaction of the basic 45-unit requirement.

Each student must take the Core Curriculum and one Specialization Core Curriculum.

REQUIRED BACKGROUND COURSES

Courses listed under this requirement are "deficiencies" if taken during the M.S. career at Stanford:

Calculus and Analytic Geometry: the equivalent of Math. 41, 42, and 43.
General Geology: the equivalent of Geology 1.
Mineralogy and Petrology: the equivalent of Geology 80.
Skill in a computer programming language: the equivalent of, e.g., Comp. Sci. 106A.

REQUIRED M.S. CORE CURRICULUM

18-26 total units must be in the required Departmental Core.

Course No. and Subject | Units
--- | ---
A.E.S. 120. Introduction to Mineral Deposits | 3
A.E.S. 180. Analysis of Geologic Structures | 3
A.E.S. 183. Engineering Geology | 3
Geol. 170. Introduction to the Chemistry of the Earth | 4
Geophys. 191. Geophysical Field Techniques | 3

3-4 units: One course from:
A.E.S. 277. Field Mapping of Mineral Deposits | 3
Geol. 102. Introduction to Field Geology | 3
Geophys. 180. Geologic Interpretation of Reflection Seismograms | 3
Geophys. 190. General Geophysics | 4
Pet. Engr. 150. Well Log Analysis | 3

6-8 units: Two courses from:
A.E.S. 190. Fundamentals of Geostatistics | 3-4
Math. 103. Matrix Theory and Its Applications | 3
Math. 130. Ordinary Differential Equations | 3
Stat. 116. Theory of Probability | 3-4

3-5 units: One course from:
A.E.S. 102. Decision Analysis in Petroleum Resource Exploration | 3
A.E.S. 290. Geostatistics for Spatial Phenomena | 4-5
A.E.S. 292. Computer Simulation in Geology | 3
Engr. Eco. Syst. 31 or 231. Decision Analysis | 3

3-5 units: One course from:
A.E.S. 253. Petroleum Geology and Exploration | 3
A.E.S. 255. Introduction to Groundwater Solute Transport | 3
A.E.S. 258. Role of Fluids in Geologic Processes | 2
A.E.S. 280. Rock Mechanics and Advanced Structural Geology | 3-4
A.E.S. 291. Practice of Geostatistics on Exhaustive Data Bases | 3-5

GEOLOGIC REMOTE SENSING

This program covers a wide range of inter-related topics, best understood with a strong geologic background. Specializations may be taken in the following application areas, each with its own set of further requirements: Exploration/Ore Deposits, Exploration/Petroleum, or Geomathematics.

Students with non-geologic undergraduate degrees will be considered but are expected to correct academic deficiencies.

REQUIRED CORE CURRICULUM

Course No. and Subject | Qtr. and Units
--- | ---
A.E.S. 180. * Analysis of Geologic Structures | S 4
A.E.S. 196. Introduction to Photogeology | S 2-4
A.E.S. 252. Sedimentary Basins | A 3
A.E.S. 280. * Rock Mechanics and Advanced Structural Geology | A 3-4
A.E.S. 290. Geostatistics for Spatial Phenomena | W 4-5
GEOMATHEMATICS IN PROCESS SIMULATION AND PETROLEUM RESOURCE ANALYSIS

This program focuses on the use of mathematics in exploration for petroleum and in analyzing petroleum resource potential. Stress is placed on analyzing and simulating petroleum-bearing sedimentary basins, including the use of detailed, dynamic three-dimensional computer simulation models that represent interdependent geologic processes that create sedimentary basins.

The program has two divisions: (1) Geomathematics in Petroleum Exploration and Resource Analysis, and (2) Geomathematics in Geological Process Simulation. The following courses form the general curriculum for the divisions and include courses selected from the Applied Earth Sciences (A.E.S.) core curriculum. Substitutions based on research needs may be approved by petition. A formal thesis is required for the M.S. degree.

GEOMATHEMATICS IN PETROLEUM EXPLORATION AND RESOURCE ANALYSIS

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 102.* Decision Analysis in Petroleum Exploration</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 251.* Oil Field Exploration and Development</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 252. Sedimentary Basins</td>
<td>A 3</td>
</tr>
<tr>
<td>A.E.S. 253.* Petroleum Geology and Exploration</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 258.* Role of Fluids in Geologic Processes</td>
<td>S 2</td>
</tr>
<tr>
<td>A.E.S. 292.* Computer Simulation in Geology</td>
<td>W 3</td>
</tr>
<tr>
<td>Geophys. 180. Geologic Interpretation of Reflection Seismograms</td>
<td>W 3</td>
</tr>
<tr>
<td>Math. 103.* Matrix Theory and its Applications</td>
<td>A,W,S 3</td>
</tr>
<tr>
<td>Total</td>
<td>16-22</td>
</tr>
</tbody>
</table>

GEOMATHEMATICS IN GEOLOGICAL PROCESS SIMULATION

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 230. Hydrogeology</td>
<td>A 5</td>
</tr>
<tr>
<td>A.E.S. 252. Sedimentary Basins</td>
<td>A 3</td>
</tr>
<tr>
<td>A.E.S. 250.* Rock Mechanics and Advanced Structural Geology</td>
<td>alt. A 3</td>
</tr>
<tr>
<td>A.E.S. 292.* Computer Simulation in Geology</td>
<td>W 3</td>
</tr>
<tr>
<td>Civ. Engr. 262. Transport and Mixing in Surface Water Flows</td>
<td>W 3</td>
</tr>
<tr>
<td>Civ. Engr. 263. Modeling Environmental Flows</td>
<td>S 4</td>
</tr>
<tr>
<td>Civ. Engr. 264. Hydrodynamics</td>
<td>A 3</td>
</tr>
<tr>
<td>Engr. 21. Mechanics of Fluids</td>
<td>A,S 4</td>
</tr>
<tr>
<td>Math. 103.* Matrix Theory and its Applications</td>
<td>A,W,S 3</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
</tr>
</tbody>
</table>

* Denotes A.E.S. Core Curriculum courses

Additional courses may be selected from other departments, with choices influenced by the student's interests and relevance of the courses to the thesis topic. Students are expected to begin work on a thesis not later than the beginning of the third quarter of enrollment in the program. Relevant courses include those in computer science, decision analysis, engineering-economic systems, fluid mechanics, geology, geophysics, geostatistics, operations research, petroleum reservoir analysis, statistics, and well-log analysis. Up to 12 credit units may be received for thesis research for the M.S. degree.

GEOMECHANICS

Graduate students may specialize in the Geomechanics program by arranging a curriculum of courses and research, tailored to their specific needs, that is approved by petition to the faculty. This curriculum should include the Applied Earth Sciences Department M.S. Core Curriculum, A.E.S. 280, 281, 282, 283, and 386A,B,C. Courses are offered in the Departments of Geophysics and Geology and from the School of Engineering to round out the curriculum. In particular, courses from the fields of tectonophysics, tectonics, and structural geology, as well as applied mechanics and materials science, are recommended. A list of these is available upon request. A thesis is required for the M.S. degree. Correspondence with Professor Pollard before application is suggested to clarify the nature of the program.

Research opportunities in geomechanics involve problems related to earthquake and volcanic hazards and to the recovery of natural resources. The focus is on rock fractures including faults, dikes, veins, joints, and solution surfaces. Students characterize fractures by de-
tailed geologic mapping of ancient and active structures. Solid, fluid, and fracture mechanics are used to analyze the fracture processes, and experimental investigations include model studies of crack propagation and measurement of fracture toughness. Current fracture research ranges from investigations of microcracks, to structural studies of faults and joints, and analyses of volcanic rift zones. Effective research projects combine field mapping, laboratory investigation, and theoretical analysis.

GEOSTATISTICS FOR NATURAL RESOURCES MANAGEMENT

Program applicants are expected to have an undergraduate background in earth sciences (geology, mining, petroleum, and civil engineering). The program is open to B.S. students in Math./Statistics, provided they make up for any deficiency in geology (Geol. 1 and 80).

The program focuses on the probabilistic modeling of reservoirs/ore deposits/environmental sites, in view of their development and/or management. Numerical models for the space/time distribution of site attributes (porosity-permeability-mineral grades) are generated to assess the need for additional data, predict recovery performance, and plan production (mining, oil recovery, pollution control, etc.).

SPECIALIZATION CURRICULUM

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 290. Geostatistics for Spatial Phenomena</td>
<td>W 4-5</td>
</tr>
<tr>
<td>A.E.S. 291. Practice of Geostatistics on Exhaustive Data Bases</td>
<td>S 3-5</td>
</tr>
<tr>
<td>A.E.S. 293. Topics in Advanced Geostatistics</td>
<td>S 3</td>
</tr>
<tr>
<td>Total</td>
<td>10-13</td>
</tr>
</tbody>
</table>

OTHER RECOMMENDED COURSES

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp. Sci. 135. Numerical Methods</td>
<td>Sum 3</td>
</tr>
<tr>
<td>Engr. 62. Introduction to Operations Research</td>
<td>A, S 4</td>
</tr>
<tr>
<td>Engr. 102W. Technical and Professional Writing</td>
<td>A, W, S 3</td>
</tr>
<tr>
<td>Stat. 201A, B. Data Analysis I-II</td>
<td>W, S 3</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

A thesis is required for the M.S. degree. A Ph.D. program in Geostatistics is available for advanced research and/or applications.

HYDROGEOLOGY

All students in the 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. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.E.S. 190. Fundamentals of Geostatistics Phenomena</td>
<td>A 3-4</td>
</tr>
<tr>
<td>or A.E.S. 290. Geostatistics for Spatial Processes</td>
<td>W 4-5</td>
</tr>
<tr>
<td>A.E.S. 230. Hydrogeology</td>
<td>A 5</td>
</tr>
<tr>
<td>A.E.S. 255. Introduction to Groundwater Solute Transport</td>
<td>S 3</td>
</tr>
<tr>
<td>A.E.S. 258. Role of Fluids in Geologic Processes</td>
<td>alt. S 2</td>
</tr>
<tr>
<td>or A.E.S. 259. Hydraulic and Tracer Tests for Groundwater Resource Evaluation</td>
<td>alt. S 2</td>
</tr>
<tr>
<td>Civ. Engr. 160. Water Resources</td>
<td>W 4</td>
</tr>
<tr>
<td>Civ. Engr. 270. Movement, Fate, and Effects of Contaminants in Natural Waters</td>
<td>A 3</td>
</tr>
<tr>
<td>Civ. Engr. 361. Soil Moisture and Groundwater</td>
<td>W 4</td>
</tr>
</tbody>
</table>

Total .............................................................. 29-31

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 below).

LOW TEMPERATURE AQUEOUS GEOCHEMISTRY

Courses and research opportunities in low temperature aqueous geochemistry are available in the Departments of Applied Earth Sciences (A.E.S.), Civil Engineering (C.E.), and Geology.

The three departments differ in the emphasis placed on applications. A.E.S. students usually have a strong interest in exploration or environmental problems and approach them from a geochemical or hydrogeological perspective. The Environmental Engineering Program in C.E. stresses engineering science in problem solving; the Geology Department emphasizes fundamental mineral physics, petrology, and geochemistry.

Students who specialize in aqueous geochemistry must either take the departmental Core Curriculum or design an individual Specialization Curriculum, subject to faculty approval. A strong background in chemistry and physical chemistry, or additional coursework in these areas, is required. Experimental or analytical experience is recommended. Geochemical research in A.E.S. is process-oriented, employing experimental or theoretical methods rather than field methods, in order to examine the problem at the most fundamental level possible. Current research is concerned with adsorption, partitioning, and dissolution reactions at mineral surfaces. Students are investigating the rate controlling mechanisms in weathering of silicates and the atomic-scale structure and composition of both aqueous and adsorption complexes of transition metals.
Additional information can be obtained from Professors Parks (A.E.S.), Bird (Geology), or Leckie (C.E.).

ORE DEPOSITS AND EXPLORATION

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

Students in the program leading to the M.S. (including coterminal) and Ph.D. degrees are required to complete the following core sequence in addition to the departmental Core Curriculum.

REQUIRED SPECIALIZATION CURRICULUM

Course No. and Subject | Qtr. and Units
--- | ---
A.E.S. 220. Geochemistry of Mineral Deposits | W 4
A.E.S. 277. Field Mapping Mineral Deposits | S 3
Geol. 275. Solution-Mineral Equilibria | W 3
Geophys. 191. Geophysical Field Techniques | A 3

Total ........................................ 13

SPECIALIZATION ELECTIVES

Choose at least 3 courses:

A.E.S. 224. Low Temperature Aqueous Geochemistry | A 3
A.E.S. 252. Sedimentary Basins | A 3
A.E.S. 258. Role of Fluids in Geologic Processes | S 2
A.E.S. 280. Rock Mechanics and Advanced Structural Geology | alt. A 3-4
Geol. 185. Volcanology | S 3
Geol. 260. Physics and Chemistry of Earth Materials | W 4

Total ........................................ 18-19

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

A.E.S. 120. Introduction to Mineral Deposits
A.E.S. 190. Analysis of Geologic Structures
Geol. 102, 103A,B. Field Geology
Geol. 152. Stratigraphic Geology
Geol. 161. Mineralogy
Geol. 170. Introduction to Chemistry of the Earth
Geol. 181, 182. Igneous and Metamorphic Petrology

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 may 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 to taking required courses from the A.E.S. core curriculum, each student must fill the requirements of the following specialization curriculum in Petroleum Geology.

REQUIRED COURSES

Course No. and Subject | Qtr. and Units
--- | ---
A.E.S. 251. Oil Field Exploration and Development | S 3
A.E.S. 252. Sedimentary Basins | A 3
A.E.S. 253. Petroleum Geology | S 3
Pet. Engr. 150A. Well Log Analysis I | A 3
Pet. Engr. 150B. Well Log Analysis II | W 3

Total ........................................ 15

ELECTIVE COURSES

Each student must take three courses for credit from the following:

Geol. 218. Seminar in Sedimentary Geology | S 3
Geol. 223. Geological-Geochemical Methods in Petroleum Exploration | A 2
Geol. 250. Sedimentary Mechanics | A 3
Geol. 254. Sedimentary Facies | A 3
Geol. 278. Organic Geochemistry | W 2

Substitutions in the program may be approved by petition. A thesis is required for the M.S. degree.

SPECIAL APPLIED EARTH SCIENCES PROGRAM

The program requires 45 units of courses and research approved by the department faculty.

ENGINEER DEGREE

A minimum of two years (six quarters) of graduate study is required. At least one year, ordinarily the last, must be spent as a registered student at Stanford. The candidate must complete 90 units of coursework, 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

Entry—Graduate students are admitted with a degree goal: M.S., Engineer, or Ph.D. Students who have not yet earned an M.S. are admitted with the M.S. goal. After initial registration they may petition to change to the Ph.D. goal, bypassing the M.S.

Objectives—The Ph.D. degree 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 "Advanced Degrees" section in this bulletin. A brief summary of additional departmental requirements follows. A complete statement may be obtained from the office of Applied Earth Sciences.

There are three basic requirements: (1) completion of the M.S. core course curriculum defined for the program with which the student is associated, (2) completion of the department's qualification procedure outlined below, and (3) completion of a dissertation. The department qualifying procedure involves completion of the core course sequence, faculty review, departmental oral examination, and a research project proposal. All but the research proposal must be completed within the first 18 months of registration.

Courses—The student must pass the required M.S. core courses with a letter grade indicator 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 the Program Committee.

Departmental Oral Examination—The student must pass the departmental oral examination, which is a test of mastery of the major option and at least one related area, no later than the end of the seventh 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 the faculty Research Advisory Group. The seminar is followed by a question period. After completion, the student should file the 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 the Research Advisory Group, the student may schedule the University oral examination. The examination is a defense of the dissertation, based on a complete manuscript, and administered by an outside chair and four or more faculty members representing the major and minor departments.

Scheduling—Detailed scheduling of all events is left to the student. A maximum of four years should be targeted. More time is allowed if the department Curriculum Committee is satisfied with a candidate's progress.

COURSES

UNDERGRADUATE

1. Introduction to Earth Resources—The occurrence, economics, history, and politics of earth resources including oil and gas, coal, water, radioactive fuels, metals, and non-metallic minerals. Topics: resources and reserves, environmental impacts of mining, nuclear waste disposal, metals from the sea, South Africa, strategic minerals, and the world resource situation. (DR:8)

3 units, Win (Gorelick, Harbaugh, Remson) TTh 1:15

100. Management of Earth Resources—Corporate strategies in the mineral and fuel resources sectors. The changes in the competitive position of resource suppliers in industrialized and developing countries and their impact on corporate strategies. Success factors in resource industries. Topics: project evaluation methods, production requirements, operating strategies, financing, and government policies (taxation).

3 units, Spr (Thiers) TTh 3:30

102. Decision Analysis in Petroleum Resource Exploration—Use of formal procedures to make optimum financial decisions in petroleum resource exploration. Estimation of probabilities attached to exploration actions and their utilization in financial forecasts involves use of problem sets that incorporate a computerized exploration game with competing teams. The concepts are applicable to resource exploration in general.

3 units, Spr (Harbaugh) MTW 11

110. Structural Geology—(Enroll in Geology 110.)

120. Introduction to Mineral Deposits—A survey emphasizing the geological environment of metallic mineral deposits. Topics: processes that lead to cycling and concentration of metals in the earth's crust, and geological characteristics of different classes of mineral deposits in the context of petro-tectonic settings. Laboratory consists of hand lens inspection of rock suites from classic mining districts. Prerequisite: Geology 80.

3 units, Aut (Einaudi) TTh 9 lab by arrangement

124. Mineral Processing and Metal Extraction—Survey emphasizing the technology involved in producing economically useful minerals and metals from mined ore and recycled solid waste. Offered only in a guided-reading format. Prerequisite: high school chemistry and physics, Geology 80.

2 units, Aut (Parks) by arrangement
130. Environmental Earth Sciences I—First of three-course sequence on the 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: introduction to city and regional planning, general plan land capability systems, hydrology, reconnaissance studies, legal basis for planning process, use of topographic and geologic maps, site design. (DR:8)

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Aut (Mader, Remson) MWF 11; labs, seminars, and field trips by arrangement

131. Environmental Earth Sciences II—Topics: environmental impact reports, weather and climate, planning regulations and land use, environmental transport, history of cities, environmental optimization, population projections. Prerequisite: 130 or consent of instructor.

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Win (Mader, Remson) MWF 11; lab, seminars, and field trips by arrangement

132. Environmental Earth Sciences III—Topics: general plan preparation and implementation, urban design, site design, climatic water balance, pollution and wastes, sanitary landfill, land use, and community site selection. Prerequisite: 131 or consent of instructor.

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Spr (Mader, Remson) MWF 11; lab, seminars, and field trips by arrangement


<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Win (Lyon) TTh 1:15-2:30 lab T or Th 2:30-4:05

134. Environmental Biophysics—Interdisciplinary approach to study of the interaction between organisms and their physical environment. Objectives: describe quantitatively the physical microenvironment; provide a clear description of energy flux and mass transfer models and apply them to exchange processes between organisms and their environments; acquaint the student with the theory and operation of devices used to measure temperature, moisture, wind, and radiation.

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aut, Win (Rossi) MWF 10

136. Environmental Earth Sciences Management—Applications of operations research to environmental problems.

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Spr (Remson) MWF 9

145. Mineral Economics—Fundamentals of commodity analysis. The effects of demand and supply imbalances on price formation. Topics: methodologies for projecting demand; techno-economic factors determining supply and production economics; feasibility studies; pricing mechanisms; and international trade. Commodity reports are usually generated as part of the course.

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Spr (Thiers) TTh 1:15-3:30

180. Analysis of Geologic Structures—(Same as Geology 180.) Emphasizes the theoretical and experimental background required to practice structural geology and mechanical principles useful for understanding rock deformation in the earth’s crust. Topics: stress and strain analysis, physical properties of rock, brittle fracture, friction, buckling, flexure, and heat and mass transport. Field, laboratory, and computer exercises on the techniques of data collection and interpretation of joints, sheet intrusions, faults, rock fabrics, and folds. The roles of these structures in the evolution of the earth’s crust, in natural resource recovery, and in earthquake and volcanic hazards. Prerequisites: Geology 1, calculus.

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Spr (Pollard) MWF 10 labs and field trips by arrangement

184. Management of Geologic Hazards—The application of earth science to identification and management of geologic hazards within the modern regulatory framework. Emphasis on developing geologic techniques to recognize natural geologic hazards and select mitigation measures to manage risk. Topics: geologic problems associated with earthquakes, landslides, floods, stream and erosion, land subsidence, underground water, environmental abuses, and planning and engineering design alternatives. Necessary geologic fundamentals are introduced. Enrollment limited to 20. Prerequisite: Geology 1 or consent of instructor. (DR:8)

<table>
<thead>
<tr>
<th>Units</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aut (Cotton) TTh 1:15-2:30 lab and field trips by arrangement

185. Engineering Geology—The application of geologic fundamentals to planning and design of civil engineering projects. Emphasis on development of geologic skills to identify, describe, and map earth materials and geologic structures as a means of determining the impact on site
development. Topics: weathering and soil-forming processes, soil and rock mechanics, site investigation techniques, surface and ground-water regimes, stream and coastal processes, Quaternary tectonics, deposits and geomorphology, environmental concerns, and geologic and geotechnical hazards. Field/laboratory exercises and case history studies emphasize the impact of site geology on the safe planning, design, and construction of civil engineering projects such as foundation, transportation facilities, excavations, tunnels and underground storage space, water supply facilities, and marine works. Enrollment limited to 20. Prerequisites: 180, 184, Geol. 1, Geol. 102, or consent of instructor.

3 units, Spr (Cotton) TTh 1:15-2:30 lab and field trips by arrangement


3-4 units (Journel, Switzer) not given 1980-91

196. Introduction to Photogeology—Lecture/lab dealing with analysis of B & W aerial photography for geologic purposes. Photogrammetry not included. Material covers sedimentary, volcanic and intrusive igneous and metamorphic rocks, in arid and humid climates. Folded and faulted rocks are studied in steroscopic pairs, from which maps and cross-sections are produced. Enrollment limited to 5. Prerequisite: 133 or equivalent.

2-4 units, Spr (Lyon) TTh 1:15-4:05

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

any quarter (Staff) by arrangement

GRADUATE

220. Geochemistry of Mineral Deposits—Lectures integrating observational, theoretical, and experimental data on the origin of mineral deposits and application to exploration concepts. Individual projects. Prerequisites: 120, Geology 170.

4 units, Win (Einaudi) MWF 11

224. Low Temperature Aqueous Geochemistry—(Same as Civil Engineering 273.) Systematic study of principles needed for solving quantitative problems in aqueous geochemistry. The use of thermodynamics in predicting 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. Prerequisite: Geology 171 or equivalent experience with thermodynamics.

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

225. Surfaces and Interfaces—Introduction to the properties of surfaces and interfaces. Chemical reactions peculiar to surfaces, especially adsorption at mineral/water interfaces. Influence of surface chemistry and adsorption on geochemical processes. Prerequisites: Geology 161 and 171, Chemistry 171 or Material Science Engineering 181, or permission of instructor.

3 units, Spr (Parks) MWF 9

227. Workshop in Low Temperature Aqueous Geochemistry—Systematic self-study review of principles and strategies needed for solving quantitative problems in equilibrium aqueous geochemistry under earth-surface conditions. Optional introduction to use of computer programs of the MINEQL family. Prerequisites: 224, Geology 161 and 175, and working knowledge of UNIX, DOS, or Apple operating systems.

2-5 units, one quarter annually (Parks) by prior arrangement only

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

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


4 units, Win (Lyon) TTh 1:15-2:30 lab T or Th 2:30-4:05

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

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: 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. Recommended: Geology 154.
3 units, Aut (Graham) TTh 1:15-3:05

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

255. Introduction to Groundwater Solute Transport—Processes influencing transport of solutes through porous media; mathematical equations describing transport of reacting solutes and numerical methods for their solution. Designed for earth scientists and for engineers interested in water and environmental problems. Prerequisites: 230, introductory computer programming.
3 units, Spr (Gorelick) TTh 10:30-12 alternate years, not given 1990-91

257. Research Seminar in Aquifer Management Modeling—Introduction to the combined use of aquifer simulation models and optimization techniques. Reviews recent literature. Topics: introduction to selected methods in operations research, water quantity and quality simulation-optimization modeling methods, policy evaluation and allocation models, and conjunctive water use management models. Prerequisites: 230, introductory computer programming.
2-3 units (Gorelick) not given 1990-91

258. Role of Fluids in Geologic Processes—Principles governing geologic processes in which fluids (groundwater) play an important role. Regional flow of groundwater; movement and entrapment of petroleum; development of anomalous fluid pressures; role of fluid in tectonic movements; hydraulic fracturing as a measure of in-situ stress; transport of chemical constituents by groundwater; flow in fractured rock; and transport of heat by groundwater. Prerequisites: elementary calculus, 230.
2 units, Spr (Hsieh) Th 3:15 alternate years, not given 1991-92

259. Hydraulic and Tracer Tests for Groundwater Resource Evaluation—Theory and application of hydraulic and tracer tests to determine flow and transport properties of aquifers. Analysis of well test in single-layer aquifers and multiple aquifer-aquitard systems; water table conditions; anisotropy; double-porosity; effects due to wellbore storage, wellbore skin, aquifer boundaries, and heterogeneities such as faults and fracture zones; natural and forced gradient tracer tests. Prerequisite: 230.
2 units (Hsieh) alternate years, given 1991-92

276. Seminar: Sedimentary Geology—Discussion of current topics in sedimentary geology.
2 units, Win (Graham) by arrangement

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

280. Rock Mechanics and Advanced Structural Geology—(Same as Geology 290.) Advanced concepts and theories of rock deformation with application to rock mechanics, structural geology, and tectonophysics. Methods of stress analysis. The governing equations of elastic plate theory are derived and applied to crustal flexure, multilayer bending, buckling, and viscoelastic flexure of rock. The governing equations of two-dimensional elastic theory are derived and applied to tectonic loading and mechanisms of stress concentration. Prerequisites: elementary calculus, mechanics, and structural geology.
3-4 units (Pollard) alternate years, given 1991-92

281. Rock Physics—(Enroll in Geophysics 262.)

3-4 units, Aut (Pollard) MWF 10 alternate years, not given 1991-92

283. Tectonophysics—(Enroll in Geophysics 290.)

290. Geostatistics for Spatial Phenomena—Same as 190 plus Parametric vs. Bayesian geostatistics. The indicator formalism, indicator kriging, and simulation. Stochastic imaging of reservoir heterogeneities. The multigaussian alternative and lognormal geostatistics. Prerequisites: 190 or 193, Statistics 116, calculus.
4-5 units, Win (Journel) TTh 10-12

291C. Practice of Geostatistics on Exhaustive Data Bases—Based on a numerical model of a deposit/reservoir. 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: 190 or 290, Fortran programming.

3-5 units, Spr (Journel) TTh 9-11

292. Computer Simulation in Geology—Procedures for developing dynamic simulation models in geology, with stress on numerical solutions of differential equations. Initial applications involve simple two- and three-dimensional flow models adapted to problems in heat-flow in igneous bodies, groundwater flow, and petroleum migration. Stochastic procedures also introduced. Emphasis on graphic display, using threedimensional graphics computers. Prerequisite: elementary computer programming.

3 units, Win (Harbaugh) TTh 10-12

293A, C. Topics in Advanced Geostatistics—Topics from conditional expectations and non-linear kriging as projections in Hilbert spaces; parametric vs. non-parametric estimation of spatial distributions; conditional simulations for stochastic imaging of deposits and reservoirs. Pooling hard and soft information. May be repeated for credit. Prerequisites: 290, advanced calculus.

3 units, Spr (Journal) MW 2:15-4

295A, B, C, D, E. Research Seminar in Remote Sensing—Discussion of recent advances, covering aspects of remote sensing, especially those applied to mineral exploration. Participants cover a pertinent aspect of the field for review and presentation. Satisfactory/No Credit grading. Sequence (A, B, C, D) varies by year.

295A. Pattern Recognition (Spatial and Spectral).
1 unit, Aut, Win, Spr (Lyon) F 12-1

295B. Geobotany.
1 unit, Aut, Win, Spr (Lyon) F 12-1

295C. Radiometry and Spectroradiometry.
1 unit, Aut, Win, Spr (Lyon) F 12-1

295D. Atmospheric Effects.
1 unit, Aut, Win, Spr (Lyon) F 12-1

296. Advanced Photogeology and Radar—Advanced mono-spectral interpretation of small-scale satellite 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. Includes laboratory analysis of imagery (satellite and aircraft) designed to extract the maximum structural information from an area. Field analysis. Prerequisites: 133/233 and 196. A photogeologic course is essential. Term paper for 4 units.

3-4 units (Lyon)
alternate years, given 1991-92

297. Airborne Exploration: Lithologic Mapping—Advanced lecture covering the multispectral and multitemporal response of terrain from ultraviolet to infrared and microwave energy, principally for use in mineralogical analyses and as an exploration tool. Spectral and temporal signatures are stressed. Also, geobotanical and biogeobotanical aspects. Labs supported by field measurement, and data analysis. Prerequisites: 133/233 and a photogeologic course. Term paper for 4 units.

3-4 units, Spr (Lyon) T 1:15-2:05, lab T 2:15-4:05; Th 1:15-4:05 alternate years, not given 1991-92

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

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 are selected on basis of participant interest and timeliness. Field trip planned and guidebook prepared in Winter. Field trip (1-2 weeks) Winter or Spring Quarter. Students prepare papers and make oral presentations. Prerequisite: 220. (May be taken concurrently.)

2 units, Win, Spr (Einaudi)

327. Topics in Low Temperature Aqueous Geochemistry—(Same as Geology 371.) Lectures, student seminars, and an optional term project on selected topics in aqueous geochemistry under earth-surface conditions. Illustrative topics: non-ideality models; measurement, evaluation, and estimation of thermodynamic data; trends in metal complex stability. Other topics may be requested. Prerequisites: 225,227, or equivalent, Geology 261.

2-4 units, one quarter annually (Parks) by prior arrangement only

any quarter (Staff) by arrangement

386A, B, C. Research Seminar: Geomechanics—Selected topics. May be repeated for credit.
1 unit, Aut, Win, Spr (Pollard) by arrangement

390A, B, C. Seminar: Geostatistics—Discussion of classic results and current research in geo-
statistics. Topics selected on basis of interest and timeliness. May be repeated for credit.
1-2 units, Aut, Win, Spr (Journel) by arrangement

ENVIRONMENTAL STUDIES

At Stanford, there is no established program or major in environmental studies. However, many environmentally related courses are offered by a number of departments.

The following list, although not comprehensive, has been prepared to assist in selecting courses in the field of environmental studies. Consult departmental listings in this bulletin and the Environmental Advising Directory (available at 101 Mitchell) for further details. Additional related classes exist in the School of Law, VTSS, and other departments. New programs and courses are being designed.

COURSES

APPLIED EARTH SCIENCES
1. Introduction to Earth Resources.
1. Management of Earth Resources.
127. Introduction to Groundwater Geochemistry.
130. Environmental Earth Sciences I.
131. Environmental Earth Sciences II.
132. Environmental Earth Sciences III.
230. Hydrogeology.

BIOLOGICAL SCIENCES
115. Evolutionary Ecology.
117. Biology and Global Change.
188. Ecosystems of the Tropics.

CIVIL ENGINEERING
160. Water Resources.
170. Environmental Science and Technology.
171. Environmental Planning.
174. Noise Pollution.
265. Sustainable Water Resources Development.
266. Environmental Policy Design and Implementation.
270. Movement, Fate, and Effects of Contaminants in Surface and Groundwater.
271A,B,C. Water Quality Control I, II, III.
274. Environmental Microbiology.

ECONOMICS
106. World Food Economy.
155. Economics of Natural Resources.

FOOD RESEARCH INSTITUTE
188. Colloquium on Population Studies.

GEOLOGY
1. Interpreting the Earth.
150. Geology of the Oceans.
170. Introduction to Chemistry of the Earth.

GEOPHYSICS
4. Natural Hazards and Man.

HUMAN BIOLOGY
134. Ecological Anthropology.

MECHANICAL ENGINEERING

PETROLEUM ENGINEERING

POLITICAL SCIENCE
114K. The Political Economy of Development.

URBAN STUDIES
148. Environmental Policy.
172. Environmental Psychology in Urban Design and Planning.
GEOLOGY

Emeriti: (Professors) Robert R. Compton, William R. Evitt, Konrad B. Krauskopf (on active duty), Benjamin M. Page (on active duty), Charles F. Park, Jr., Tjeerd vanAndel (on active duty); (Sr. Lecturer) Ernest I. Rich

Chairman: Gordon E. Brown, Jr.

Associate Chairman: Juhn G. Liou

Professors: Gordon E. Brown, Jr., Robert G. Coleman, Marco T. Einaudi†, W. Gary Ernst*, Stephan A. Graham*, James C. Ingle, Jr., Juhn G. Liou, Donald R. Lowe, Michael O. McWilliams**, George A. Parks†, David D. Pollard†, Irwin Remson†, Norman H. Sleep*

Associate Professors: Dennis K. Bird, Simon Brassell, Gail A. Mahood, Elizabeth L. Miller, Jonathan Stebbins

Associate Professor (Research): Michael F. Hochella, Jr.

Consulting Professors: Steven R. Bohlen, H. Edward Clifton, Brent Dalrymple, Gerard J. Demaison, Timothy Hall, Keith A. Kvenvolden

Consulting Associate Professors: Edmund Chang, Joseph W. Ruetz

* Joint appointment with Geophysics

** Joint appointment with Geophysics

† Joint appointment with Applied Earth Sciences

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The program leading to the degree of Bachelor of Science in Geology provides the background for a wide variety of careers. It prepares students for graduate studies in the earth sciences, law, business administration, land use planning, environmental engineering, public service, and other professions where an understanding of the earth and a background in science can be important. The field of geology is broad in scope and includes the study of the earth’s history and the evolution of life, the oceans and atmosphere, the processes that shape the earth’s mountains, continents, and landscapes, the chemistry and physics of earth materials, and sources of economic minerals and fuels. Geology is also concerned with the earth’s present, particularly the ways in which society is affected by natural hazards (such as volcanic eruptions and earthquakes), and the ways in which society affects the planet (such as the pollution of ground water and the depletion of resources).

An important emphasis of the B.S. program in Geology is the study of earth processes, materials, and history in the natural laboratory of the field. Stanford University’s location near the Pacific continental margin, the Sierra Nevada mountain range, and the San Andreas fault system provides a nearly unparalleled setting for field studies.

Originally mostly observational and descriptive, geology has evolved into a quantitative science dealing with the physics and chemistry of the earth and other planets, and with interactions between the biological and physical systems of the earth. The study of geology thus includes significant coursework in the basic sciences and mathematics. The diversity of these requirements and experiences results in graduates with an unusual versatility and range of skills.

The undergraduate program in Geology is designed to recognize the diversity of the field and to provide a great deal of flexibility. A large proportion of the required courses can be selected by the student in consultation with the undergraduate advisor, allowing the program to be tailored to individual goals and interests. A senior-year project provides additional opportunities for student-directed research and education.

CORE COURSE SEQUENCE

All undergraduate Geology majors are expected to complete the core course sequence. Letter grades are required.

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geol. 1. Interpreting the Earth</td>
<td>A,W,S,Sum 4</td>
</tr>
<tr>
<td>Geol. 2. Earth History</td>
<td>A 3</td>
</tr>
<tr>
<td>Geol. 3. Earth History Laboratory</td>
<td>A 2</td>
</tr>
<tr>
<td>Geol. 103A,B. Field Geology (or its equivalent)</td>
<td>Sum 12</td>
</tr>
<tr>
<td>Geol. 110. Structural Geology</td>
<td>S 5</td>
</tr>
<tr>
<td>Geol. 151. Sedimentary Geology and Petrography</td>
<td>W 4</td>
</tr>
<tr>
<td>Geol. 152. Paleontology and Stratigraphy</td>
<td>S 4</td>
</tr>
<tr>
<td>Geol. 161. Mineralogy and Optics</td>
<td>A 5</td>
</tr>
<tr>
<td>Geol. 162. Petrography</td>
<td>S 2</td>
</tr>
<tr>
<td>Geol. 170. Chemistry of the Earth or Geophys. 190. General Geophysics</td>
<td>A 4</td>
</tr>
<tr>
<td>Geol. 181. Igneous Petrology or Geol. 182. Metamorphic Petrology</td>
<td>A 5 S 4</td>
</tr>
<tr>
<td>Total</td>
<td>49-50</td>
</tr>
</tbody>
</table>

INDEPENDENTLY DESIGNED SPECIALIZED CURRICULUM

In addition to the core course sequence, all majors must complete a series of elective courses totaling a minimum of 20 units of which at least 3 but no more than 10 units will be independent research units (Geol. 199). These elective units afford an opportunity to acquire substantial strength in one of the many subdisciplines of geology and allied earth sciences. Alternatively, elective units can be utilized to complete requirements for a teaching credential or to ac-
quire depth in a discipline outside the earth sciences, such as civil engineering or marine biology. Students interested in the analytical aspects of earth sciences and planning to go on for a graduate degree may want to use the elective units to obtain a strong background in mathematics, chemistry, and/or physics.

Appropriate electives in accord with the interests of the student are selected in conference with the undergraduate faculty advisor. There are no constraints on elective courses; they may be taken in the Department of Geology or any other department of the University.

REQUIRED COURSES IN THE SUPPORTING SCIENCES

Letter grades are required.

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
<th>A,W 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 31. Chemistry Principles</td>
<td>W,S 3</td>
<td></td>
</tr>
<tr>
<td>Chem. 135. Physical Chemistry</td>
<td>W,S 3</td>
<td></td>
</tr>
<tr>
<td>(Geol. 171, Chem. 33 or Chem. 171 may be substituted.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math. 41, 42, 43. Calculus and Analytical Geometry (Math. 19, 20, 21 may be substituted for Math. 41, 42.)</td>
<td>A,W,S 15</td>
<td></td>
</tr>
<tr>
<td>Phys. 51, 53, 55 (Phys. 21, 22, 23 may be substituted but is not recommended for students contemplating graduate work.)</td>
<td>A,W,S 12</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

SUMMARY OF COURSE REQUIREMENTS

Core Course Sequence 49-50
Independently Designed Specialized Curriculum 20
Supporting Sciences 34
Total 103-104

HONORS PROGRAM

The Department of Geology offers a program leading to the degree of Bachelor of Science in Geology with Honors. The program provides an opportunity for students to undertake independent study and research on a topic of special interest culminating in an honors report. The honors program is open to seniors having a letter grade indicator of at least 3.5 in earth science courses and of at least 3.0 in all University coursework. Financial support is available to help defray laboratory and field expenses incurred in conjunction with honors research.

Students intending to apply for the honors program should register in the departmental office before the start of their senior year and follow these guidelines for the program:

1. Potential honors student should identify a research project, either theoretical or field or experimental.
2. The student shall submit a written research proposal to the departmental honors subcommittee, which decides on the suitability of the proposal as a project.
3. Course credit for the research project is assigned by the project advisor within the framework of Geology 105.
4. A written report must be completed for honors credit.
5. Before the end of the student's senior year, each honors candidate shall present a public seminar on the work proposed for credit.
6. The decision as to whether a given project and report does or does not merit award of honors shall be made jointly by the honors subcommittee and the student's advisor.
7. The work completed for the honors program cannot be used as a substitute for regularly required courses.

COTERMINAL B.S. AND M.S. PROGRAM

A Stanford undergraduate majoring in Geology may be admitted to graduate studies for the purpose of working simultaneously toward bachelor's and master's degrees.

1. Students are encouraged to apply at the beginning of Winter Quarter of the junior year, but applications are accepted in the seventh, eighth, ninth, or tenth quarter of undergraduate work.
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 other graduate applicants.

Both degrees may be granted simultaneously, provided the student:

1. Completes 15 full-time quarters or the equivalent (or three full quarters after completing 180 units). Partial tuition registration is possible after the completion of 12 full quarters.
2. Applies for each degree at the appropriate time and to the appropriate office.
3. Completes all the requirements for the baccalaureate degree and is recommended for the degree by the Subcommittee on Graduation.
4. 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 department of Geology 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 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 and geophysical research are 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 geochemistry, groundwater geology, igneous petrology, marine geology, metamorphic petrology, mineralogy, minor deposits, mineral physics, paleontology and micropaleontology, palynology, petroleum geology, photogeology, rock mechanics, sedimentology, stratigraphy, structural geology, and volcanology.

Course programs in the areas of faculty interest are tailored to the student's needs and interests with the aid of his or her research advisor. 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 and involve courses and faculty in both Applied Earth Sciences and Geology. The three broad areas of faculty research include (1) geochemistry, petrology, and mineralogy, (2) sedimentary geology and paleontology, and (3) regional, structural, and tectonic geology. These are summarized as follows:

**Geochemistry, Petrology, and Mineralogy**—The research and teaching interests of a number of the faculty in the Geology Department involve geochemistry and its applications, mineralogy and mineral physics, igneous and metamorphic petrology, ore deposits, hydrothermal systems, mineral surface and colloid reactions, organic geochemistry, and the fundamental structure and properties of earth materials. Applications include field-oriented studies, detailed trace and major element analysis, computer prediction and modeling, x-ray scattering and spectroscopic studies of earth materials, the geochemistry of mineral surfaces, mineral-fluid interactions, and laboratory experimentation at high temperatures and pressures. The scale of problems studied ranges from global to atomic. Students with strong backgrounds in chemistry are especially urged to contact faculty in these fields, including Professors Bird, Bohlen, Brassell, Brown, Cole-

**Sedimentary Geology and Paleontology**—Sedimentary geology at Stanford emphasizes the relationships between the tectonic, depositional, and paleoceanographic development of continental margins and associated basins, including quaternary geology and neotectonics of coastal regions. Current studies include a full array of margin settings in North America, the Caribbean, the Mediterranean, Africa, and the Pacific Rim. Our tools include sedimentary petrology, lithofacies, and biofacies analysis of depositional environments, micropaleontology, surface and subsurface analysis of sedimentary structure, application of organic geochemistry and ground water hydrology, and computer simulation of basin evolution. Faculty with special interests in these topics include Professors Brassell, Clifton, Graham, Ingle, Kvenvolden, Lowe, and Remson with a number of overlapping research interests shared with other faculty in the Departments of Applied Earth Sciences and Geophysics.

**Tectonic, Structural, and Regional Geology**—A wide spectrum of subdisciplines bearing on structural, tectonic, and regional geologic studies are represented among the faculty in the Geology Department including Professors Mc-Williams (paleomagnetic reconstruction of terranes; geochronology), Miller (structural geology and regional tectonics), Page (neotectonics), Pollard (structural geology and rock mechanics), Sleep (thermal and mechanical models), Thompson (deep geology and rock mechanics), along with Nur (rock physics) in the Geophysics Department. Ongoing studies range from theoretical and laboratory analysis of stress, strain, and rock fracture to field-based studies of accreted terranes and tectonic evolution of the Cordillera. Integration of geologic and geophysical approaches to regional tectonic questions is encouraged in order to understand both surface and deep deformational processes.

**Admission**—For admission to graduate work in the department, the applicant must have taken the Aptitude Test (verbal, quantitative, and analytical) of the Graduate Record Examination. 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. A coterminal B.S./M.S. program is open to Stanford undergraduates.

**MASTER OF SCIENCE**

**Objectives**—It is the purpose of the master's program in Geology to continue a student's training in geology and to prepare the student for a professional geological career.
Procedures—The Graduate Committee of the department appoints a tentative academic advisor during registration with appropriate consideration of the student's background, interests, and professional goals. In consultation with the academic advisor, the student plans a program of coursework for the first year. The student should select a thesis advisor within the first year of residence and submit to this 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; responsibility then passes to the thesis advisor. The student may change either thesis or academic advisors by mutual agreement and after approval from the Graduate Committee.

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

1. The student must complete a minimum of 36 units of coursework.
   a) Not more than 15 units of the 36 shall normally consist of formal lecture courses, the remainder to be seminars or special problem and research units.
   b) Of the 36-unit University minimum, all courses must be at or above the 100 level and 50 percent must be courses designated primarily for graduate students.
   c) The course list is selected by the student with his or her academic advisor and must meet with approval of the latter.

2. 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.

3. Early during the thesis research period, and after consultation with the student, the thesis advisor appoints a second reader for the thesis, the thesis advisor being the first reader. The two readers determine jointly whether the thesis is acceptable for the M.S. degree in the department.

4. Once the thesis has been approved, the student makes a public presentation of 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:

Quarter Procedure
1 Plan coursework for first year with academic advisor and submit Program Proposal.
2-3 Planned coursework; selection of thesis advisor and thesis topic; submit short research proposal to thesis advisor; begin thesis research.
3-5 Select second reader.
5-6 Present a complete draft of thesis to thesis advisor and second reader at least three weeks prior to deadline for filing M.S. thesis with Graduate Program Office; complete M.S. thesis; file thesis; present results publicly.

Time Limits—Students should note that University rules impose the following time limits: (1) for coterminal students, 3 calendar years after completion of 180 units; (2) for all other M.S. candidates, 3 calendar years from the start of the first quarter of enrollment in the M.S. program. Extensions require approval of the department as well as Graduate Studies.

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 class list sign-up, an advisor is appointed by the Graduate Committee of the department, with appropriate consideration of the student's background, interests, and professional goals. In consultation with the advisor, the student plans a program of coursework for the first year. The student should choose a research advisor within the first year of residence. The research advisor supervises completion of the departmental requirements for the Ph.D. program (as outlined below) until the student passes the research examination, at which time this responsibility passes to the Research Advisory Committee. The student may change advisors with approval from the Graduate Committee.

Requirements—The University's requirements for the Ph.D. are stated in the "Advanced Degrees" section of this bulletin. The student must also be guided by the following departmental requirements:

1. The student must successfully complete the courses that form the individualized academic program. The requirements include a minimum of four courses of at least 3 units each from four different faculty members in the School of Earth Sciences.

2. The student must qualify for candidacy for the Ph.D. by the end of the sixth quarter in residence. Departmental procedures require preparation of a research proposal, approval of this proposal by the research advisor, selection of a Committee for the Research
Examination, and approval of the membership by the Graduate Committee of the department. The research examination consists of three parts: (1) oral presentation of a research proposal, (2) examination on the research proposal, and (3) examination of subject matter relevant to the proposed research. The research examination may be repeated once. For details regarding committee membership, examination requirements, and appeal procedures, see the Departmental Information sheet.

3. Annually, in the month of March or April, the candidate must organize a meeting with the research committee to present a brief progress report covering the past year. On a form provided by the department, the Research Advisory Committee shall note its impression of progress and, if desired, recommendations for further work. The report shall be signed by all committee members and by the student; a quorum must be present, and individual meetings with members are not an acceptable substitute. The report must be submitted to the department before May 1 of each year following that in which candidacy has been certified.

Doctoral Dissertation—Under the supervision of the Research Advisory Committee, the candidate must prepare a doctoral dissertation that is a contribution to knowledge and is the result of independent research. The format of the dissertation must meet the Graduate Studies guidelines. The student is strongly urged to prepare dissertation chapters that in scientific content and format are readily publishable.

In accordance with University procedure, the department shall appoint the research advisor and two members of the Research Advisory Committee to be readers of the draft dissertation. The readers are charged to read the draft and to certify in writing to the department that it is adequate to serve as a base for the University oral examination. Until such written and signed certification has been received by the department, the student is not permitted to schedule the University oral examination.

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

Quarter Procedure
1 Plan coursework for the first year with advisor.
2-6 Preparation of research proposal; research examination, certification, and petition for Ph.D. candidacy; admission to candidacy for the Ph.D.
2-12 Ph.D. research; University oral examination; complete dissertation.
Laboratory sessions deal with stratigraphic interpretation, geologic maps and cross sections, sedimentary environments, and metazoan evolution and fossils. Recommended for students taking Geology 2; required for Geology majors who took 2 in 1985-86 or later. Prerequisite: 2, (which may be taken concurrently).

2 units, Aut (Lowe) 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 emphasizes use of the hand lens in making observations, and field trips demonstrate rock structures and genetic associations. Prerequisite: 1. Recommended: introductory chemistry.

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

102. Introduction to Field Geology—Instruction and practice in the basic methods of geologic investigation and recording in the field. Emphasis on techniques of systematic observation on the outcrop and the construction of geologic maps and sections from the data obtained. The field area studied varies each year, but each site displays a variety of rock types and landforms related to clearly defined structures. Conducted from White Mountains Research Station in Bishop, CA, during interval between Labor Day and the beginning of Autumn Quarter. See the Summer Session bulletin for the schedule. Prerequisite: 1.

3 units, Sum (Staff)

103A,B. Advanced Field Geology—Juniors and seniors become involved in a substantial field investigation of professional scope. Assumes a familiarity with elementary techniques used in field mapping, stratigraphic, and structural studies. In-depth exposure to analysis of relatively complex geologic problems in the field. Presentation of research results in a professional report. Conducted from a tent camp at one or more localities in the western states and involves coordinated field mapping, descriptions, and interpretation of a relatively unknown field area. Emphasis is 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. Prerequisites: 1, 2, 110, and 151; or consent of instructor(s).

103A. Field portion of 103 includes studies described above and short reports on this work written in the field. Credit for 103A requires completion of 103B.

8 units, Sum (Miller)

103B. Laboratory studies, compilation of maps, cross-sections, stratigraphic columns and structural data for the preparation of a comprehensive geologic report on field areas studies during 103A; work done in the field or on campus.

4 units, Sum (Miller)

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

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

110. Structural Geology—Emphasizes the use of structural geology in understanding the deformational history of the earth’s crust, the evolution of mountain belts, and formation of ocean basins. The general properties, rheology, and mechanisms of deformation of the crust. Large scale structures formed by crustal shortening, extension, and strike-slip faulting. Techniques of structural analysis include: the study and interpretation of maps and construction of balanced cross-sections, measurements of strain in deformed rocks, stereonet analysis of folds and multiple folding events, deformational fabrics in metamorphic rocks and preferred crystallographic orientation of minerals in metamorphic tectonites. Prerequisites: 1, calculus, or consent of instructor.

5 units, Spr (Miller) MWF 9 lab and field trips by arrangement

150. The Oceans: An Introduction to the Marine Environment—Introduction to oceanography. Topics: topography and geology of the sea floor, the circulation of the ocean and atmosphere, the nature of sea water, waves, tides, and the history of the major ocean basins. The interface between continents and ocean basins, emphasizing estuaries, beaches, and continental shelves with California margin examples. The relationships between the distribution of inorganic constituents, ocean circulation, biologic productivity, and marine environments from deep sea to the coast. Marine resources and attendant legal conflicts. Lectures, occasional demonstrations, and a required one-day field trip to measure and analyze waves and currents. For non-majors and prospective geology majors. (DR:7)

3 units, Win (Ingle) MWF 11 demonstrations, field trip by arrangement

151. Sedimentary Geology and Petrography: Depositional Systems—Topics: weathering, erosion and transportation, deposition, the origins of sedimentary structures and textures, sedi-
men composition, diagenesis, sedimentary facies, tectonics and sedimentation, and the characteristics of the major siliciclastic and carbonate depositional environments. Laboratory: methods of analysis of sediments in hand specimen and thin section. Field trips required. Prerequisite: 1, 2.

4 units, Win (Lowe, Graham) MWF 9
lab T 1:15-4, field trips by arrangement

152. Paleontology and Stratigraphy—Rudiments of interpreting sedimentary sequences emphasizing integration of paleontologic and sedimentologic evidence to reconstruct depositional environments, basin history, and paleogeographic and paleoceanographic settings. Readings and lectures on the nature of the fossil record, the use of fossils for geologic dating and correlation, and the record of evolution. Characteristic variations of modern and ancient biocenoses and litho-facies are traced in time and space. Biostratigraphy, magnetostratigraphy, and radiometric dating and correlation. Individual investigation of a stratigraphic problem forms the basis for a required term paper. Lectures supplemented by classic and current scientific literature and take-home exercises. Prerequisites: 1, 2.

4 units, Spr (Ingle) MWF 11
three required field trips
research conferences by arrangement

161. Mineralogy and Optics—Basic crystallography and principles of x-ray diffraction. Principles of crystal chemistry. Factors affecting the stability of minerals and the solid contaminants of our environment. Elementary phase equilibria. Examination of the structures, chemistry, physical properties and paragenesis of the major rock-forming minerals emphasizing silicates. The principles of optical mineralogy. Lab on determinative mineralogy: hand specimen identification and optical and x-ray methods. One field trip. Prerequisites: 1, and Chemistry 31 (may be taken concurrently).

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

162. Petrography—Application of the principles of optics to the identification of minerals and the rocks they comprise. Emphasizes practical experience in the study of thin sections of rocks using a petrographic microscope. Teaches the skills needed for rapid mineral and rock identification and introduces the interpretation of rock textures and structures and mineral reactions visible in thin section. Two three-hour laboratory exercises per week. Prerequisite: 161.

2 units, Spr (Coleman, Miller)
by arrangement

170. Introduction to the Chemistry of the Earth—How chemical elements are distributed in the earth, oceans, and atmosphere, processes which cause this distribution, and conceptual and analytical tools needed to explore these questions. Lectures supplemented by laboratory experiments relating to aspects of aqueous chemistry, sedimentary, igneous, and metamorphic petrology. A field trip observes geochemical processes affecting ground water and mineral deposits.

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

171. Geochemical Thermodynamics—Introduction to the application of chemical principles and concepts to geologic systems. The chemical behavior of fluids, minerals, and gases using simple equilibrium approaches to modeling the geochemical consequences of diagenetic, hydrothermal, metamorphic, and igneous processes. Topics: reversible thermodynamics, solution chemistry, mineral-solution equilibria, reaction kinetics, and the distribution and transport of elements by geologic processes. Prerequisite: 161.

3 units, Aut (Bird) MWF 9

180. Analysis of Geologic Structures—(Same as Applied Earth Sciences 180.) Emphasizes the theoretical and experimental background required to practice structural geology and mechanical principles useful for understanding rock deformation in the earth's crust. Topics: stress and strain analysis, physical properties of rock, brittle fracture, friction, buckling, flexure, and heat and mass transport. Field, laboratory, and computer exercises emphasize the techniques of data collection and interpretation of joints, sheet intrusions, faults, rock fabrics, and folds. The roles of these structures in the evolution of the earth's crust, in natural resource recovery, and in earthquake and volcanic hazards. Prerequisites: 1, calculus, Macintosh skills.

4 units, Spr (Pollard) MWF 10
labs and field trips by arrangement

181. Igneous Petrology—Origin of igneous rocks, emphasizing magmatic differentiation processes. Topics: the physical properties of magmas, role of volatile components, applications of trace elements and isotopes to petrogenesis, modeling of crystal fractionation and partial melting, relevant experimental data and phase diagrams, and relation of magma types to tectonic setting. Laboratory exercises involve hand-specimen and petrographic examination of suites of volcanic and plutonic rocks. For seniors and new graduate students. Graduate students may take without
lab for 3 units. Prerequisite: 161, 162, or equivalent.
5 units, Aut (Mahood) MWF 10
   lab TTh 1:15-4:05

182. Metamorphic Petrology—Genesis of metamorphic rocks and the imposed physiochemical conditions for their formation. Topics: metamorphic zones and facies, 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 minerals and metamorphic rocks. Prerequisite: consent of instructor.
4 units, Spr (Liou, Ernst) TTh 11
   lab T 1:15-4:05

185. Volcanology—Eruptive mechanisms; models of emplacement of pyroclastic flows and characteristics of resulting deposits; volcanic landforms and their relation to the composition and physical properties of the magma; calderas; volcanic gases; eruptive histories of volcanic centers; volcanic hazards and their mitigation; volcanic-hosted geothermal energy and mineral resources. One four-day field trip required.
3 units, Spr (Mahood) MWF 11
   alternate years, not given 1991-92

185L. Volcanology Laboratory—Hand sample and petrographic microscope examination of volcanic rocks. Labs are keyed to lectures in 185, which must be taken concurrently. Prerequisite: some experience with a petrographic microscope.
1 unit, Spr (Mahood) W 1:15-4:05
   alternate years, not given 1991-92

199. Senior Research Project—In-depth research project is required of each major during one quarter of the senior year. The results are presented in a written paper. Projects are chosen in consultation with a faculty member, who serves as a project advisor.
3 units, Aut, Win, Spr (Staff)
   by arrangement

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

216. Geologic Evolution of the Western U.S. Cordillera—Broad-based overview of the geology of the western states appropriate for undergraduate and graduate students with a range of interests and background. The evolution of the mountain belt from its inception in the Precambrian to its contemporary history of extension and strike-slip faulting, based on the description, analysis, and interpretation of the rock record through time. Characteristic structural styles developed during crustal shortening, extension, and strike-slip tectonic regimes; tectonic controls on sedimentary basin formation; plate margin magmatism and metamorphism; and the relation of plate motions to the land geologic record, drawing on geologic examples from this mountain belt. This data base provides insight into the crustal-scale processes and driving mechanisms common to this and other mountain chains.
2 or 3 units, Win (Miller) TTh 4-5:30
   alternate years, not given 1990-91

218. Seminar in Sedimentary Geology—The basis for and problems involved with comparative sedimentology—the interpretation of sedimentary rocks on the basis of modern analogues. A wide range of issues in a combined lecture/discussion/seminar format. Three or four one-day field trips are required on weekends. Prerequisites: 151, 152, or equivalent background.
3 units, Spr (Clifton) M 11-12 T 11-1

2 units, Aut (Demaison) M 4:15-6:05

224. Biological Markers in Petroleum Exploration—Descriptions of the major classes of biological markers, such as steranes and triterpanes, and the basis for their application in the correlation of source rocks and petroleum and as indicators of their thermal history and environments of deposition. Examples of the application of biological markers are presented as case histories in selected sedimentary basins.
2 units, Spr (Brassell) F 1:15-3:05

232. Numerical Methods in Hydrology—Supervised self study of numerical methods with illustrative examples chosen from hydrology. Preparation and solution of finite-difference
models. Prerequisites: elementary calculus and computer programming.

3 units, any quarter (Remson)
by arrangement

241. Introduction to Micropaleontology—Microscopic marine fossils including diatoms, ostracods, and radiolaria with emphasis on foraminifera. Principles of classification, evolutionary trends, common genera, ecology, and environmental distribution of foraminifera. Application of planktonic and benthic foraminifera to interpretation of paleoenvironments, paleoceanographic and paleoclimatic analysis, and correlation of marine sequences. Paleoenvironmental and age analysis of an unknown microfossil sample serves as a term research project. Instruction in laboratory and field techniques.

5 units (Ingle)
alternate years, given 1991-92

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

3 units (Ingle)
alternate years, given 1991-92

250. Sedimentation Mechanics—The mechanics of sediment transport and deposition and the origins of sedimentary structures and textures, particularly as applied to interpreting ancient rock sequences. Dimensional analysis, fluid flow, drag, boundary layers, open channel flow, particle settling, erosion, sediment transport, sediment gravity flows, soft sediment deformation, and fluid escape. Field trip required.

3 units (Lowe)
alternate years, given 1991-92

253. Sedimentary Petrology—Examination and interpretation of sediments and sedimentary rocks. Aspects of provenance, texture, composition, diagenesis, and incipient metamorphism. Lectures and readings stress research in sedimentary petrography over the last five years; less emphasis on classical petrography. Class is topical and varies yearly. Prerequisite: 151.

2 units, Spr (Staff) TTh 9

253L. Sedimentary Petrology Laboratory—Student defines a research problem and solves it using a combination of petrographic microscope, SEM, and/or microprobe techniques. Ten-page write-up similar to publishable paper and oral presentation required.

2 units, Spr (Staff)

254. Sedimentary Facies and Environments—Recognition of sedimentary environments in the field; facies studies of alluvial, fluvial, beach, shelf (siliciclastic and carbonate), deltaic, turbidite, and pelagic environments. Origins of sequences in sedimentary rocks, geometric aspects of sedimentary rocks, analysis of bedforms. Lectures and readings stress research in sedimentology over the last five years.

3 units, Aut (Staff) MWF 2:15
3 field trips by arrangement

254L. Sedimentary Facies and Environments Laboratory—Student defines a research problem in sedimentology undertaken in the field, laboratory, or in theory, and solves it. Units depend on time available to student. Oral presentation with write-up required.

1 or 2 units, Aut (Staff)

260. Physics and Chemistry of Earth Materials—The interrelationships among structure, composition, and physical and thermochemical properties of the major rock-forming silicate minerals and of silicate melts and glasses. Topics: the response of minerals and melts to variations in temperature, pressure, and composition; the connections between atomic-scale structure and thermodynamic properties of earth materials; the derivation, interpretation, and use of phase diagrams in mineral-melt-vapor systems; the theory and limitations of geothermometry and geobarometry; and the mechanisms controlling trace element behavior. Characterization of earth materials using x-ray and spectroscopic methods in lectures and in laboratory exercises. Several labs are devoted to synthesis experiments of minerals and glasses.

4 units, Win (Brown, Stebbins) MWF 11
labs by arrangement

264. Techniques in X-ray Fluorescence—Modern fluorescence instrumentation and associated computing available to earth scientists at Stanford. Proper and efficient instrument use and accepted techniques in data interpretation. Use of the data collection and reduction software available, including wavelength scanning, qualitative to quantitative analysis, instrument calibration, matrix corrections, fundamental parameters, and the statistics of precision for counting and analysis. Instruction in use of sample preparation facilities.

2 units, Spr (Sparks) M 3
lab by arrangement
265. Electron Microprobe and SEM: Theory—
The capabilities of the scanning electron microscope and electron microprobe. Topics: theory, design, and function of electron microbeam instrumentation, sample preparation, practical procedures for imaging, qualitative and quantitative analysis, and data reduction.
2 units, Aut (Paque) TTh 9

265L. Electron Microprobe and SEM: Laboratory—Instruction in use of Stanford's Center for Materials Research scanning electron microscopes and electron microprobe. A research project allows quantitative analysis of materials of the student's choice. Required for those who wish to independently use the facilities. Lab size limited. Prerequisites: 265 (may be taken concurrently), consent of the instructor.
2 units, Aut, Win, Spr (Paque) by arrangement

275. Solution-Mineral Equilibria: Theory—
Procedures for calculating and evaluating the thermodynamic properties of reversible reactions among rock-forming minerals and aqueous solutions in geologic systems. The concepts and principles of chemical thermodynamics relevant to geochemical processes followed by a systematic investigation of the thermodynamic behavior of minerals, H₂O, CO₂, and electrolyte solutions at high temperatures and pressures. Emphasis on the generation and utility of phase diagrams depicting solution-mineral equilibria relevant to phase relations associated with diagenetic, hydrothermal and metamorphic processes, and the prediction of temperature, pressure, and the chemical potential of thermodynamic components compatible with observed mineralogic phase relations in geologic outcrops. Individual research topics. Prerequisite: 171.
3 units, Win (Bird) MWF 10

278. Organic Geochemistry—Introduction to the origins and geological fate of sedimentary organic matter, and the formation of petroleum emphasizing its molecular aspects. The biological origins and geological significance of geologically important classes of organic compounds considered in combination with the methods for their identification and their applications. The principles of the subject illustrated by reference to their value in interpreting recent and ancient sedimentary environments and in petroleum exploration. Applications include palaeoclimatic and palaeoenvironmental assessment, maturity evaluation, and the recognition of pollution from fossil fuels. Recommended: some prior knowledge of basic organic chemistry.
3 units, Win (Brassell) MWF 1:15

279. Analytical Methods in Organic Geochemistry—Combined lecture/laboratory linking the principles and applications of techniques for the extraction, fractionation, and analysis of sedimentary organic matter with practical, hands-on experience in current methods. The basis for interpretation of biological markers from chromatographic and spectroscopic data and their geological application. Term project examines the biological marker characteristics of extractable organic compounds in a selected sediment or petroleum.
2 units, Spr (Brassell) M 1:15-3:05

280. Rock Sample Preparation—Practical instruction in the safe use of rock-crushing and mineral-separation equipment. For graduate students and advanced undergraduate students using these techniques for their research.
1 unit (Mahood) alternate years, given 1991-92

281. Advanced Metamorphic Petrogenesis—For those who have had an introduction to metamorphic petrology and phase equilibria. Topics:
(1) the origin and evolution of metamorphic rocks emphasizing metamorphic processes and petrogenesis in the mid-to-lower continental crust;
(2) the evolution and maturation of continental crust from geochemical and geophysical points of view through the integration of information from heterogeneous phase equilibria, crystal chemistry, trace element and isotopic geochemistry, experimental geochemistry, and tectonics;
(3) the generation of crustal material and its modification by various processes in a tectono-thermal framework that allows a quantitative assessment of the evolution of metamorphic belts. Two lectures and one laboratory weekly.
3 units, Win (Bohlen) by arrangement

283. Petrologic Phase Equilibria—Principles of phase equilibrium determined by laboratory experimentation and thermochemical calculation, as applied to igneous and metamorphic petrology. Not a comprehensive survey of the diversity of hard rocks. Focuses on the underlying principles of classical thermodynamics which govern mineral equilibria. Introduction of chemical kinetics and order-disorder phenomena in geologic systems.
4 units (Ernst) alternate years, given 1991-92

285. Isotopes and Trace Elements in Igneous Petrogenesis—The use of trace elements and radiogenic and stable isotopes in igneous petrogenesis. Topics: mass spectrometric techniques; geochronology of the Rb-Sr, U-Pb, and U-series disequilibrium systems; formation of meteorites and the early history of the earth; evidence for nature of basalt sources and the implications for mantle convection; evolution of mafic magmas in the lower crust; evidence for contributions
from subducting slabs to arc magmas; residence
times of magmas and magma chamber processes;
multiple origins of rhyolitic magmas; granites
as imperfect mirrors of their source regions;
trace-element modeling of partial melting, frac-
tional crystallization, magma mixing, and com-
bined assimilation-fractional crystallization;
pitfalls of the use of trace-element discriminant
diagrams in tectonic analysis. Prerequisite: 181
or equivalent.

3 units, Win (Mahood) MWF 9
alternate years, not given 1991-92

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

290. Advanced Structural Geology and Rock
Mechanics—(Same as Applied Earth Sciences
280.) Advanced concepts and theories of rock
deformation with application to rock mechanics,
structural geology, and tectonophysics. Prereq-
usites: elementary calculus, mechanics, and
structural geology.
3-4 units (Pollard)
alternate years, given 1991-92

310. Surface Analytic Chemistry—A practical,
hands-on approach to surface analytic techniques
including x-ray and ultraviolet photoelectron
spectroscopy, Auger electron spectroscopy,
scanning electron and Auger microscopy, and
low energy electron diffraction. Instruction on
a VG ESCALAB Mk II instrument. Lecture
topics: design and function of surface analytic
instrumentation, technique fundamentals and
application, sample preparation, and general
procedures in ultra-high vacuum equipment.
A term project allows students to perform surface
analytic experiments on materials of their choice.
Required for those who wish to independently
use the VG ESCALAB Mk II at Stanford’s Center
for Materials Research. Class size limited. Pre-
requisite: consent of instructor.
3 units, Win (Hochella) MW 10
lab by arrangement

317. Advanced Field Mapping—10-14 days map-
ing in a structurally complex region. Emphasis
on collecting detailed structural, stratigraphic,
and sedimentologic data to solve a topical prob-
lem in either regional and/or local geology. Pre-
requisite: consent of instructor.
3 units (Miller) by arrangement

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

358. Seminar in Sedimentary Geology.
1-3 units, Win, Spr (Staff)
by arrangement

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

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

378. Advanced Topics in Organic Chemistry—
A varied series of discussion sections, readings,
and seminars on aspects of organic geochemistry
and recent research. Themes: historical develop-
ment of the subject, its major goals and applica-
tions, and its literature focusing on current topics in the field.
2 units, Aut, Win, Spr (Brassell) Th 10-12

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

382. Seminar in Metamorphic Petrology—Se-
lected topics in tectonic and metamorphic proc-
esses, research problems and methods of study
of metamorphic rocks and their tectonometa-
morphic evolutions. Prerequisite: consent of
instructor.
1-2 units, Aut, Win, Spr (Liou, Coleman,
Ernst) by arrangement

386. Seminar in Experimental Geochemistry—
For those interested in doing experiments and in
using experimental data, and who wish to
trace how experiments are planned and carried out, how usable data are extracted from results,
how experimental errors propagate through cal-
culations, and how models can be realistically
constrained. Student projects concerning either
the design of an experiment or the proper use
of experimental data are presented.
2 units, Win (Stebbins) by arrangement

Problems in Various Fields of Geology.
(Staff) units, quarter, time by arrangement

309. Problems in General Geology.
319. Problems in Structural Geology.
321. Problems in Organic Geochemistry.
339. Problems in Environmental Earth Sci-
ences and Hydrogeology.
349. Problems in Paleontology, Palynology,
and Paleoecology.
355. Problems in Oceanography.
359. Problems in Sedimentary Geology.
369. Problems in Mineralogy.
379. Problems in Geochemistry.
389. Problems in Petrology and Volcanology.
399. Problems in Geomathematics.

Research in Various Fields of Geology.
(Staff) units, quarter, time by arrangement

409. Research in General Geology.
419. Research in Structural Geology.
421. Research in Organic Geochemistry.
439. Research in Environmental Earth Sci-
ences and Hydrogeology.
449. Research in Paleontology, Palynology,
and Paleoecology.
455. Research in Oceanography.
GEOPHYSICS

Emeritus: George A. Thompson (on active duty)
Chairman: Amos M. Nur
Professors: John F. Claerbout, W. Gary Ernst, Robert L. Kovach, Amos M. Nur, Jonathan Roughgarden*, Norman H. Sleep, Mark D. Zoback
Associate Professors: Jerry M. Harris, Simon Klemperer, Michael O. McWilliams
Assistant Professor: Greg Beroza
Associate Professor (Research): Paul Segall
Courtesy Professors: Stephan A. Graham, David D. Pollard
Acting Associate Professor: Gerald M. Mavko
Acting Assistant Professor: Richard Ottolini
Consulting Professors: Cecil Green, Walter Mooney, Francis Muir, William Ostrander, William Savage

*Joint appointment with Biological Sciences

Geophysics is the branch of earth science concerned with exploration of the earth and its history by physical measurement. 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. It has a number of research facilities among which are a rockmagnetism laboratory, a geochronology laboratory, several large scale microcomputers, a high pressure and temperature rock deformation laboratory, and various instruments for field measurements. Current research activities include earthquake mechanics, geophysical well logging, application of seismology to the study of present-day tectonics, near field seismology, seismic studies of the continental lithosphere, isotopic age dating, paleomagnetic investigations of regional tectonics, behavior of the geomagnetic field, free oscillation and surface wave studies, and major programs in reflection seismology and experimental and theoretical rock physics. Graduate programs lead to the degrees 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 are 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 or an honor’s thesis is also required. Normally, this is undertaken as part of the student’s participation in three quarters of Research Seminar (Geophysics 185A, C, D, E, F, G, H, J, K, L, S, T, U, V) 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. and Subject

Chem. 31. Chemical Principles
Chem. 135. Physical Chemical Principles, or Physics 170, 171. Thermodynamics
Elect. Engr. 141. Electromagnetic Fundamentals or Physics 120. Electricity and Magnetism
Geol. 1. Interpreting the Earth
Geol. 50. Rocks and Minerals
Geol. 102. Introduction to Field Geology
Math. 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 curriculum includes 9 units of Geophysics electives.

Particularly recommended to fill the 9-unit requirement: 150, 174, 190, 191. Other suggested Geophysics electives are: 102, 180, 195, 262, 276, 254, 255.

Recommended elective courses which do not fill the 9-unit requirement: Comp. Sci. 105 or 106, Geol. 103A and B, and 181, Physics 57, 58, 64A, 64B, 120, 121, 122, 210, 211, or Elect. Engr.
HONORS PROGRAM

The department offers a program leading to the degree of Bachelor of Science in Geophysics with Honors. The guidelines are:
1. Find a research project, either theoretical, field, or experimental, that has the approval of an advisor.
2. Submit a proposal to the department, which will decide on its suitability as an honors project. Necessary forms are in the department office.
3. Course credit for the project is assigned by the advisor within the framework of Geophysics 205.
4. Before the end of the year, each honors candidate shall give a seminar on his or her work. This seminar is announced publicly and is open to the general audience.
5. The decision as to whether a given independent study project does or does not merit an award of honors shall be made jointly by the department and the student’s advisor. This decision shall be based on the quality of both the honors work and the student’s other work in earth sciences.
6. The work done on the honors program should not be used as a substitute for regularly required courses.

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 fields and in related sciences, and to obtain a start on independent work and specialization.

Requirements for the Degree—The candidate must:
1. Be registered in the graduate school for at least three quarters at full tuition.
2. Complete 45 units with a letter grade indicator of at least “B.” Engineering 102W is required. 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 is undertaken as part of the candidate’s participation in three quarters of Research Seminar (Geophysics 385A, C, D, E, F, G, H, J, K, L, S, T, U, V).
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. A background in field geology should be at the level of Geology 103A and B.

4. Submit a Program Proposal for the Master’s Degree in the first quarter of enrollment.

Students who do not meet the standard course requirements (see the 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.

M.S. IN EXPLORATION AND DEVELOPMENT

Objectives—To provide the theoretical background needed for a career in petroleum exploration or development geophysics. The program takes four quarters, beginning and ending in the Autumn Quarter. A summer internship working in industry or in a government laboratory is an integral part of the program. A written report based on the summer internship is completed in the final Autumn Quarter.

Prerequisites—B.S. degree 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. The following additional undergraduate courses are recommended: linear algebra, computer science, complex variables, petrography, and structural geology.

Requirements for the Degree—Geophysics 150, 174, 180, 181, 190, 191, 262, 284; Applied Earth Sciences 180, 190, 251, 252, 253; Electrical Engineering 261, 263; Geology 151; Petroleum Engineering 150A, B, 155; and elective courses in mathematics, physics, civil and chemical engineering. A total of 36 units are required for the completion of this degree.

DOCTOR OF PHILOSOPHY

Objectives—The Ph.D. degree 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 and the completion of 108 units graduate study at Stanford must be satisfactorily completed. At least two of these years, ordinarily the first, must be spent as a registered student at Stanford. During the first year, candidates take three quarters of Research Seminar (Geophysics 385A, C, D, E, G, H, J, K, L, S, T, U, V). Ph.D. candidates in Geophysics are required to complete Physics 121 or Electrical Engineering (E.E.) 142, E.E. 261, Engineering 102W, and Physics 210, 211, or Mathematics 220A, 220B, and four of the following: Geophysics 102, 174, 195, 262, 283, 284, or 290. Additional advanced courses are to be selected from the following topics: applied physics, astrophysics, atomic and
nuclear physics, communications theory, computer sciences, civil engineering, chemical engineering, electromagnetic theory, engineering mechanics, geology, geophysics, materials science, physics of solids, and 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. Petitions submitted after admission to candidacy are approved only in the event of extraordinary circumstances. 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 two academic quarters) is required for the Ph.D. degree. The student must pass the departmental written qualifying examination (given annually in late September) by the second year; pass the departmental oral examination by presenting and defending a written research paper or proposal by the end of the second year; submit an Application for Candidacy to the Graduate Program Office; fulfill the requirements of the minor department, if a minor is elected; prepare and defend 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 who fail to meet this deadline are required to reapply for admission to candidacy and retake the department and the University oral examinations. They are given one additional year in which to submit dissertations.

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

**COURSES**

4. Natural Hazards and Man—Introduction to understanding natural and other hazards, earthquakes, volcanic eruptions, tsunamis, toxic waste disposal, nuclear power plant siting, their risk assessment, possible mitigation, and protective measures. For non-majors and potential earth scientists. (DR:8)

3 units, Win (Kovach) MWF 10

10. Continents Adrift: Plate Tectonics and the Geology of California—For prospective Earth Science majors or non-majors. Introduction to plate tectonics, applied to the geological history of California, where a mosaic of geological terranes have been built, assembled, and modified by the mechanisms of plate tectonics. Topics: plate geometry and the present distribution of faults, earthquakes and volcanoes; geological history of California and western North America for the past 250 million years; evolution of the San Andreas fault system, causes and consequences of plate motion; the origin of the Sierra Nevada, Great Valley, and Coast Ranges; the geological future for California. Two Saturday field trips.

3 units, Spr (McWilliams) MWF 10

102. Paleomagnetism—The application of paleomagnetic methods to problems in tectonics, and stratigraphy. Origin and analysis of the geomagnetic field, origin of magnetization in geological materials, techniques of measurement, data analysis, apparent polar wandering and plate motion, analysis of terrane displacement. Students conduct a small-scale paleomagnetic study as a research project. Prerequisite: Geology 1 or 2. Recommended: 150, Geology 110, Physics 53.

3 units, Spr (McWilliams) by arrangement

III. Introduction to Computing in Earth Science—Computing tools for research in earth sciences. How to use existing hardware and software tools. Focuses on: UNIX operating system; computer networking; graphics software; text processing software; and management of programming projects.

1 unit, Aut (Farrell) MW 1:15

150. Plate Tectonics—Description and evolution of movements between lithospheric plates as determined from geologic and geophysical data. Topics: relative velocities between plates; marine magnetic anomalies; interpretation of paleomagnetic data; seismicity at plate boundaries; geologic processes at rises, trenches, and transforms; causes of plate motions; 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 (Sleep) MWF 11


3 units, Aut (Kovach) MWF 9
176. Principles of Ecology—(Same as Biological Sciences 176.) Introduction to ecology emphasizing ecological theory and the population and community scales of organization, using primarily zoological examples. Evolutionary processes of ecology. Prerequisite: first year calculus (Math 19-21 or higher). Recommended: 33.
3 units, Win (Roughgarden) TTh 10

180. Geologic Interpretation of Reflection Seismograms—Elementary principles of reflection seismology, seismic data processing, and field operations including a 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) TTh 7-9 p.m., lab W 1:15-4

181. Seismic Data Processing—Workshop experience in computer enhancement of reflection data. Prerequisites: Electrical Engineering 261, concurrent or previous registration in 180.
3 units, Spr (Zoback) WF 1:15-3:30

185A, C, D, E, G, H, J, K, L, S, T, U, V. Research Seminars—An opportunity for undergraduates to participate directly in an ongoing research project. Participation consists 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 coterminal 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)

185C. Research Seminar: Seismology—Current research in seismology, seismicity, and earthquake source mechanisms.
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 each 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 and refraction data.
2 units, Aut, Win, Spr (Thompson, Mooney) by arrangement

2 units, Aut, Win, Spr (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

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

185L. Research Seminar: Seismotectonics—Research using seismic reflection and other geophysical data to understand structure and processes in seismically active areas.
2 units, Aut, Win, Spr (Zoback) by arrangement

185S. Research Seminar: Seismic Tomography—Current research in transmission and reflection tomography including topics on forward modeling, inversion, and data acquisition.
2 units, Aut, Win, Spr (Harris) by arrangement

185T. Research Seminar: Crustal Deformation—Current research in crustal deformation with application to active tectonic and volcanic processes. Conventional and space techniques, data analysis, inversion of surface data to constrain physical processes in the earth.
2 units, Aut, Win, Spr (Segall) by arrangement

185U. Research Seminar: Fault Mechanics—Current research into the mechanics of faulting, fracture mechanics, friction, models of strain accumulation and post-seismic deformation, pore fluid effects, and induced seismicity.
2 units, Aut, Win, Spr (Segall) by arrangement

185V. Research Seminar: Poroelasticity—Few problems in crustal geophysics are independent of pore spaces, pore fluids, and rock-fluid interactions. Current research topics on the mechanical properties of porous rocks discussed: dynamic problems of seismic velocity, dispersion, and attenuation; and quasi-
static problems of faulting, fluid transport, crustal deformation, and loss of porosity. Covers published papers and current research. Participants define, investigate, and present an original problem of their own.

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

185Y/385Y. Research Seminar: Theoretical Ecology—(Same as Biological Sciences 286.) Current topics in theoretical ecology, especially interface between earth sciences and ecology/evolutionary biology. Examples: molecular systematics and plate tectonic reconstruction; physical oceanography and marine population dynamics; species selection and evolution of sex; remote sensing and population dynamics; dynamics of spatially distributed populations; niche theory and coevolution of competing species.

2 units, Spr (Roughgarden)
by arrangement

190. General Geophysics—Elementary study of gravitational magnetic, seismic, and thermal properties of the earth. Measurements, interpretation, applications to earth structure and exploration. Lab includes field measurements of gravity anomalies, magnetic anomalies, and seismic velocity. Prerequisites: calculus, first-year college physics. Recommended: Geology 110.

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. Introduction to techniques of geophysical prospecting (excluding seismic reflection). Students engage in all phases of the program, interpret the data, and prepare a final report. Suggested for non-geophysics majors in other earth science disciplines. Recommended: 190.

3 units, Aut (McWilliams) TTh 10-11:30
field trip by arrangement

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

4 units, Aut (McWilliams) TTh 10-11:30
field trip by arrangement

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 on current unresolved problems, including the formation of the planets and their thermal histories.

3 units, Spr (Sleep) TTh 10-11:30

205. Honors Program—Experimental, observational, or theoretical honors project and thesis in geophysics under supervision of a faculty member. Prerequisites: superior work in the earth sciences and approval of the department. Students who elect to do an honors thesis should begin planning it no later than Winter Quarter of the junior year.

1-3 units, Aut, Win, Spr, Sum (Staff)
by arrangement


3 units, Win (Nur) T 11-1 Th 11-12

276X. Advanced Seismology—Review of modern techniques in earthquake seismology. Elastodynamic theory. Representation theorem of seismic sources; elastic waves in homogeneous, isotropic and unbounded media; propagation of plane waves, attenuation, elastic waves in two-layered or half-space media. Prerequisites: 174 and knowledge of complex variables.

3 units (Staff)
alternate years, given 1991-92

276Y. Advanced Seismology—Body waves in vertically heterogeneous media (generalized ray theory, reflective method, WKBJ method, full-wave theory), kinematics of seismic source processes. Introduction to dynamics of seismic source processes. Prerequisite: 276X.

3 units (Staff)
alternate years, not given 1991-92


3 units (Staff)
alternate years, given 1991-92


282. Rock Fracture—(Enroll in Applied Earth Sciences 282.)

283. Geophysical Inverse Problems—Lectures on fundamental concepts in inverse theory and application of inverse theory. Generalized in-
verse theory, stochastic inverse, resolving kernels, and error analysis. Prerequisite: Math 103.

3 units (Staff)
alternate years, not given 1991-92

284. Imaging the Earth's Interior—Extrapolation of wave fields through 2-D in homogeneous media by finite difference and Fourier methods. Acoustic reflection imaging. Migration. Velocity estimation. Prerequisites: familiarity with convolution and Fourier transform; Physics 120, 121.

3 units, Spr (Claerbout) MWF 10

285. Seismogram Decomposition—Fourier transform convolution, Z-plane, recognizing conjugate operators in physical processes and using them for inverse modeling by the conjugate-gradient method. Missing data, deconvolution, velocity spectra, near-surface irregularity, sample spectra of noise, spectral factorization, impedance, Q. Prerequisites: complex numbers, simultaneous equations.

3 units, Aut (Claerbout) MWF 10

288. Crustal Deformation—Collection, reduction, and analysis of crustal deformation measurements for the study of plate motion, earthquakes and volcanoes. Data types include terrestrial geodetic methods: leveling, triangulation, laser distance measurements, space methods: GPS, VLBI, SLR, and continuous strain instruments. Inverse methods for analyzing data.

3 units, Win (Segall) MWF 10


3 units (Zoback)
alternate years, given 1991-92

301. Problems in Geophysics.
any quarter (Staff) by arrangement

380A.B. Seminar: Exploration and Development Geophysics—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 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 (Staff) by arrangement
380B. 1 or 3 units, Aut (Staff) by arrangement

385A,B,C,D,E,G,H,J,K,L,S,T,U,V. Research Seminars—An opportunity to frame and pursue research or thesis research within the context of one of the ongoing research projects in the department. Gives the advanced graduate student a regular opportunity to present thesis research progress reports 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)

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

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


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 and refraction data.

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


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

385J. Research Seminar: Paleomagnetism and Tectonics—Current research in paleomagnetism, rock magnetism, global, and regional tectonics.

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


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

385L. Research Seminar: Seismotectonics—Research using seismic reflection and other geophysical data to understand structure and processes in seismically active areas.

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

385S. Research Seminar: Seismic Tomography—Current research in transmission and reflection tomography including topics on
forward modeling, inversion, and data acquisition.
2 units, Aut, Win, Spr (Harris)

by arrangement

385T. Research Seminar: Crustal Deformation—Current research in crustal deformation with application to active tectonic and volcanic processes. Conventional and space techniques, data analysis, inversion of surface data to constrain physical processes in the earth.
2 units, Aut, Win, Spr (Segall)

by arrangement

385U. Research Seminar: Fault Mechanics—Current research into the mechanics of faulting, fracture mechanics, friction, models of strain and post-seismic deformation, pore fluid effects, and induced seismicity.
2 units, Aut, Win, Spr (Segall)

by arrangement

385V. Research Seminar: Poroelasticity—Few problems in crustal geophysics are independent of pore spaces, pore fluids, and rock-fluid interactions. Current research topics on the mechanical properties of porous rocks discussed: dynamic problems of seismic velocity, dispersion, and attenuation; and quasi-static problems of faulting, fluid transport, crustal deformation, and loss of porosity. Covers published papers and current research. Participants define, investigate, and present an original problem of their own.
2 units, Aut, Win, Spr (Mavko)

by arrangement

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

399. Teaching Experience in Geophysics—On-the-job training in the teaching of geophysics. Provides 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 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

Emeriti: (Professors) Frank G. Miller (on active duty), Marshall B. Standing, Alvah J. Horn
Chairman: Khalid Aziz
Associate Chairman: Franklin M. Orr, Jr.
Professors: Khalid Aziz, William E. Brigham, George M. Homsy (by courtesy), Sullivan S. Marsden, Jr., Franklin M. Orr, Jr., Henry J. Ramey, Jr.
Associate Professor: Roland N. Horne

Petroleum engineers are concerned with the optimization of hydrocarbon recovery from oil and gas reservoirs. This involves drilling of wells, design and operation of production facilities, selection and implementation of schemes for enhancing recovery, monitoring of reservoirs, and transportation of oil and gas to processing facilities and to markets. Because of the complex and changing nature of the problems involved, the Petroleum Engineering Department curriculum attempts to develop a sound background in relevant basic sciences and their application to practical problems. This includes fundamentals of physics, chemistry, mathematics, geology, geophysics, computer science, and engineering. Applied courses in the department cover virtually all aspects of petroleum engineering and some related fields like geothermal engineering.

Petroleum engineers are distinguished from other engineers by their understanding of the characteristics of reservoir rock and flow of fluids in such systems. The broad training in this field prepares the graduates for professional areas such as:

Drilling and Production Technology
Enhanced Oil Recovery
Environmental Engineering
Geothermal Energy Production
Natural Gas Engineering
Pipeline Transportation
Reservoir Engineering
Reservoir Simulation
Water Production and Reclamation
Well and Property Economic Evaluation
Well Logging and Log Analysis
Well Test Analysis

Faculty and graduate students in the department conduct research in a variety of areas including: enhanced oil recovery by thermal means, by gas injection, and by the use of chemicals; reservoir simulation with computer models; well test analysis; flow of fluids and
fluid mixtures in pipes; natural gas engineering; properties of petroleum fluids; and geothermal engineering. Undergraduate students are encouraged to participate in research projects. Graduate programs lead to the degrees of Master of Science, Engineer, Engineer with Management Option, and Doctor of Philosophy.

**FACILITIES**

The department currently occupies the Lloyd Noble Laboratory of Petroleum Engineering and portions of the Ruth Wattis Mitchell Earth Sciences Building and the Henry Salvatori Laboratory of Geophysics and operates laboratories for research in various enhanced oil recovery processes and geothermal engineering. Students have access to a variety of computers for research and coursework. The department offices and laboratories will move to the new Green Earth Sciences Research Building when it is completed.

**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 certified by the Accreditation Board for Engineering and Technology (ABET). The department undergoes accreditation inspections with the School of Engineering; see the "School of Engineering" section of this bulletin. Basic sciences and engineering are stressed to provide depth sufficient for the wide spectrum of careers possible in this field.

**COURSE PROGRAM**

The requirements for the B.S. degree in Petroleum Engineering are similar to those described in the "School of Engineering" section of this bulletin. Students must satisfy the University distribution, writing, and language requirements. The normal Petroleum Engineering undergraduate program automatically satisfies the University Distribution requirements in area 6 (Mathematics), area 7 (Natural Sciences), and area 8 (Technology and Applied Science). Engineering fundamentals courses and petroleum engineering depth and elective courses should be taken for a letter grade. ABET accreditation requires that engineering students have one-half year (22 ½ units) of engineering design. That requirement is normally met on completion of the engineering fundamentals and petroleum engineering depth courses.

In brief, the credit and subject requirements are:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Minimum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering fundamentals</td>
<td>19</td>
</tr>
<tr>
<td>Mathematics</td>
<td>20</td>
</tr>
<tr>
<td>Science</td>
<td>24</td>
</tr>
<tr>
<td>Petroleum engineering depth</td>
<td>45</td>
</tr>
<tr>
<td>Distribution, writing, language and electives</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
</tr>
</tbody>
</table>

The following courses constitute the normal program leading to a B.S. in Petroleum Engineering. The program may be modified to meet a particular student's needs and interests, provided the degree requirements for engineering and ABET certification are met. Modified programs must be approved by the student's advisor. Design units are indicated in brackets.

**MATHEMATICS**

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 41. Calculus and Analytical Geometry</td>
<td>5</td>
</tr>
<tr>
<td>Math. 42. Calculus and Analytical Geometry</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 19. Calculus and Analytical Geometry</td>
<td>3</td>
</tr>
<tr>
<td>Math. 20. Calculus and Analytical Geometry</td>
<td>3</td>
</tr>
<tr>
<td>Math. 21. Calculus and Analytical Geometry</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
</tr>
</tbody>
</table>

In addition, the following courses are also required:

<table>
<thead>
<tr>
<th>Course and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 43. Calculus and Analytical Geometry</td>
<td>5</td>
</tr>
<tr>
<td>Math. 44. Calculus</td>
<td>3</td>
</tr>
<tr>
<td>Math. 130. Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

**SCIENCE**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 31. Chemical Principles</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 33. Structure and Reactivity</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 135. Physical Chemical Principles</td>
<td>3</td>
</tr>
<tr>
<td>or Chem. 171. Physical Chemistry</td>
<td></td>
</tr>
<tr>
<td>Geology 1. Interpreting the Earth</td>
<td>4-5</td>
</tr>
<tr>
<td>Physics 51. Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Physics 53. Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>Physics 54. Electricity and Magnetism</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>24-25</td>
</tr>
</tbody>
</table>

**ENGINEERING FUNDAMENTALS**

<table>
<thead>
<tr>
<th>Course and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 10. Applied Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 11. Mechanics of Materials I</td>
<td>4</td>
</tr>
<tr>
<td>or Mech. Engr. 33. Introduction to Fluids Engineering</td>
<td></td>
</tr>
<tr>
<td>Engr. 30. Engineering Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>or Chem. Engr. 110. Equilibrium Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>or Engr. 60. Engineering Economics</td>
<td>3</td>
</tr>
</tbody>
</table>
Plus one course chosen from:

Engr. 40. Basic Electronics [2] 5
Engr. 50. Introductory Science of Materials 3

Total 19-22

* Students in junior- and senior-level petroleum engineering courses are assumed to have competence in Fortran.

PETROLEUM ENGINEERING DEPTH

The following courses constitute the core program in Petroleum Engineering (45 units required):

<table>
<thead>
<tr>
<th>Course No and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pet. Engr 151D. Reservoir Fluids Laboratory [0]</td>
<td>2</td>
</tr>
</tbody>
</table>

Total 39

Technical Electives: Students must select a minimum of 6 additional units of courses from Applied Earth Sciences, Geology, Geophysics, or Petroleum Engineering. Courses that may be used to satisfy this requirement are listed below. Other relevant courses may be substituted with the prior approval of the student’s advisor.

<table>
<thead>
<tr>
<th>Course No and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophys. 190. General Geophysics [1]</td>
<td>4</td>
</tr>
<tr>
<td>Petr. Engr. 103. Survey of the Energy Industries</td>
<td>3</td>
</tr>
</tbody>
</table>

Total 20

Note: Courses taken to satisfy requirements for engineering fundamentals, petroleum engineering depth, and technical electives must include a total of 22½ design units (minimum). ABET design requirements are being revised. Consult department for the latest information.

Courses recommended as electives (in addition to technical electives):

<table>
<thead>
<tr>
<th>Course No and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. Engr. 140. Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 135. Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 102W. Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 103. Public Speaking/Presentation Development</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 2, 3. Earth History, Earth History Lab</td>
<td>3, 2</td>
</tr>
<tr>
<td>Geophys. 180. Geologic Interpretation of Reflection Seisimgrams</td>
<td>3</td>
</tr>
<tr>
<td>Math. 113. Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Math. 114. Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Math. 131. Partial Differential Equations I</td>
<td>3</td>
</tr>
<tr>
<td>Math. 132. Partial Differential Equations II</td>
<td>3</td>
</tr>
<tr>
<td>Petr. Engr. 173. Special Topics</td>
<td>3</td>
</tr>
<tr>
<td>Petr. Engr. 190. Undergraduate Teaching Experience</td>
<td>1-3</td>
</tr>
<tr>
<td>Petr. Engr. 190. Undergraduate Research</td>
<td>1-3</td>
</tr>
<tr>
<td>Stat. 110. Statistical Methods in Engineering and the Physical Sciences</td>
<td>4</td>
</tr>
</tbody>
</table>

Sample course programs by year and quarter are available in Petroleum Engineering, 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. There is extensive use of computers in most petroleum engineering courses. Students must develop programming skills through self study and appropriate coursework.

Other requirements are: (1) engineering fundamentals, petroleum engineering depth courses, and technical electives should be taken for letter grades, and (2) ABET accreditation requires engineering students to have one half year (22⅔ units) of engineering design. The latter requirement is normally met on completion of engineering fundamentals and petroleum engineering depth requirements.

HONORS PROGRAM

A limited number of undergraduates may be admitted to the honors program at the beginning of the senior year.

To be admitted, the student must have a letter grade indicator (LGI) of at least "B" in all coursework in the University. In addition to the minimum requirements for the B.S. degree, the student must complete 6 units of advanced petroleum engineering courses and complete at least 3 units of research (Pet. Engr. 190).

Students who wish to be admitted to the honors program should register in the Petroleum
Engineering Department office before the start of their senior year. Those who do not meet all of the above formal requirements may petition the department for admission. Those completing the program receive the B.S. degree in Petroleum Engineering with Honors. An overall 3.5 LCI is required in all petroleum engineering courses for graduation with honors.

COTERMINAL B.S. AND M.S. PROGRAM

A Stanford undergraduate majoring in engineering or earth sciences apply to work simultaneously toward bachelor’s and master's coterminal 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 is evaluated and acted upon by the graduate admissions committee of the department. Typically, at least a 3.25 letter grade indicator in engineering, science, and mathematics is expected. Applicants should take the Graduate Record Examination (GRE) to be considered. Students seeking a B.S. in an engineering field other than petroleum engineering, and an M.S. in Petroleum Engineering should plan to take petroleum engineering and geology undergraduate requirements as a portion of the engineering breadth requirement for the 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 degree of Engineer requires a comprehensive two-year program of graduate study. This degree permits more extensive coursework 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. Extensive coursework and a minimum of two years of graduate work beyond the master's degree is required. Doctoral candidates are encouraged to gain experimental research experience in either M.S. or Ph.D. programs.

MASTER OF SCIENCE

The objective is to prepare the student for professional work in petroleum engineering through 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. Register as a graduate student for at least three quarters at full tuition.
2. Submit a Program Proposal for the Master's Degree in the first quarter of enrollment.
3. Complete 45 units with at least an average letter grade indicator of “B”; normally 6 of these units must be independent work on a research problem.
4. Make up deficiencies in previous work; 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 may be considered as mezzanine courses, i.e., they may receive either undergraduate or graduate credit: Pet. Engr. 150A, 150B, 155, 170, 171, 172, and 175. The 10-unit limitation applies to other deficiencies such as geology and other petroleum engineering courses.

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

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

RECOMMENDED COURSES

The following list is recommended for most students. With the consent of the student’s advisor, other courses may be substituted based on interest or prior background.

MATHEMATICS SEQUENCE

<table>
<thead>
<tr>
<th>Course No and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>9</td>
</tr>
</tbody>
</table>

TOTAL
RESERVOIR ENGINEERING SEQUENCE
Pet. Engr. 175. Well Test Analysis ........................................ 3
Pet. Engr. 270A. Advanced Reservoir Engineering .................. 3
Pet. Engr. 270B. Advanced Reservoir Engineering .................. 3
Total .................................................................................. 9

ENHANCED OIL RECOVERY SEQUENCE
Pet. Engr. 251. Thermodynamics of Phase Equilibria .............. 3
Pet. Engr. 280A. Improved Recovery Methods ......................... 3
Pet. Engr. 280B. Improved Recovery Methods ......................... 3
Total .................................................................................. 9

RESERVOIR SIMULATION SEQUENCE
Pet. Engr. 171. Reservoir Simulation ...................................... 3
Pet. Engr. 271. Advanced Reservoir Simulation ..................... 3
Total .................................................................................. 6

TECHNICAL ELECTIVES
Technical electives should consist of two courses from Pet. Engr. 172, 267, 269, 273, 274, 284, or any advanced-level course from other departments (with consent of advisor).
Electives ............................................................................. 6

RESEARCH
Engr. 360. Advanced Work in Petroleum Engineering ............ 6
Total units required for M.S. Degree ...................................... 45

ENGINEER
The objective is to broaden training through additional work in engineering and related sciences and by additional specialization.

A minimum of two years (six full quarters) of graduate study is required. At least one of the years, ordinarily the last, must be spent as a registered student at Stanford. The candidate must complete 90 units of coursework including 15 units of research (Petroleum Engineering 360), and including all course requirements of the department's master's degree (39 units, excluding research). If the candidate has received credit for research in the M.S. degree, this credit ordinarily would be transferable to the Engineer degree, in which case a total of 9 additional research units would be required. No more than 10 units 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; i.e., they may apply as either undergraduate or graduate credit: 150A, 150B, 155, 170, 171, 172, and 175. That is, they may apply as either undergraduate or graduate credit. The 10-unit limitation applies to 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 are suggested (other courses may be selected with advisor approval):

Course No. and Subject Units
Bus. 210-211. Accounting I and II 4 ea.
Bus. 220. Business Finance I ............................................. 4
Bus. 261. Decision Making under Uncertainty ................... 4
Bus. 270. Organizational Behavior ................................. 4
Bus. 290. Strategic Management ................................. 4
Bus. 351. Negotiation and Intervention ........................... 4
Bus. 352. Small Business Management .......................... 4
Bus. 498. Energy Business Issues .................................. 4
Indust. Engr. 270. Managing Technical Companies 4

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 an average LGI of "B." 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, another faculty member, and the University Committee on Graduate Studies.

DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy is conferred upon evidence of high attainment in conducting an independent investigation and presenting the research results.

A minimum of three years (nine quarters) of graduate study must be satisfactorily completed. At least two of the years, ordinarily the last, should be spent as a registered student at Stanford. Ordinarily, the student is expected to take at least 72 units beyond the 45 units required for the master's degree. Approximately 45 units of coursework are generally required, exclusive of research units. The 45 units in question should represent graduate courses in petroleum engineering offered at Stanford, selected from the following list, and other courses approved by the department.

MATH AND APPLIED MATH

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aero. &amp; Astro. 192. Vector Analysis and Cartesian Tensors</td>
<td>3</td>
</tr>
<tr>
<td>Aero. &amp; Astro. 214A. Numerical Methods in Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Aero. &amp; Astro. 214B. Numerical Computation of Compressible Flow</td>
<td>3</td>
</tr>
<tr>
<td>Aero. &amp; Astro. 291A,B. Linear Transforms and Their Applications to Engineering Problems I and II</td>
<td>3 ea.</td>
</tr>
<tr>
<td>Chem. Engr. 220. Applied Mathematics in Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 106A. Programming Methodology</td>
<td>5</td>
</tr>
<tr>
<td>Comp. Sci. 106B. Programming Abstractions</td>
<td>5</td>
</tr>
<tr>
<td>Comp. Sci. 106X. Programming Methodology and Abstractions</td>
<td>5</td>
</tr>
<tr>
<td>Comp. Sci. 135. Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 137A. Numerical Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Comp. Sci. 273A,B.C. Advanced Numerical Analysis</td>
<td>3 ea.</td>
</tr>
<tr>
<td>Math. 106. Introduction to Theory of Functions of a Complex Variable</td>
<td>3</td>
</tr>
<tr>
<td>Math. 113. Linear Algebra and its Applications</td>
<td>3</td>
</tr>
<tr>
<td>Math. 114. Linear Algebra and Matrix Theory</td>
<td>3</td>
</tr>
<tr>
<td>Math. 115. Fundamental Concepts of Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Math. 131. Partial Differential Equations—I</td>
<td>3</td>
</tr>
<tr>
<td>Math. 132. Partial Differential Equations—II</td>
<td>3</td>
</tr>
<tr>
<td>Mech. Engr. 201. Applications of Complex Variables</td>
<td>3</td>
</tr>
<tr>
<td>Stat. 110. Statistical Methods in Engineering and Physical Sciences</td>
<td>4</td>
</tr>
</tbody>
</table>

SCIENCE

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>App. Earth Sci. 225. Surfaces and Interfaces</td>
<td>3</td>
</tr>
<tr>
<td>App. Earth Sci. 251. Oil Field Exploration and Development</td>
<td>3</td>
</tr>
<tr>
<td>App. Earth Sci. 255. Introduction to solute Transport</td>
<td>2</td>
</tr>
<tr>
<td>Geol. 232. Numerical Methods in Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 278. Organic Geochemistry</td>
<td>2</td>
</tr>
<tr>
<td>Geophys. 180. Geologic Interpretation of Reflection Seismograms</td>
<td>3</td>
</tr>
<tr>
<td>Geophys. 190. General Geophysics</td>
<td>4</td>
</tr>
<tr>
<td>Geophys. 262. Rock Physics</td>
<td>3</td>
</tr>
</tbody>
</table>

ENGINEERING

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. Engr. 140. Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 221. Transport Phenomena I</td>
<td>3</td>
</tr>
<tr>
<td>Chem. Engr. 222. Transport Phenomena II</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 298. Seminar in Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>Mech. Engr. 250. Introduction to Heat Transfer</td>
<td>4</td>
</tr>
<tr>
<td>Mech. Engr. 252A. Convective Heat and Mass Transfer</td>
<td>3</td>
</tr>
</tbody>
</table>

The Ph.D. program is normally a four-year program. Except in unusual circumstances, the first year is consumed in fulfilling the requirements for the M.S. degree. During the second and the third years, the student acquires a minimum of 45 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 27 units of research. The student begins the research work by making a literature survey and by formulating research objectives. In the fourth year, the student works full time on completing research and writing the dissertation.

The departmental qualifying examination usually is taken at the beginning of the second year of graduate study, or at any time mutually agreed upon by the student and the faculty. Students are required to take the qualifying examination at the first opportunity after the completion of the requirements for the master's degree. Students who enter the program after obtaining the master's degree in another university take the qualifying examination in the second year of graduate study at Stanford, but are required to present a seminar on their master's research during their first year. The qualifying examination extends over a period of about 10 days and consists of a written part and 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. Students are required to apply for candidacy for the Ph.D. degree after passing the departmental qualifying examination.

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. The student must prepare a dissertation which is a significant contribution of knowledge, and the result of independent work.

The 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 must submit an “Application for Extension of Candidacy” for approval by the department chairman if they wish to continue in the program.

Ph.D. MINOR

To be recommended for the Ph.D. degree with Petroleum Engineering as a minor subject, a student must take 15 units of selected graduate-level lecture courses in the department. These should include 270A and B. The remaining courses must be selected from 170, 171, 271, 275, 280A and B.

COURSES

103. Survey of the Energy Industries—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 renewable resources. (DR:8) 3 units, Spr (Staff) MWF 10

111. Computer Applications for Petroleum Engineers—Lectures, seminars, and class projects. Provides “seed” knowledge of the software and hardware available to petroleum engineering students, effective use of computer resources, and some software tools. Focuses on X-Windows, use of graphics, interlanguage communication, and user interfaces. 2 units, Aut (Horne) by arrangement

150A. Well Log Analysis I—Interdisciplinary course for all earth scientists and engineers giving practical understanding of the interpretation of well logs by use of real field examples. Lectures, problems. Methods for evaluating commercial significance or rock formations penetrated in exploratory drilling. First of a two-part course concentrating on the fundamentals of all types of logs including electric and nonelectric logs. 3 units, Aut (Lindblom) evenings, by arrangement

150B. Well Log Analysis II—Second part of 150 series. Concentrates on quantitative, interpretative techniques of all types of logs. 2 units, Win (Lindblom) W 7-10 p.m.

151A. Hydrocarbon Fluid Phase Behavior—Lectures, problems. Chemical structure, and physical and thermodynamic properties of underground earth fluids. Use of computers for design problems. Gas laws, behavior of liquids, phase equilibria, viscosities of hydrocarbons; properties of subsurface waters and steam. Prerequisite: 103. Recommended: Computer Science 106. 3 units, Aut (Staff) T 10-12 Th 11

151D. Reservoir Fluids Laboratory—Physical properties of petroleum and its products: gravity, viscosity, surface tension, distillation, etc.; computer prepared reports and literature search. Prerequisite: 151A (may be taken concurrently). 2 units, Aut, Win, Spr (Marsden) by arrangement

151E. Core Analysis—Laboratory and related lectures on porosity, permeability, capillary pressure, irreducible saturations, and the formation resistivity factor of porous media. Prerequisites: 151D, 155. 3 units, Aut, Win, Spr (Marsden) by arrangement

152A. Drilling Technology—A comprehensive picture of modern drilling operations, practices, and equipment onshore and offshore. Lectures, field trips, problems. 3 units, Win (Staff) T 10-11:50 Th 11

152B. Production Technology—Inflow performance relationships for undersaturated and saturated hydrocarbon reservoirs. Single phase and multiphase flow through vertical, horizontal, and inclined pipes. Flow through restrictions. Separator design and separation flash calculations. 3 units, Spr (Staff) T 10-12 Th 11

152C. Drilling Fluids Laboratory—Lecture: clay mineralogy, rheology of drilling fluids. Standard measurements of well drilling muds. 2 units, Win (Marsden) MW 2:15 lab MW 3:15-5:05

porous media, capillary pressure, and relative permeability. Simultaneous flow and diffusion of heat or mass. Prerequisites: Engineering 21 or Mechanical Engineering 33: Math 30 (may be taken concurrently), or consent of the instructor.

3 units, Win (Orr) TTh 2


1 unit, any quarter (Staff)
by arrangement

167. 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, taxation, fair market value. Prerequisite: consent of instructor.

3 units, Win (Kourt, Voss) S 9-12

170. Elements of Reservoir Engineering—Lectures, problems. Underground oil and gas reservoir reserve estimates using volumetric calculators, material balance equations and decline curves. Fluid flow in underground reservoirs, flow in wells for oil, gas, and oil/gas mixtures. Design and prediction of production system behavior as a function of pressure and time. Oil displacement by water and gas. Natural water influx calculations. Prerequisites: 151A and 155, or consent of instructor.

3 units, Spr (Brigham) MWF 1:15


3 units, Aut (Horne) TTh 8:30-9:50


3 units Aut (Aziz) MWF 8


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


3 units, Spr (Ramey) MWF 10


3 units, Aut (Orr) TTh 2:30-4

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, taxation, fair market value; original or guided research problems on economic topics with report. Prerequisite: consent of instructor.

3 units, Win (Kourt, Voss) S 9-12


1 unit, any quarter (Staff)
by arrangement

269. Geothermal Reservoir Engineering—Steam well deliverability measurement, forecasting, and steam reserves 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, Win (Ramey) MWF 1:15

alternate years, not given 1991-92

270A. Advanced Reservoir Engineering—Lectures, problems. Steady-state and pseudosteady-state flow of liquids and gases in porous media including the effects of gravity and corrections to Darcy's Law. Applications of Laplace Transforms to transient flow problems in reservoir engineering. Flow and pressures in multiwell
systems. Prerequisites: 155, 170, and Math 130, or consent of instructor.

3 units, Aut (Brigham) MWF 9


3 units, Win (Staff) MWF 10


3-4 units, Win (Aziz) MWF 11


any quarter (Staff) by arrangement


3 units, Aut (Marsden) MWF 10


3 units, Win (Staff) by arrangement


3 units, Win (Orr) TTh 8:30-9:50


3 units, Spr (Steff) by arrangement


3 units, Spr (Horne) T 10-12 Th 11

284. Non-Newtonian Fluids in Petroleum Engineering—Properties and applications of non-Newtonian fluids in drilling, completing, cementing, fracturing, improving production of well; transportation and enhanced oil recovery. Prerequisite: graduate standing.

3 units, Win (Staff) by arrangement

285A,B,C,E,F. Research Seminars—Special, focused study in areas of research within the department. All graduate degree program students may 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 (Bramey) by arrangement

285E. Research Seminar: Reservoir Simulation—Current research in SUPRI-B (Reservoir Simulation) program.

1 unit, any quarter (Aziz) by arrangement

285F. Research Seminar: Well Test Analysis.

1 unit, any quarter (Ramey) by arrangement

359. Teaching Experience in Petroleum Engineering—On the job training in teaching petroleum engineering. Student prepares and presents several lectures, problem sets, grades problems, and prepares laboratory experiments
under the supervision of regular instructor. Performance is evaluated by students and the regular instructor.

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


any quarter (Staff) by arrangement

Dean: Marshall S. Smith

Associate Deans: Nel Noddings (Academic Affairs), Anne Caddy (Administration)

Assistant Dean: Ralph Keller (Alumni Relations)


Associate Professors: Rafael M. Diaz, Martin Ford, Edward Haertel, Jane Han-naway, David Rogosa, Myra H. Strober

Assistant Professors: Patricia J. Gumport, Teresa D. LaFromboise, Melanie Sperling


Lecturers: Margaret Azevedo, Raymond F. Bacchetti, Joyce Burton, David Fettermann, John W. Gardner, Grace Grant, Ronald B. Herring, Giselle Martin, Louise Spindler

Acting Associate Professor: Dolores Gallagher-Thompson

Consulting Professor: Roy D. Pea

Consulting Associate Professors: Michael Carter, Donald M. Hill III

The School of Education is organized into six Program Area Committees:

Administration and Policy Analysis (APA)
Curriculum and Teacher Education (CTE)
International Development Education (IDE)

Psychological Studies in Education (PSE)
Research and Evaluation Methods (REM)
Social Sciences in Education (SSE)

These committees function as administrative units which act on admissions, plan course offerings, assign advisors, and set program requirements within their areas. Various subspecialties are offered in most program areas. Faculty members are primarily affiliated with one program, but often participate in two of the area committees. While there is a great deal of overlap and interdisciplinary emphasis across program areas, students are affiliated with one area committee and must meet the degree requirements set by that committee.

Detailed information about admission and degree requirements, faculty members, and specializations related to these area committees can be found in the School of Education Admissions Brochure.

OFFERINGS

The School of Education prepares scholars, teachers, supervisors, guidance workers, policy analysts, researchers, administrators, and other educational specialists. Five graduate degrees with specialization in education are granted by the University: Doctor of Philosophy, Doctor of Education, Educational Specialist, Master of Arts, and Master of Arts in Teaching (subject). While no undergraduate majors are offered, an undergraduate honors program and courses are available to undergraduates.

The school provides appropriate coursework and programs to recommend candidates to the California Commission on Teacher Credentialing for the Single Subject (secondary) Teaching Credential and the Preliminary Administrative Services Credential. California credential requirements frequently satisfy all or part of the requirements in other states.

Students who have qualified for a preliminary teaching credential in California and need a fifth year of study and a university recommendation for the clear California teaching credential may satisfy this requirement in one of the University's degree programs. The Stanford Teacher Education Program (STEP) offers a master's degree along with the credential. Persons who are interested in becoming principals, central office administrators, or superintendents and who are seeking the Preliminary Administrative Services credential must be admitted to the Program for Prospective Principals.
Students interested in credentials must contact the Credential Program office in the School of Education during their first quarter of study. Requirements for credentials and degree program requirements do not necessarily coincide, and students seeking a credential along with a degree must make certain that they satisfy both types of requirements.

The School of Education offers an eight week summer session. Those who pursue a full program of study (15 units) for eight weeks may earn a full quarter of residence toward the requirement for a degree. Course offerings are covered in the bulletin Summer Session issued each year in February. The school offers no correspondence or extension courses.

UNDERGRADUATE PROGRAM

The school focuses on graduate education and research training and does not offer an undergraduate major. However, undergraduate education is receiving increased attention, and programs are available to those interested in the field of education. Several courses at the 100 level are especially designed for undergraduates. An honors program is available to undergraduates, and the Undergraduate Program in the School of Education (UPSE) offers a variety of tutoring opportunities for undergraduates interested in developing educationally oriented skills. Undergraduates are also encouraged to explore admission to coterminal and master’s degree programs such as the Master of Arts degree in Education described below.

HONORS PROGRAM

This program, limited to 12 students, permits interested and able undergraduates at Stanford to build upon the training received in their major field of major study by pursuing additional courses and a research or practicum project in a related area of education.

Students apply for entry during the junior year. Approved coursework totaling 25 units must be taken, in addition to coursework in the major field of study. No more than 6 units can be taken for work on the honors thesis; the thesis is based upon a supervised research or practicum project. At least one course must be taken from each of the following:

1. Educational policy and history in the U.S. Courses include American Education and Public Policy; History of Education in the United States; History of School Reform; Issues in Education.

2. Contemporary problem areas. Courses include Psychology of Literacy; Sex and Education; The New Families: Implications for Education and Employment; Investing in the Education of the Disadvantaged.

3. Foundational disciplines. Courses include Psychological Foundations of Education; Sociology of Education; Models of the Child in Contemporary Educational Thought; Introduction to Philosophy of Education; History of Education.

One course or a directed reading, with either a faculty member in Education or in the major department, that relates the major to an education issue is also required. Additionally, a 2-unit honors seminar, taken in the Spring Quarter in either the junior or senior year, is required.

Near the end of Spring Quarter successful candidates for honors orally present brief reports of their work and findings at a mini-conference. All honors students in Education are expected to attend this conference.

MELLON FOUNDATION PROGRAM IN TEACHER EDUCATION FOR UNDERGRADUATES

The Mellon Program in Teacher Education offers undergraduates the opportunity to begin preparing for a career in teaching before entering the Stanford Teacher Education Program (STEP). The program also offers an enhanced pedagogical perspective in the student’s major. Mellon Fellows participate in educational coursework and fieldwork planned in conjunction with each fellow’s major area and with education advisors. Following completion of the bachelor’s degree, fellows enroll in the Stanford Teacher Education Program (STEP). During the first year of teaching, fellows are given opportunities to attend several follow-up sessions at Stanford. The follow-up sessions are devoted to assisting fellows as they enter the profession.

Eligibility—Students who have four remaining quarters to complete the bachelor’s requirements at Stanford are eligible to apply. They should be majoring in, or have the equivalent of a major in, one of the areas for which STEP prepares teachers: foreign language (Spanish, German, or French), history, English, science (biology, chemistry, or physics), or mathematics. (Regular STEP applicants do not need to meet these eligibility requirements. Students who are not accepted as Mellon Fellows may still apply for graduate study in STEP.)

Financial Aid—The tuition needs of Mellon Fellows are met for the STEP year. Paid tutoring is available for the senior year. Applications can be obtained from the STEP Office in the Center for Educational Research at Stanford (CERAS). The deadline for applying is April 1. Awards are made by May 1.
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 the A.B. in their undergraduate major and the A.M. in Education. Approval of the student's undergraduate department and of the School of Education is required. Applications may be made upon completion of 105 units, but no later than the end of the 11th quarter of undergraduate work. Students study for both the bachelor's and master's degrees simultaneously and must complete 15 full-tuition quarters, or three full-tuition 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 is 36 units.

Applicants may obtain coterminal degree application materials from the School of Education Admissions Office. The Graduate Record Examination (General Test) is required for all coterminal admissions. Coterminal applicants must also consult with the University's Graduate Program Office regarding eligibility.

Graduate Programs

Several advanced degree programs are offered by the School of Education and are described below. Requirements vary somewhat across programs. Both University and School of Education requirements must be met for each degree. The University requirements are detailed in the "Degrees" section of this bulletin. Students are urged to carefully read this section noting residency, tuition, and registration requirements. A student who wishes to enroll for graduate work in the School of Education must be qualified and admitted to graduate standing by the University and by one of the area committees within the school.

Complete information about admissions procedures and requirements is available by writing to the Office of Graduate Admissions, Building 590, Stanford University, Stanford, CA 94305-3052. The admissions packet includes: The School of Education Admissions Brochure, which outlines degrees, programs, admissions and graduation requirements, and interests of the faculty of the school; a reprint of the School of Education section of the bulletin Courses and Degrees, which describes courses and degrees offered; and application materials. Scores from the Graduate Record Examination General Test (verbal, quantitative, and analytical areas) must be submitted as well as TOEFL scores for those whose first language is not English.

Master of Arts

The Master of Arts degree is conferred by the University upon recommendation of the faculty of the School of Education and the University Committee on Graduate Studies. The University residency requirement is three full-tuition quarters of registration as a graduate student at Stanford. The minimum unit requirement is 36 quarter units earned at Stanford as a graduate student. At least 12 units must be taken for a letter grade indicator of "B" or better, and a minimum of 18 units must be taken in the School of Education. Master's students should obtain detailed program requirements from their area committees, and University degree requirements and forms from the Degree Programs office in the School of Education during their first quarter of residence. Please note that some master's degree programs require more than the minimum of 36 quarter units of credit. No thesis is required to earn a master's degree. (Note: the IDE Area Committee does require an essay.) Additional detailed information regarding entrance requirements and degree requirements is available in the School of Education Admissions Brochure. Upon admission, each student is assigned an advisor from the appropriate area committee to begin early planning of a coherent program.

The area committee programs with specializations available for Master of Arts degrees are as follows:

Administration and Policy Analysis
Elementary/Secondary Administration
Higher Education Administration
Policy Analysis
Joint Program with Graduate School of Business
Prospective Principal's Program
Curriculum and Teacher Education with specializations in:
  Curriculum Areas (Art, Dance, Math, Science, Social Studies)
  Design and Evaluation of Educational Programs (General Curriculum, Curriculum Evaluation, Elementary Education, Secondary Education, Teacher Education.
  Language, Literacy and Culture (Bilingual/Bicultural Education; Second Language Education; Writing, Reading, and Language-English)
  International Development Education
  International Educational Administration and Policy Analysis
  Research and Evaluation Methods
Social Sciences in Education Gender Studies
Stanford Teacher Education Program

PROSPECTIVE PRINCIPAL'S PROGRAM
The Prospective Principal’s Program at Stanford offers the Master of Arts degree with a specialization in Administration and Policy Analysis which can be combined with the Preliminary Administrative Services Credential. It enables prospective principals to become leaders and to manage ideas, resources and self to achieve worthwhile educational results for a diverse student population. This is accomplished through three consecutive summers of full-time study and is therefore available to persons working in a school system during the academic year. Teaching experience is a prerequisite for admission to this program. The master's degree requires 45 quarter units. In order to qualify for the credential, a total of 48 quarter units, including internship units, are necessary. Additional information regarding admission requirements, coursework, and credential requirements is available in the School of Education Admissions Brochure.

STANFORD TEACHER EDUCATION PROGRAM (STEP)
STEP offers a Master of Arts program to prepare humanities and sciences college graduates for careers as secondary teachers of English, languages (French, German, Spanish), mathematics, science (biology, chemistry, physics) and social studies. By exposing its students to individuals who have diverse views on the enactments of teaching that reflect a variety of values, teaching styles, talents, and experiences, STEP provides its students with the cognitive tools for making their own educational choices based upon an improved understanding of themselves, their students, their goals, and the educational context in which they work. The 12-month STEP year begins in June with a Summer Quarter of intensive academic preparation and experience in summer school programs based at Stanford and nearby schools. During the academic year, students take courses in professional education and academic subjects; they also teach part-time in a secondary school for the entire public school year. The master's degree and Single Subject (secondary) Teaching Credential require 45 quarter units, taken during four quarters of continuous residency. Further information regarding admission requirements, coursework, and credential requirements is available in the School of Education Admissions Brochure.

MASTER OF ARTS, TEACHING (SUBJECT)
The degree of Master of Arts, Teaching (M.A.T.) is reserved for experienced teachers or for individuals who have previously completed a program of teacher preparation. It is offered jointly by the School of Education and many academic departments such as Art, Biology, Chemistry, English, German, History, Latin American Studies, Mathematics, Physics, Political Science, Slavic Languages and Literatures, and Sociology. In addition to these fields, it is possible for candidates to work out special programs in other areas.
Applicants must have:
1. Completed a bachelor's degree with an acceptable letter grade indicator 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 by both the department of the teaching major and the School of Education.
2. Teaching experience.
General requirements for the degree are:
1. Three quarters of full-tuition registration (or equivalent in partial tuition quarters). Only one quarter of non-matriculated study may be counted toward the residency requirement for this degree.
2. A minimum of 45 quarter units of graduate study. At least 36 of these units must be completed at Stanford.
3. A minimum of 25 units of the courses taken for the M.A.T. degree in the teaching field of concentration.
4. At least 12 units of the M.A.T. degree requirements of graduate courses in the Stanford School of Education. 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 selected in consultation with the advisor in the School of Education.)
5. Requirements in the major teaching field determined by the major department, and the program of professional courses by the School of Education. The program proposal for the degree must be signed by representatives of both the academic department and of the School of Education.

6. The candidate must achieve a letter grade indicator of at least "B" 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.

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

8. A program proposal for the degree submitted to the Graduate Program Office by the end of the first quarter of residence.

9. Specific course requirements in both the teaching field and professional education determined in part by the candidate's previous program of studies.

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. (This program is administratively located in the Research and Evaluation Methods Program Committee, REM.) Evaluation of educational and social programs helps society to find programmatic methods of solving pressing problems. Evaluators must be familiar with a variety of disciplines and have expertise in at least one. A broad understanding of the political, social, and organizational settings in which decisions are made and programs are carried out is essential. Students take courses examining evaluation problems from theoretical, technical, and practical perspectives.

This program is especially designed for, but not limited to, applicants who: (1) hold a master's degree and wish to advance professionally; (2) are taking another course of postgraduate study at Stanford and wish to obtain this degree concurrently; or (3) hold a doctoral degree but wish to specialize in Evaluation in a postdoctoral year. The Ed.S. degree requires 45 quarter units beyond the master's degree (or its equivalent) and includes field-based project work. The University requirement of three full-tuition quarters in residence at Stanford also applies. Additional information about admission and program requirements is available in the School of Education Admissions Brochure.

DOCTORAL DEGREES

Two types of doctoral degrees are offered by the School of Education. The Doctor of Philosophy (Ph.D.) degree is offered by all program area committees. The Doctor of Education (Ed.D.) degree is offered only in the Administration and Policy Analysis Program. Both degrees are conferred by the University upon recommendation by the faculty of the School of Education and the University Committee on Graduate Studies. University residency requirements (nine full-tuition quarters or the equivalent), amount of transfer credit applicable (no more than three full quarters), and the timetable for the stages of progress to completion are applicable to both degrees. Additionally, the School of Education unit requirement for both degrees is a minimum of 72 units of coursework and research completed at Stanford beyond the baccalaureate degree. (If more than 72 are needed to meet particular Program Area requirements, students may transfer up to 36 units of coursework taken within the past seven years.)

Students should note carefully that admission to graduate standing by the University to work toward a doctoral degree does not in itself constitute admission to candidacy for the degree. Students must qualify and apply for candidacy by the end of their second year of study and should obtain information about procedures and requirements during their first year.

Doctoral degrees are designed for students preparing to conduct research and to teach as faculty members in a college or university, or to direct research in public school systems or in specialized institutions. The Ph.D. degree is somewhat more oriented to theoretical research, while the Ed.D. degree can focus more on informed and critical applications of existing knowledge to educational practice. Ph.D. students must complete a formal minor in another discipline or hold an acceptable master's degree outside the field of education. A minor is not required for the Ed.D.

Doctoral students should plan to specialize in the field of their professional interest, preparing for some line of professional activity while mastering an organized body of knowledge. With the flexibility offered in programs, students are encouraged to design a course of study which is relevant and meaningful to their interests and professional objectives.

Upon admission, an advisor is assigned from the admitting area committee who will work with the student to establish an appropriate course of study and project research plans. Other faculty members may also be consulted to aid
in this process. All programs of study require approval of the relevant area committee, the Associate Dean for Academic and Student Affairs, and the University Committee on Graduate Studies. More details about the varying requirements for each area committee along with information regarding doctoral core courses and general timeframe expectations are given in the School of Education Admissions Brochure, and complete guidelines may be obtained from the specific area committees.

The program areas for doctoral study are as follows:

**Administration and Policy Analysis**
- Elementary/Secondary Administration
- Higher Education Administration
- Policy Analysis
- Joint Program with Graduate School of Business

**Curriculum and Teacher Education with specializations in:**
- Curriculum Areas (Art, Math Science, Social Studies)
- Design and Evaluation of Educational Programs (General Curriculum, Curriculum Evaluation, Elementary Education, Secondary Education, Teacher Education)
- Language, Literacy, and Culture (Bilingual/Bicultural Education; Second Language Education; Writing, Reading, and Language—English)

**International Development Education**

**Psychological Studies in Education with specializations in:**
- Child and Adolescent Development
- Counseling and Health Psychology
- Educational Psychology

**Social Sciences in Education with specializations in:**
- Anthropology of Education
- Economics of Education
- History of Education
- Philosophy of Education
- Sociology of Education
- Social Science in Education (interdisciplinary)

**Ph.D. MINOR**

Candidates for the Ph.D. degree in other departments or schools of the University may elect to minor in Education. Requirements include a minimum of 30 quarter units of graduate coursework in Education and a clear field of concentration. Students choosing to minor in education should meet with the Associate Dean for Academic and Student Affairs to determine a suitable course of study early in their program.

---

**COURSES**

**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.

**EDUCATION**

The numbering of courses in the School of Education identifies the course level and the audience to which a given course is offered:
- **100-level**—Primarily for undergraduates (graduates may enroll).
- **200 and 300-level**—For A.M., and first- and second-year doctoral students.
- **400-level**—Research seminars or similar courses primarily for third-year doctoral students and beyond.

Course descriptions are 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. This designation is intended for courses taught by visiting faculty.

**100A, B. Tutor Skills Training**—For undergraduates who want to tutor or coach in local schools and educational programs. Opportunities for first-hand experience exist at all grade levels and in a wide variety of subjects. Students discuss experiences and learn relevant interpersonal, analytical, and instructional skills. Students must have concurrent tutoring placement. (Contact UPSE, Upward Bound or the Public Service Center, or attend the first class meeting.) (CTE)

**100A. Skills Training for Elementary Level Tutors**—(Same as Psychology 168A.)
- 2-3 units, Aut, Win, Spr (Takemoto)
  W 4:15-5:30

**100B. Skills Training for Secondary Tutors**—(Same as Psychology 168B.)
- 2-3 units, Aut, Win, Spr (Staff)

**104. Psychosocial Aspects of Aging**—(Same as Human Biology 104.) Survey on common stressors of middle age and later life, and coping strategies employed to address them. Depression and dementia: how they are manifest, what is known about etiology and treatment, and what the research gaps are at present. Students are exposed to successful interventions used with
individual patients and/or family members to reduce burden and stress. Also, the interface between physical and mental health through topics (e.g., nutrition) by guest lectures. Hypotheses why some middle aged and older adults develop significant psychosocial problems while others with the same kinds of stressors do not. Field work optional.

4 units, Spr (Gallagher-Thompson) MWF 9

105. American Education and Public Policy—(Same as History 158B, Political Science 186K.) Treats policy issues in education, drawing on history and political science. 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? Lectures and small group discussions. (SSE, APA)

3 units (Kirst, Tyack) not given 1990-91

111. Introduction to Philosophy of Social Science—(Same as Philosophy 61.) Focuses on the difference writers have noted between the natural and social sciences, and topics of importance in the social sciences: explaining human action, the functional explanation of social phenomena, and holistic versus reductionist orientations. Examples for contemporary social science research literature. For upper division undergraduates majoring in social sciences, and for beginning graduate students in related areas such as education. (SSE, REM)

3 units, Win (Phillips) T 7-10 p.m.

116X. Anthropological Perspectives on American Culture—(Same as Anthropology 15.) Convergence and divergence in values, lifestyles, and psychocultural attributes are analyzed for mainstream, minority, and variant cultural patterns in U.S. society. Processes of boundary maintenance and identity reference. Current social movements in the perspective of counter-culturalism, marginality, and cultural change. Schooling in America as a process of cultural transmission, including the problems of cultural minorities in mainstream institutions. Field studies of relevant phenomena are encouraged. (SSE) (DR:5)

5 units (C. Spindler, L. Spindler)

not given 1990-91

120. Problems of Intelligence, Information, and Learning—(Same as Symbolic Systems 20.) Introduction to studies of intelligent reasoning, knowledge, understanding, representation, and meaning. Results of computational, linguistic, philosophical, and psychological research discussed and compared. Relevance of material to instruction and learning. (PSE) (DR:4)

4 units, Aut (Greeno) MWThF 1:15

131. Economics of Women's Education and Work—(Same as Feminist Studies 129.) The determinants and effects of women's employment in the U.S. using theoretical, empirical, and policy materials emphasizing relationships between education and employment. Topics: labor force participation and attachment, earnings, discrimination, occupational segregation, housework, child care, affirmative action, and comparable worth. (SSE)

4 units, Spr (Strober) MW 1:15-3:05 alternate years, not given 1991-92

134. Career and Personal Counseling in Culturally Diverse Settings—(Same as Psychology 237.) Design and implementation of career counseling interventions based on cross-cultural perceptions and definitions of career competence, career development theories, and appropriate counselor behavior. Case studies of bicultural role conflict in work settings. (PSE)

3 units, Win (Krumboltz, Gallagher-Thompson) M 3:15-5:05

140X. Civil Rights, Children, and Poverty in America: Strategies of the Future—(Same as Poli. Sci. 180.) Overview of the great challenges and controversies facing American society in the 1990's: race and sex discrimination, children in poverty, reform of our education system, and abortion and privacy rights. Analyzes the roles of America's political, legal and educational institutions in addressing fundamental social and political problems, and examines strategies for positive change. (APA)

5 units, Spr (Steyer) MT 7-9 p.m. and by arrangement

155. Development of Measuring Instruments—For persons planning to develop achievement tests, reasoning tests, or questionnaires for research and evaluation, and for teachers wishing to improve classroom examinations. Planning tests, writing items, item tryout and criticism, qualities desired in tests, and interview techniques. Lectures, case studies, and practical exercises.

3 units (Haertel) alternate years, given 1991-92

161. Introduction to Teaching and Learning in Asia—Preparation for transcultural living and teaching experiences. Emphasis on knowledge of Asian history and culture; skills required for living in an Asian community; and role played by American culture in shaping one's own at-
163X. Technology Policy, Knowledge Formation, and Economic Development—The nature of national policies toward the economic development challenge of information technology. The impact this technology, set in the context of those policies, has on the kinds of skills demanded in the labor force and the production of knowledge. (IDE)
4 units, Spr (Herring) by arrangement

170. Gender and Education—(Same as Sociology 112, Feminist Studies 130.) Gender as a critical variable in educational institutions and labor markets. Interdisciplinary approach to 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 primary disciplines are economics and sociology, but historical, psychological, and legal materials are examined. Focuses on the U.S. but some work on other countries. (SSE)
4 units, (Strober, Cohen) alternate years, given 1991-92

175X. Experiential Curricula: The Case of Wilderness Education—Explores the use of experiential education in elementary and secondary school curricula through a case study of wilderness education, the possible benefits, and the weaknesses of experiential teaching and learning. Discussion of varied conceptual frameworks for alternative education from Dewey, Bereiter, and Illich. Enrollment limited. Fee: $55.
3 units, Aut (Westheimer) T 7-9:30 p.m.

180. Directed Reading in Education—For master's degree students. (All Areas.)

any quarter (Staff) by arrangement

185A. Research Methods in Applied Linguistics I—Emphasizes research techniques for investigating first language acquisition in children, including naturalistic and experimental techniques. Students learn to use existing computerized child language data bases (CHILDES). Issues of sampling, test construction, statistical analysis, and formal reporting of results. Prerequisites: a course in basic statistics and in language acquisition. (CTE)
4 units, Win (Hakuta) TTh 2:15-4:05

185B. Research Methods in Applied Linguistics II—Emphasizes research techniques for investigating second language acquisition and bilingualism. Topics: methods of error and performance analysis of naturalistic language protocols; measurement of language proficiencies of bilinguals; measurement of language attitudes; evaluation of individual difference data. Prerequisite: 185A. (CTE)
4 units, Spr (Hakuta) TTh 2:15-4:05

190. Directed Research in Education—For master's degree students. (All Areas.)
any quarter (Staff) by arrangement

195X. Studying Classroom Uses of Information Technology—Enables teachers to design, carry out, and interpret studies of the use of information technology (computers, video, telecommunications, and robotics) in their own classrooms. Use of simple research designs (case studies and classroom experiments), and familiar methods (observations, interviews, ratings, and test-like tasks), to design studies, perhaps with the assistance of their students and in collaboration with colleagues. Answers questions about the educative value of different uses of information technology for their students.
3-6 units, Sum (Walker) by arrangement

197. Education and the Status of Women: Comparative Perspective—(Same as Sociology 117.) Theories and perspectives from the social sciences relevant to an understanding of the role of education in changing, modifying, or reproducing structures of gender differentiation and hierarchy. Cross-national research on the status of women and its uses to evaluate knowledge claims from varying perspectives. (IDE, SSE)
4 units, Win (Ramirez) MWF 10 and by arrangement

199X. Undergraduate Honors Seminar—Required for all seniors enrolled in the honors program in the School of Education. Focuses upon doing research in education. Participants are expected to share ongoing work on their honors thesis. (All Areas.)
2 units, Spr (McDermott) T 7-9 p.m.

201. History of Education in the United States—(Same as History 158.) Analysis of selected turning points in education in relation to religion, political socialization, race relations, immigration, and urbanization. (SSE)
3 units, Spr (Tyack) MW 10 and by arrangement

202. Teachers, Schools, and the U.S. Constitution—Designed for the beginning secondary school teacher. Readings, lectures, and class activities involve the application of concepts and analytical techniques from the social sciences to problems of the beginning teacher. Emphasis on constitutional and legal features of these issues. Interdisciplinary approach involves a team
of three faculty members with differing social sciences specialties. (CTE)
4 units, Spr (Cohen, Kirst, Padilla)
MW 3:15-5:05

203. Models of the Child in Contemporary Educational Thought—Introductory focus on a number of influential views of the child formulated by psychologists, political theorists, and philosophers, and placing them in historical and philosophical perspective. (SSE)
4 units (Phillips)
alternate years, given 1991-92

205. Ideology and Education—Philosophical analysis of concept of "ideology" from Marx to the present. Focusing on claim that all education is ideological, raises question of whether or not there is any non-ideological way of setting and evaluating educational goals, methods, and curricula. Emphasis on analyzing and critiquing manifestations of racism and sexism in educational domains. (SSE)
4 units (Glass) not given 1990-91

206A. Introduction to the Study of International Development Education—Theoretical orientations and the research agenda in international development education, and resources for study and research at Stanford. Required for all first-year students in SIDEC; others by consent of instructor. (IDE)
1 unit, Aut (Carnoy) M 12-1:05
and by arrangement

206B. Project Workshop in International Development Education—The conclusion of the four-quarter A.M. program in SIDEC, required of all A.M. students. It is organized around the students' "Master Project" and provides in-depth reviews of draft project reports. The final version of the report is due at the end of the course. (IDE)
2-5 units, Sum (Ramirez)
W 9:30-12:30

207. International Cooperation in Educational Development—(Same as Political Science 248.) Critical review of current policies, priorities, and practices in international cooperation in education, emphasizing the role of international organizations (World Bank, Unesco, OECD), and of national development assistance agencies. (ISE)
5 units, Aut (Weiler) TTh 4:15-6:05
alternate years, not given 1991-92

208A. Introduction to Curriculum—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, Win (Eisner) MW 9-10:50

208B. Introduction to Curriculum—The practice of curriculum improvement including planning, policy-making, development, implementation, and evaluation. Extensive, in-depth treatment of methods and approaches to curriculum improvement and their strengths and limitations. (CTE)
4 units, Spr (Walker) MW 3:15-5:05

208C. Introduction to Curriculum: Policy Focus—Curriculum studies for those concerned primarily with school policy and administration. Topics: curriculum theory; relation of theory and practice; schools and classrooms as contexts for curriculum; curricular policy making; leadership in school curricular issues; curriculum development; curriculum evaluation. (CTE)
3 units, Sum (Walker) MW 10:30-11:50

210. Problems in Sociology of Education—(Same as Sociology 210.) Introduction to sociological approaches to educational phenomena. Topics: 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. Reading and evaluating social sciences research. Short written assignments and individual feedback. 210/310 meet together. (SSE)
4 units, Win (Cohen) MW 3:15-5:05

211X. Advanced Topics in Philosophy of Social Science—(Same as Philosophy 166/266.) Examines several central issues in the philosophy of social science. Theories of technical change and their explanatory power in other cultural contexts. (SSE, REM)
4 units, Spr (Staff)

213. Aesthetic Foundations of Education—What is meant by "the art" of teaching. 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 9-10:50
alternate years, not given 1991-92

216X. An Introduction to Field Research—Introduces students to issues in the implementation of research in non-laboratory "real life" settings through a series of field trips to sites engaged in ongoing research in a variety of topics. These include prevention of substance abuse in children and adolescents, promotion of health maintenance behaviors, and investigation of the factors associated with successful counseling. Lectures and discussions provide background about research design and methodology prior to site visits. Open to School of Education students.
3 units, Aut (Gallagher-Thompson)
by arrangement
217X. Intellectual Development and Instructional Design—Provides a basic understanding of the manner in which children's thought processes develop during the preschool, elementary school, and high school years; also develops skills for utilizing this understanding to improve design of classroom and remedial learning activities during each period. (PSE)

4 units, Aut (Case) MW 3:15-5:05

218. Society, Education, and Dance—(Same as Dance 268.) The field of dance and related dance literature/film/video from a variety of perspectives: historical, philosophical, ethnographic, dance in education, contemporary problems, and current trends. Lectures amplified by readings, films, and discussion. (CTE) (DR:2*)

3 units (Cashion, Ross)

alternate years, given 1991-92

219. Artistic Development of the Child—Introduces research in the behavioral sciences having relevance for understanding the child's artistic development. (CTE)

4 units (Eisner)

alternate years, given 1991-92

220A,B,C,D,Y. The Social Sciences and Educational Analysis—Relationships among economics, political science, and sociology and their applications to education in the U.S. Required of students in APA and open to all. Each quarter emphasizes the contribution of a particular social science but 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. Topics: investment and consumption theories of education, the effects of education on earnings and employment, the effects of education on economic growth and distribution of income, and the financing of education. Students who lack training in micro-economics are required to enroll in 220Y for one additional unit of credit. (APA, SSE)

4 units, Aut (Strober) TTh 1:15-3:05

220B. The Social Sciences and Educational Analysis: Introduction to the Politics of Education—(Same as Political Science 187.) The relationships between political analysis and policy formulation in education; focus is 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 policy analysis, implementation, and politics of reform emphasized. (APA, SSE)

3 units, Win (Kirst) MW 8:20-9:50

220C. Education and Society—(Same as Sociology 143.) 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, and the organizational structure of schooling. (APA, SSE)

5 units, Spr (Hannaway) TTh 8-9:50

220D. History of School Reform: Origins, Policies, and Outcomes—School reform as an interaction between the broad context (social, economic, political, and ideological factors), schools as institutions, and the goals and behaviors of groups and individuals. Why and how some school reforms persist, why some fail or fade, and why some recur periodically. Focus is on early 1900s, 1950s and 60s, and current state-driven changes. Students investigate a particular reform: its sources, policy development and implementation, and the consequences, intended and unintended, using one or more of the analytic frameworks presented. (APA, SSE)

4-5 units, Aut (Cuban, Tyack)

MW 10:20-11:50

220Y. Introduction to the Economics of Education: Economics Section—Introduction to micro-economics for those taking 220A who have not had micro-economics before or who need a refresher. Co-requisite: 220A. (APA)

1 unit, Aut (Strober) F 1:15-3:05

221. Issues in Policy Analysis—(Same as Public Policy 221.) Major concepts associated with the development, enactment, and execution of social policy. Issues of policy implementation, agenda setting and problem formulation, coalition politics, and intergovernmental relations are examined through case materials and supplementary readings. Objective is to identify and understand factors that affect ways in which analysts and policymakers learn about the policy system and ways in which they can influence it. (APA)

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

222A,B. Decision Analysis in Education—A three-quarter sequence in the application of quantitative reasoning and decision making in education.

222A. Decision Analysis in Education I—Introduction to use of statistics to summarize data and make decisions in the face of uncertainty. Topics: elementary probability theory, sampling methods, descriptive statistics, inferences about populations, the value of un-
certain outcomes, statistical decision theory, risk, and utility. Use of actual case data and computers. For educational administrators and policy analysts who must consider and act upon limited or uncertain information. (APA)

5 units, Aut (Massy) MWF 3:15-5:05

222B. Decision Analysis in Education II—Problems of optimization and design, and evaluation of decision experience. Marginal analysis, educational production functions, cost effectiveness and cost-benefit analysis, constrained maximization, program evaluation. Introduction to linear models for large-scale data analysis. Attention to sensitivity of implications to model assumptions. (APA)

5 units, Win (Gardner) TTh 10-11:50

224X. Computers in the Classroom—Basic computer operations and terminology. Includes word processing, networking, instructional packages, teacher utility programs; uses in particular subject fields; economic, social, and ethical issues emphasizing equity. Meets fifth year teacher credential requirement. (CTE)

3 units, Win, Spr (Walker) TTh 4:15-5:45

228X. Institutional Renewal and Leadership—The nature of leadership, tasks of leader, and kinds of leaders. The two-way nature of leader's relation to followers or constituents, including role of trust and charisma; leadership development as a career-long process; and the means of holding leaders accountable. Necessity of contemporary leaders to lead through (or in spite of) large-scale organized systems and the problems created by the multiplicity of systems; the processes of growth and decay in organized systems, and steps that make renewal possible; attention to leader's need for personal renewal. Open to undergraduates. (APA, IDE)

4 units, Win (Gardner) TTh 12:15-2:05

228. Psychology of Literacy—Introduction for graduate students as part of the core curriculum for the Language, Literacy, and Culture program. Focuses on psychological principles in understanding the reading and writing process, and the acquisition of literacy. Required of LLC students, but open to others with approval of the instructor. (CTE)

3 units, Sum (Calfee) TTh 8:20-9:50

229. The Development of Human Competence: Theory, Research, and Practice—Conceptions of effective personal and social functioning, and research on psychological and educational processes associated with the development of human competence. Introduces a conceptual framework for understanding humans as self-organizing, self-constructing living systems and provides a set of principles for intervening to enhance competence from infancy to adulthood. (PSE)

4 units, Aut (Ford) TTh 12:15-2:05

alternate years, not given 1991-92

230X. Education and Values—Focuses on normative aspects of educational research and policy formation. Issues, often in a case study format: how values influence the research process, ethical treatment of the subjects involved in research, the ethical dimension of policies concerning minority groups and special populations, the values and aims of education. (All Areas.)

4 units, Spr (Phillips, Tyack, Noddings) TTh 12:15-2:05


4 units (Thoresen) given 1991-92

236. Current Research Topics in Developmental Psychology—Offers a broad perspective of developmental psychology by reading representative samples of original research in current areas of cognitive, social, and applied developmental research geared to instructor and student interests. Instructor provides "researcher's map" describing major issues and questions, theoretical frameworks and methodological approaches, and the significance of each area of understanding child development. Topics: infant perception, temperament, attachment, play, children's friendships, language acquisition, bilingualism, attention deficit disorder, and child abuse. (PSE)

4 units (Thoresen) given 1991-92

238A. Orientation to Counseling Psychology—Overview of counseling psychology profession including counseling theories, techniques, and assessment. Topics: relationship enhancement, problem conceptualization, goal setting, intervention techniques, and monitoring outcomes. Review of training tapes, roleplaying, and supervision of initial counseling experiences. For first year counseling psychology students. Consent of instructor required. (PSE)

6 units, Aut (Krumboltz, Gallagher-Thompson) by arrangement

238B. Counseling and Health Psychology: Supervised Applications—Integration of counseling practice with research findings. Continuing review of training tapes, roleplaying, and supervision of counseling experiences. For first year
counseling psychology students. Consent of instructor required. (PSE)

3 units, Win (Krumboltz, Gallagher-Thompson) by arrangement

238C. Counseling and Health Psychology: Supervised Applications—Advanced study of counseling theories, techniques, and assessment methods. Emphasis on the integration of counseling practice within a research framework. Continuing review of training tapes, roleplaying, and supervision of counseling experiences. For first year counseling psychology students. Consent of instructor required. (PSE)
6 units, Spr (Krumboltz, Gallagher-Thompson) by arrangement

239X. Contemporary Social Issues in Child Adolescent Development—Focuses on critical social and developmental issues that affect children and adolescents. Topics: divorce and single parenting, child care, poverty, sexuality, and mass media, emphasizing the impact of these conditions on normal development, education, and school-related social and cognitive performance. (PSE)
4 units, Spr (Padilla) MW 1:15-3:05

240. Adolescence: Health and Special Needs—Physiological and psychological problems of adolescence emphasizing health related issues including nutrition and substance abuse, adolescent development, and mainstreaming issues for secondary educators. Meets teacher and administrator credential requirements. (CTE)
1 unit, Aut (Brown) Th 6-8 p.m.

241X. Research in Writing and Writing Instruction: The Social, Cognitive, and Linguistic Dimensions of Written Language—Tradition and change in writing research with attention to theoretical and pedagogical implications. Topics: writing and learning; writing/reading connections; writing/speaking connections; the composing process; writing pedagogy. (CTE)
4 units, Win (Sperling) TTh 4:15-6:05

242X. First Year Proseminar in Language, Literacy, and Culture—For master's and first-year doctoral students in LLC program. Introduces basic concepts and pragmatics of the field; provides opportunities to meet faculty, respond to critical readings, and explore professional matters. (CTE)
4 units, Aut (Sperling) TTh 12:15-2:05
Win (Padilla) TTh 12:15-2:05
Spr (Padilla) TTh 4:15-6:05

245X. Sociology of Mass Schooling—(Same as Sociology 147.) Introduction to issues regarding the rise, organization, and expansion of mass education throughout the world. Interdisciplinary readings with a comparative/historical and cross-national research focus. Evaluation of functionalist, conflict, incorporation, and other theories of mass education. (IDE, SSE)
4 units, Aut (Ramirez) MWF 11-12:30
246A,B,C,D. Secondary School Teaching Practicum—Training and practice in specific skills in schools. Regular meetings taken during each quarter of STEP year. (16 units required for graduation from the program.) (CTE)

246A. 1-13 units, Sum (Grant) F 9-12 and by arrangement
246B. 1-13 units, Aut (Grant) W 7-9 p.m. and by arrangement
246C. 1-13 units, Win (Grant) W 7-9 p.m. and by arrangement
246D. 1-13 units, Spr (Grant) W 7-9 p.m. and by arrangement

248X. Theory and Issues in Writing and Literacy—Major theoretical issues in writing and literacy and implications for education. Connections between literacy, thinking, and learning emphasizing kinds and definitions of literacy, oral and written language, social construction of literacy, historical perspectives, and the functions of reading and writing.
4 units, Spr (Sperling) MW 3:15-5:05

250A,B. Statistical Analysis in Educational Research I—Two-quarter sequence for graduate students with little empirical research experience. Analysis of variance and covariance; correlation and regression; analysis of categorical data. Proficiency with statistical computer packages. Prerequisite: Statistics 60/160. (REM)
250A. 4 units, Spr (Staff) MWF 11-12:30
250B. 4 units, Aut (Olkin) MWF 11-12:30

4 units, Win (Olkin) MWF 11-12:30

251. Experimental Methods in Educational Research—Introduction to methods of research and design and analysis. Topics: philosophy and logic of design, reliability and validity of measures, alternative use of qualitative and quantitative methods. For graduate students (particularly PSE, CTE, and SIDEC) with little experience
in research and analysis. Preference given to first year doctoral students. (REM)
4 units, Aut (Calfee) MWF 1:15-2:45

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. Prerequisite: Statistics 60 or Psychology 60, or equivalent. (PSE, REM)
3-4 units, Spr (Haertel) MW 3:15-5:05

255. Human Abilities—(Same as Psychology 155.) Introductory survey of psychological theory and research on human cognitive abilities; their nature, development, and measurement; and their importance in society. Relation of education and intellectual abilities; examples relating to social institutions. Cognitive analysis of verbal reasoning and spatial abilities. Individual differences in relation to motivation, personality, gender, and ethnic differences. Prerequisites: Psychology 1 and 60 or equivalent. (PSE)
3 units, Win (Snow) MWF 10

255A. Human Abilities Research Topics—Discussion of individual student research topics in human abilities. Specifically planned, as an adjunct to 255 and Psychology 155, for doctoral students who have special interests that cannot be served by the large group instruction provided in those courses. Prerequisite: concurrent registration in 255 or Psychology 144, and consent of instructor. (PSE)
1-2 units, Win (Snow) by arrangement

257X. Statistical Methods for Behavioral and Social Sciences—(Same as Psychology 152/252.) For students with experience and training in empirical research. Analysis of data from experimental through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through two-way tables, logistic regression. Integrated with the use of statistical computing packages. Prerequisite: Statistics 60/160. (REM)
5 units, Win (Rogosa) MWF 11-12:30

plus section by arrangement

258X. Organizations: Principals and Emerging Ideas—Analyzes basic ideas about the hows and the whys of the ways organizations and the people in them function. Multiple perspectives are drawn from psychology, sociology, political science, and economics to address questions about what holds organizations together (and in place) and what influences how (and when) they change. The commonalities, differences, and implications of various theoretical approaches and the applicability to different types of organizations, particularly educational organizations, is emphasized. (APA)
4 units, Spr (Hannaway) MW 3:15-5:05

260X. Investing in the Education of the Disadvantaged—The educationally disadvantaged represent a large rising portion of students in the U.S. public schools. Failing their needs has wide repercussions for the future of the U.S. economy, society, and polity. The issue is addressed from a policy analytic perspective by exploring the nature of the problem, the inadequacy of past and present policies, and the formulation of approaches that promise greater success. Open to A.M. students and undergraduates. (APA, SSE)
4-5 units, Aut (Bartels, Kahne, Owens) MW 1:15-3:05

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. 3 units, Sum (Staff)
MW 3:15-5:05
262B. 2 units, Aut (Sperling)
M 4:15-6:05

263A,B. Curriculum and Instruction in Mathematics—Purposes and programs of mathematics in the secondary curriculum; teaching materials, methods. (CTE)
263A. 3 units, Sum (Staff) TTh 3:15-5:05
263B. 2-3 units, Aut (Kelley) W 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) T TH 3:15-5:05
264B. 2 units, Aut (Azvedo) T 4:15-6:05

265X. Curriculum and Instruction in Economics—Introduction to major concepts in economics. Approaches to teaching economics in secondary schools: survey of teaching materials; opportunity to develop techniques for newly emerging topics. (CTE)
3 units, Win (Strober) T 4:15-6:05

and by arrangement

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. Enroll-
ment limited to STEP students, or consent of instructor. (CTE)

267A. 3 units, Sum (Atkin)
MW 3:15-5:05
267B. 2 units, Win (Atkin)
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. 3 units, Sum (Cuban)
TTh 3:15-5:05
268B. 2 units, Aut (Cuban)
Th 4:15-6:05

269. Foundations of Learning for Teaching—The psychology of instruction and the epistemology of school subjects as related to the planning and implementation of teaching, the analysis of curriculum and the evaluation of performance and understanding. Readings and activities are coordinated with internship and student teaching activities of participants. (CTE)

4 units, Win (Shulman) MW 3:15-5:05
and by arrangement

270X. African American English in Educational Context—Examines linguistic and cultural conflicts that confront the majority of African American students. Interdisciplinary research is reviewed with attention to cross-generational educational needs. Ethnographic studies of schools and their students are central to this course, as is the evolution of educational and linguistic research among African Americans.

3 units, Aut (Baugh) T 6-9 p.m.

273. Education as a Social Science—Intended only for first-year students in the social sciences in Education. Students meet with faculty of the area committee, are oriented to the range of intellectual and research strategies represented by the social science faculty, and interview faculty and plan with them the topic of discussion of their course session. Each session is planned with relevant readings. Assists student in course planning and in strategies for developing a problem question for the doctoral thesis. Opportunity to develop sessions to meet orientation and adjustment needs, as they arise. Meets with 325A. (SSE)

1 unit, Aut (Hannaway) T 4:15-6:05

276. Women and Moral Theory—(Same as Feminist Studies 127.) Ethical problems in education. After reading and discussing background material in ethics and feminism, concentrates on ethical problems in education of interest to feminists. Emphasis on the ethics of caring. (SSE)

4 units, Aut (Noddings) MW 1:15-3:05

278. Introduction to Issues in Evaluation—Focuses on basic literature and major theoretical and practical issues facing the emerging evaluation profession. Topics: 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. (REM)

4 units, Win (Phillips) TTh 12:15-2:05

280. Training Seminar: Ethnography of Schooling—(Same as Anthropology 280.) How to learn about culture and to analyze education-relevant situations such as the multicultural classroom. The cultural process is approached by (1) acquiring techniques of observation, interview, and interpretation of behavior in context, and soliciting and recording the "native" explanations of their own behavior; (2) developing an internally consistent conceptual structure that orients observation and elicitation productively; (3) being sensitized to one's own culture and how it influences perception and interpretation of behavior. Selected techniques of ethnographic research applicable to the study of schooling are demonstrated and applied in modest field research projects. Writing of one research report or proposal for research. (SSE)

5 units, Sum (G. Spindler, L. Spindler)

282. Linguistics and the Teaching of English as a Foreign/Second Language—(Same as Linguistics 189/289.) 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 (Hubbard) MW 3:15-5:05

285X. Modeling of Knowledge and Cognitive Processes—(Same as Psychology 285.) Introduction of concepts and methods of constructing models of human cognition, and evaluating models with empirical data. Emphasis on computational models, including production systems, schemata, and semantic networks. Evaluation methods include thinking-aloud protocols, latencies, patterns of performance, and correlations with psychometric scores. To enroll, students should be conducting research in which construction of a model plays a significant role. Prerequisite: consent of instructor. (PSE)

3 units (Greeno)
alternate years, given 1991-92

286. Second Language Acquisition—Investigation of second language acquisition processes. Measurement of linguistic achievement and of
cultural and cognitive correlates of second language acquisition and bilingualism. (CTE)

4 units, Aut (Hakuta) MW 10-11:50

288. Social Diversity and Educational Reform—Introduces key normative issues facing educators. The relation of social diversity (race, ethnicity, gender, and class) to equality in schooling. Alternative conceptions of the purposes of education in reform movements. (CTE, SSE)

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

289. Leadership in Education: Research and Practice—A conception of leadership that includes the classroom, school, district office, and state capital. The role complexity of teachers through superintendents, past and present, and how that complexity permitted leadership to arise. Case studies and theory covering over a century of schooling are introduced and discussed. (APA)

3-4 units (Cuban) alternate years, given 1991-92

290. Methods of Teaching German—(Same as German Studies 302.) (CTE)

2 units, Aut (Petig) Th 2:15-4:05

291. 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) Th 3:15-5:05

292. Methods of Teaching French—(Same as French 293.) Approaches, methods, and procedures in relation to foreign language acquisition theory; teaching practice regularly observed in a demonstration class. (CTE)

4 units, Spr (Staff) TTh 10

293. Language and Cognitive Development: Implications for Schooling—Language use and development as they relate to general issues in teaching and learning. Ways in which linguistics, philosophy, and psychology approach a shared problem-area are examined through a study of major works in a variety of disciplines. (CTE)

4 units (Padilla) not given 1990-91

295X. Psychology of Problem Solving and Reasoning—(Same as Psychology 261, Symbolic Systems 295.) Introduction to results and methods of research on cognitive processes of solving problems and reasoning. Focus is on accomplishments and limitations of research conducted since 1970. (PSE)

3 units, Spr (Greeno) MW 3:15-4:40 alternate years, not given 1991-92

296X. Substance Dependence: Assessment, Treatment and Prevention—Survey of prevalence, etiology, and treatment of alcohol and drug-related disorders. Focuses on a developmental perspective and how substance abuse disorders manifest themselves at different ages from childhood through late adulthood. Discussion of various treatment approaches that have been beneficial. Experimental course, open to graduate students.

2 units, Win (Gallagher-Thompson, Moffat) W 3:15-5:05

297. Language and Literacy in Secondary Schools—Methods for fostering comprehension and composition skills by middle and high school students. Introduction to theory of critical literacy, with application to subject matter areas. Techniques for text analysis, classroom discussion, and teacher assessment of student achievement. Intended for STEP interns, but open to graduate and advanced undergraduate students. (CTE)

3 units, Sum (Curley) TTh 1:15-3:05

302X. The Role of Knowledge and Learning in Teaching—Focuses on current literature relevant to the structure of subject matter of instruction in schools, and to the cognitive processes involved as students try to learn material. Includes implications of the literature for role of the teacher. (APA)

3 units, Sum (Phillips, Shulman) MW 9-10:30

303. Qualitative Inquiry in Education—Examines ways in which artistically and humanistically based approaches to study of teaching, classroom life, and schooling can improve understanding of education. Introduces qualitative methods of inquiry that emphasize literary and other interpretive forms, and new approaches to inquiry in education. Includes a small study using methods. (REM, CTE)

4 units, Sum (Eisner) MW 10-11:50

304. The Philosophical and Educational Thought of John Dewey—(Same as Philosophy 304.) Analysis of important works of John Dewey: The School and Society, The Quest for Certainty, and Experience and Education, related essays, and critiques. (SSE)

4 units (Noddings, Phillips) alternate years, given 1991-92


5 units, Aut (Carnoy) TTh 2:15-4:05 and by arrangement

306B. Education and Political Change—(Same as Political Science 221.) Introductory analysis
of the relations between education and politics from a comparative perspective. Topics: 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 239.) Models of cultural change are developed that stress the impact of abrupt changes in the conditions of life on the personal adaptations of individuals and local communities brought about by modernization and urbanization. Education as an instrument of change and its intervention in the process of indigenous cultural transmission as an aspect of these processes. Case studies document and help build appropriate models. Students, in a seminar-like setting, apply the models developed to the analysis of third world and other relevant situations. (IDE, SSE)

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

306D. Sociology of Development and Education—(Same as Sociology 306.) The analysis of the relations between educational and societal developments from a comparative perspective. Readings on varying theoretical perspectives and empirical studies on the structural and cultural sources of educational expansion and differentiation, and on the cultural and structural consequences of educational institutionalization. Research topics: education and nation-building; education, mobility, and equality; education, international organizations, and world culture. (IDE, SSE)

5 units, Spr (Ramirez) MW 1:15-3:05

307. Knowledge and Legitimation: The Politics of Educational Research—(Same as Political Science 328.) Within the theoretical framework of legitimation theory, the notion of "compensatory legitimation" for the analysis of the national and international politics of educational research. Case studies on the work of agencies for research support, cooperation, and dissemination. Research seminar for doctoral students; consent of instructor required. (IDE, SSE)

5 units, Spr (Weiler) T 4:15-6:05
alternate years, not given 1991-92

308X. The Analysis of Teaching—Teaching is more often thought of as an art or craft than as a science. In what sense might this be true? To what degree do teachers function as performers? Employs videotapes of teachers in action as a resource for the analysis of teaching. Provides concepts and methods from the field of criticism as tools with which to analyze teaching. Literature in criticism, aesthetics, and as qualitative evaluation secures conceptual tools for the analysis of teaching. (CTE)

3 units, Sum (Eisner) MW 9:10-10:30

310. Problems in Sociology of Education—(Same as Sociology 310.) For doctoral and master's students. Meets with 210. Emphasis on conceptualizing and analyzing applied sociological research in education. Short written assignments, individual feedback and work with actual research data. (SSE)

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

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. The principles for design and evaluations of group work for students and teamwork for teaching staff. Topics: social processes of influence, role differentiation, and evaluation. Methods for systematic evaluation and observation are included; students receive practical experience in using these methods. (SSE)

4 units (Cohen)
alternate years, given 1991-92

315. Cultural Transmission: Education in Cross-Cultural Perspective—(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, the sequence of culturally constructed experiences in life careers, cultural analysis, and sensitization. Attention to education in the U.S. and other complex societies, and in non-literate cultures. (SSE) (DR:5 )

3-5 units, Win (G. Spindler, L. Spindler)
T 7-10 p.m.

317. Psychological Research on Teaching—Introduction to theory, methodology, and substantive findings of research on teaching and teacher education. (PSE)

4 units, Spr (Shulman) MW 1:15-3:05
alternate years, not given 1991-92

319. The Development of Self-Regulation—The origins and development of children's capacity to plan, guide, and monitor their own behavior. Seen as a movement from other (external) to self (internal) regulation, it is accomplished in three phases: dyadic regulation, when the child's attention, security, and goal-oriented activity is socially regulated within caregiver-child interaction; during the caregiver's withdrawal and the child's takeover of the regulatory role; with
self-regulation proper, when the child plans, guides, and monitors its own activity through private speech. Also, self-regulation as a level of behavioral organization constituting a major component of school readiness and which sets a basis for metacognitive development. (PSE) 3 units (Diaz) alternate years, given 1991-92

320X. Instruction of Socially Heterogeneous Populations—For school administrators in a state, e.g., California, where schools have populations that are multilingual, multiracial, and multicultural. The nature of the challenges these schools are facing and commonly recommended solutions. Objective: to develop a capacity for critical evaluation of the statements of the “problem” and recommended solutions. The evidence on ability grouping and tracking as a way of dealing with academic diversity. Alternatives to homogeneous grouping, e.g., methods for teaching students to use each other as resources. Focuses on problem of unequal status within heterogeneous classrooms and schools. 3 units, Sum (Cohen) MTW 10:30-12

321A,B. Qualitative Methods of Educational Research: Issues in Design and Data Collection—Survey of types of qualitative research methods from a variety of disciplinary perspectives (anthropology, cognitive psychology, criticism, history, political science), with intensive experience in the collection, analysis and reporting of data. Prerequisites: at least in the second year of doctoral program; one or more graduate courses in statistics. Students must enroll for both quarters. No auditors. (REM) 321A. 2-5 units, Win (McDermott) TTh 2:15-4:05 321B. 2-5 units, Spr (McDermott) TTh 2:15-4:05

325A,B,C. Administration and Policy Analysis Research Seminar—Faculty and dissertation students present their research and proposals for research to other faculty and students in the APA program. Emphasis on presenting research ideas at an early stage of their formulation to conceptualize and critically review research designs and proposals. (APA) 325A. 1 unit, Aut (Hannaway) T 4:15-6:05 325B. 1 unit, Win (Hannaway) T 4:15-6:05 325C. 1 unit, Spr (Hannaway) Th 4:15-6:05

328A,B. Topics in Higher Education—Selected topics drawn from the economics and administration of colleges and universities. Topics may vary: the micro-economic paradigm for non-profit institutions, impact of external economy on institutions, productivity in academic departments and support units, planning and budgeting, administrative processes, relations of faculty and administration with governing board. 328A and B are given in alternate years; may be taken in either order. (APA) 328B. 3 units, Spr (Massy) T 2:15-5:05

329X. Language Shift—The movement of immigrants from preference of the native language to preference of the dominant language is addressed at the psycholinguistic and sociolinguistic levels. Efforts of various immigrant groups to maintain their native language and current research on second language acquisition and native language loss. Prerequisites: courses in first and second language acquisition. (CTE) 4 units (Hakuta) alternate years, given 1991-92

330X. Research Practicum in Language, Literacy, Culture—For second year students in the LLC program. A forum within which students critically examine selected recent research, and methodological and design issues, and prepare critical and integrated reviews of a research question. Increases familiarity with recent research, provides a forum for critical thinking and debate, integrates students' work during the second year of the program, and aids planning dissertation topics. (CTE) 3 units, Aut (Hakuta) Th 2:15-4:05 and by arrangement Win (Calfee) Th 12:15-2:05 and by arrangement Spr (Staff) Th 4:15-6:05 and by arrangement

335X. Language Policy and Planning: National and International Perspectives—International study of social, political, and educational tensions that shape language policy. Emphasis on language education that affects immigrants, guestworkers, and indigenous linguistic minority populations; policies that determine foreign language instruction; and U.S. language policies in a comparative approach. (CTE) 4 units (Padilla) not given 1990-91

338A,B,C. Practicum in Counseling and Health Psychology—Intensive supervised field experience in local schools or social agencies. (For Counseling Psychology majors only.) (FSE) 338A. 1-6 units, Aut (Krumboltz, Gallagher-Thompson) by arrangement 338B. 1-6 units, Win (Krumboltz, Gallagher-Thompson) by arrangement 338C. 1-6 units, Spr (Krumboltz, Gallagher-Thompson) by arrangement

343. Motivational Processes in Education—Theory and research from the psychology and education literatures on three basic sets of motivational processes: goals, emotions, and personal agency beliefs. Introduces a conceptual
framework for integrating these processes into a comprehensive understanding of motivated behavior, and emphasizes the crucial role of these processes in the development and maintenance of effective patterns of academic and social functioning. Implications for classroom instruction, curriculum development, and educational policy. (PSE)

4 units (Ford)
alternate years, given 1991-92

346X. Research Seminar in Higher Education—
(Same as Sociology 307.) Overview of U.S. system of higher education and how it evolved. Central questions: What are structural and cultural features of contemporary system? How did organizational structures and purposes get defined? How and why have they changed? Examines topic areas (e.g., organization and governance, faculty, students, curriculum) and recurrent system-wide issues (e.g., stratification, decentralization, excellence, and diversity). (APA)

4 units, Aut (Gumport) Th 3:15-6:05

347. Problems of Teacher Education—Enables students to formulate researchable problems and promising methods for the study of teacher education. Compares teacher education with education in other professions and other issues in the preservice and inservice education of teacher professionals. (CTE)

4 units (Shulman)
alternate years, given 1991-92

350A. Psychological Studies in Education—Introduction to psychological studies in education. Required of first-year doctoral students in Psychological Studies. Others by consent of instructor. (PSE)

1 unit (Greeno, Padilla) Th 2:15-4:05

350B,C,D. Research Practicum in Psychological Studies in Education—Three quarter sequence provides students in PSE an opportunity to engage in all facets of the research process. Individual projects in a group context are designed to provide extensive opportunities for training and feedback concerning specific projects and the general enterprise of psychological research in education. Required of second-year students in PSE. Others by consent of instructor. (PSE)

350B. 3 units, Aut (Ford, Krumboltz) TTh 10-11:50 and by arrangement
350C. 3 units, Win (Diaz, Siegel) TTh 10-11:50 and by arrangement
350D. 3 units, Spr (Snow, Hakuta) TTh 10-11:50 and by arrangement

353A. Problems in Measurement: Item Response Theory—(Same as Psychology 249A.) Survey of alternative mathematical models used in test construction, analysis, and equating. 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. (REM, PSE)

3 units, Aut (Haertel) MW 9:20-10:50
alternate years, not given 1991-92

353B. Problems in Measurement: Factor Analysis—(Same as Psychology 249B.) Models, methods, and applications of factor analysis. Models for factor analysis; estimation procedures; factor rotation; factor scores; using factor analysis in research; confirmatory factor analysis; methods for dichotomous variables. Prerequisites: Psychology 152 and 248, or equivalent. (REM, PSE)

3 units (Haertel)
alternate years, given 1991-92

354X. School-Based Decision Making—Leadership and organizational issues in the movement toward school-based decision making. Emphasizes building capacity for individual schools to make decisions, establishment of an inquiry process at the school level, use and availability of information, implementation and evaluation of decisions, parental involvement, support of school-based decisions by districts. (APA)

3 units, Sum (Levin) W 1:15-4:05

355. Policy and Research in Science Education—(Same as Human Biology 117.) Science education from pre-school through undergraduate years, outside and inside established educational institutions, emphasizing public primary and secondary schools. Oriented toward questions of science education policy: What science should be taught at different education levels? For what purpose? To whom? By whom? Where? By what methods? How is the effectiveness of science programs to be assessed? Overview of issue in 355A. Emphasis on school-based research on these topics in 355B. (CTE)

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

356X. Research Seminar on Educational Organizations—For doctoral students interested in applying ideas from organizational theory to educational organizations. Focuses on the appropriateness of different theoretical perspectives for studying selected aspects to educational organizations. Students are expected to work with organizational ideas and to have completed basic coursework in research methods. (APA)

4 units (Hannaway) not given 1990-91

369. Personnel Administration—Topics: selection and appraisal of personnel, collective bargaining,
work-related stress, and dismissal. The legal, social science, and educational aspects of these topics. (APA)

3 units (Bridges) 
alternate years, given 1991-92

375X. Organizational Development: Theory and Practice—(Same as Business 375.) Designed to develop familiarity with theory and practice of planned organizational change through case analyses, role plays, simulations, etc. (APA)

4 units, Spr (Porras) MF 1:20-3:05

376. Education and Theories of the State—Explores the relationship between political system structures and educational change by analyzing theories and interpretations of how political systems function and the implications of these theories for understanding education. Classical and Marxist interpretations discussed. (IDE, SSE)

4 units (Carnoy) 
alternate years, given 1991-92

379X. Public Policy Toward Abused and Neglected Children—(Same as Law 337.) Standards that are, and should be, used in defining child abuse and neglect and evaluating means of state intervention to protect such children. Role of various professionals, doctors, lawyers, mental health workers, police and social workers in dealing with problems of child abuse and neglect. Types of research currently being done and identification of new research directions. Limited to 20 graduate and law students and meets for 15 weeks under Law School semester system. Consent of instructor required. (APA)

5 units total (Wold) not given 1990-91

383. Recent Developments in Foreign Language Education—Second-language teaching in the context of bilingual education and cultural pluralism. Student variables and problems of individualization of instruction. Description and evaluation of linguistic and cultural objectives. (CTE)

4 units (Staff) not given 1990-91

387A,B,C. Research Practicum: Cross-National Studies of Educational and Political Organization—(Same as Sociology 387A, B, C.) Analysis of quantitative and longitudinal data on national educational systems and political structures. Prerequisite: consent of instructor. (IDE) 

2-5 units, Win (Snow) by arrangement

388. Research Workshop in International Development Education—Research workshop for the review of key issues in the methodology and epistemology of social research in education, and 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) 

2-5 units, Win (Carnoy) M 3:15-6:05

415. Seminar in Educational Psychology—Topics seminar for advanced students. Admission by consent of instructor. (PSE) 

415A. Seminar in Educational Psychology: Assessment of Cognitive and Motivational Structure. 

3 units, Aut (Snow) by arrangement

416. Seminar on Aptitude—Study of individual differences in learning, cognitive, and motivational processes related to education. Limited to advanced doctoral students in education and psychology. Prerequisites: 250A, B, 255, or equivalent, and consent of instructor. (PSE) 

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

421. Internship in Educational Administration—A field experience for students in the educational administration program. Supervised by staff; project centered. (APA) 

3-5 units, Aut, Win, Spr, Sum (Bridges) by arrangement

422A,B,C. Practicum for Principals—The major tasks and related activities of principals. Uses a training approach that is problem rather than discipline based and provides for a substantial degree of self-directed learning by students under the guidance of professors and practicing principals. (APA) 

422A. 4-6 units, Sum (Bridges, Cuban) 
TTh 1:15-4:05

422B. 4-6 units (Bridges, Cuban) 
alternate years, given 1991-92

422C. 4-6 units, Sum (Bridges, Cuban) 
TTh 9-11:50

423A. Construction of a Research Plan: Education Administration and Policy Analysis—Focuses on the product and process of transforming an interest into a researchable problem. Limited to APA students. (APA) 

3 units, Aut (Bridges, Smith) 
MW 1:15-3:05

423B. Construction of a Research Plan: Research Design and Methodology—Conceptual and methodological issues in current research design. Students are expected to critically analyze and develop research proposals. (APA) 

3-5 units, Win (Bridges, Smith) 
MW 3:15-5:05

426. Theory and Practice in Criterion-Referenced Test Interpretations—Definitions of criterion-referenced tests, objective methods of domain definition and test construction, problems and methods of standard setting, statistical
analysis of criterion-referenced test data, and applications to minimum competency testing. Prerequisite: 252 or equivalent coursework, or consent of instructor. (PSE, REM)
3 units, Win (Haertel) MW 3:15-4:35 alternate years, not given 1991-92

431. Doctoral Seminar: Counseling and Health Psychology—Analysis of professional problems. May be repeated for credit. Limited to doctoral candidates in counseling psychology. Prerequisite: consent of instructor. (PSE)
1 unit, Aut, Win, Spr (Krumboltz, Gallagher-Thompson) T 4:15-6:05, biweekly

437X. Recent Theoretical Advances in Intellectual Development—Focuses on contemporary theories of intellectual development. Theories of particular developmental processes (e.g., sensorimotor development, development of quantitative skills) and a general theory of development. Relevance of contemporary developmental theory for instruction. (PSE)
3 units, Spr (Case) F 1:15-4:15

450. Seminar on Ethical Concerns in Research and Evaluation—Ethical obligations, issues, and dilemmas in planning, conducting, disseminating, and applying educational research emphasizing new problems raised by qualitative methods. Codes of ethics developed by relevant scientific and professional organizations are evaluated. (All Areas)
3 units (Noddings) not given 1990-91

453. Doctoral Dissertation—(All Areas)
any quarter (Staff) by arrangement

460. Advanced Seminar in Evaluation Design—The major traditions in the design of evaluation research. The strengths and weaknesses of standard evaluation models in view of the different objectives for evaluation, emphasizing the constraints inherent in studying educational processes and institutions. Focus is on dilemmas central to the design and conduct of educational evaluations and pursues alternative, "state-of-the-art" approaches. (REM)
3 units, Spr (Staff) by arrangement

466. Doctoral Seminar in the Design and Evaluation of Educational Programs (DEEP)—Required of all doctoral students in DEEP to provide the opportunity to become acquainted with research in this field. Students learn about research activities in which they are engaged and the kinds of problems that they believe to be important in the field. Introduces research and scholarship related to the DEEP program at Stanford. All DEEP faculty participate, along with other Stanford faculty and outside speakers. Seminar is on the major problems in this field and ways these are addressed by current investigators. (CTE)
3-5 units, Win (Eisner) T 7-9 p.m.

470. Practicum—For advanced graduate students. (All Areas)
any quarter (Staff) by arrangement

470E. Practicum in Evaluation—Topics of current interest in the area of educational evaluation. Restricted to student members of the Evaluation Consortium. (All Areas)
any quarter (Staff) by arrangement

480. Directed Reading—For advanced graduate students. (All Areas)
any quarter (Staff) by arrangement

493B. Seminar on Methodological Problems in Educational Research—Discussion of topics of current methodological interest including papers presented by visiting researchers. Practicum in consulting on actual projects being carried out by faculty and students. Consent of instructor required. (REM)
1-3 units, Win (Staff) by arrangement

ADMINISTRATION AND POLICY ANALYSIS (APA)

105. American Education and Public Policy (Same as History 158B, Political Science 186K.)


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 (Same as Political Science 187.)

220C. Education and Society (Same as Sociology 143.)

220D. History of School Reform: Origins, Policies, and Outcomes

220Y. History of School Reform: Origins, Policies, and Outcomes

221. Issues in Policy Analysis

222A. Decision Analysis in Education I
222B. Decision Analysis in Education II

235X. Organizations: Principals and Emerging Ideas

260X. Investing in Education of the Disadvantaged

390. Leadership in Research and Practice

392X. The Role of Knowledge and Learning in Teaching
308X. The Analysis of Teaching
311X. Topics in Educational Finance and Productivity
320X. Instruction of Heterogeneous Populations
324. Managing Complex Organizations
325A,B,C. Administration and Policy Analysis Research Seminar
326X. Institutional Renewal and Leadership
328A,B. Topics in Educational Organizations
330X. Research Practicum in Language, Literature, and Culture
335X. Language Policy and Planning: National and International Perspectives
369. Personnel Administration
375X. Organizational Development: Theory and Practice
379X. Public Policy Toward Abused and Neglected Children
421. Internship in Educational Administration
422A,B,C. Practicum for Principals
423A. Construction of a Research Plan: Educational Administration and Policy Analysis
423B. Construction of a Research Plan: Research Design and Methodology

CURRICULUM AND TEACHER EDUCATION (CTE)

100A. Tutor Skills Training for Elementary Tutors (Same as Psychology 168A.)
100B. Tutor Skills Training for Secondary Level Tutors (Same as Psychology 168B.)
175X. Experiential Curricula: The Case of Wilderness Education
185A. Research Methods in Applied Linguistics I
185B. Research Methods in Applied Linguistics II
195X. Studying Classroom Uses of Informational Technology
202. Teachers, Schools, and the U.S. Constitution
205A,B. Introduction to Curriculum
205C. Introduction to Curriculum: Policy Focus
213. Aesthetic Foundations of Education
218. Perspectives in Dance
219. Artistic Development of the Child
224X. Computers in the Classroom
225. Psychology of Literacy
240. Adolescence: Health and Special Needs
241X. Research in Writing and Writing Instruction: The Social, Cognitive, and Linguistic Dimensions of Written Language
242X. First Year Proseminar on Language, Literacy, and Culture
246A,B,C,D. Secondary School Teaching Practicum
248X. Theory and Issues in Writing and Literacy
361X. African American English in Educational Context
264A,B. Curriculum and Instruction in Foreign Languages
265X. Curriculum and Instruction in Economics
267A,B. Curriculum and Instruction in Science
268A,B. Curriculum and Instruction in Social Studies
269. Foundations of Learning for Teaching
282. Linguistics and the Teaching of English as a Foreign/Second Language (Same as Linguistics 289.)
286. Second Language Acquisition
289. Social Diversity and Educational Reform
291. 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.)
294. Language and Cognitive Development: Implications for Schooling
297. Language and Literacy in Secondary Schools
303. Qualitative Inquiry in Education
308X. The Analysis of Teaching
329X. Language Shift
426A,B,C,D. Secondary School Teaching Practicum
428X. Theory and Issues in Writing and Literacy
429X. Language Shift
430X. Research Practicum in Language, Literature, and Culture
435X. Language Policy and Planning: National and International Perspectives
440X. Research in Mathematical Education
447. Problems of Teacher Education
355. Policy and Research in Science Education
383. Recent Developments in Foreign Language Education
466. Doctoral Seminar in the Design and Evaluation of Educational Programs (DEEP)
492. Seminar in Problems of Teaching and Learning of a Second Language

INTERNATIONAL DEVELOPMENT EDUCATION (IDE) (SIDE)C)

161. Introduction to Teaching and Learning in Asia
163X. Technology Policy, Knowledge Formation, and Economic Development
197. Education and the Status of Women: An International Perspective (Same as Sociology 117.)
206A. Introduction to the Study of International Development Education
206B. Project Workshop in International Development Education
207. International Cooperation in Educational Development
245X. Sociology of Mass Schooling (Same as Sociology 245.)
306A. Education and Economic Development
306B. Education and Political Change (Same as Political Science 281.)
306C. Education and Sociocultural Change (Same as Anthropology 239.)
306D. Sociology of Development and Education (Same as Sociology 306.)
307. Knowledge and Legitimation: The Politics of Educational Research (Same as Political Science 328.)
326X. Institutional Renewal and Leadership
376. Education and Theories of the State
387A,B,C. Research Practicum: Cross National Studies of Educational and Political Organization
408. Research Workshop in International Development Education

PSYCHOLOGICAL STUDIES IN EDUCATION (PSE)
120. Problems of Intelligence, Information, and Learning (Same as Symbolic Systems 20.)
132. Psychosocial Aspects of Aging (Same as Human Biology 104.)
134. Career and Personal Counseling in Culturally Diverse Settings (Same as Psychology 237.)
155. Development of Measuring Instruments
216X. An Introduction to the Experience of Research
217X. Intellectual Development and Instructional Design
229. The Development of Human Competence: Theory, Research, and Practice
232. Science and Research in Counseling Psychology (Same as Psychology 253.)
236X. Current Research Topics in Developmental Psychology
238A. Orientation to Counseling Psychology
238B,C. Counseling and Health Psychology: Supervised Applications
239X. Contemporary Social Issues in Child and Adolescent Development
252. Introduction to Test Theory (Same as Psychology 248.)
255. Human Abilities (Same as Psychology 155.)
255A. Human Abilities Research Topics
285X. Modeling of Knowledge and Cognitive Processes
295X. Psychology of Problem Solving and Reasoning
296X. Substance Dependence: Assessment, Treatment, and Prevention
299X. Adulthood
317. Psychological Research on Teaching
319X. The Development of Self-Regulation
338A,B,C. Practicum in Counseling and Health Psychology
343. Motivational Processes in Education
350A. Psychological Studies in Education
350B,C,D. Research Practicum in Psychological Studies in Education
353A. Problems in Measurement: Item Response Theory (Same as Psychology 249A.)
353B. Problems in Measurement: Factor Analysis (Same as Psychology 249B.)
415. Seminar in Educational Psychology
416. Seminar on Aptitude
426. Theory and Practice in Criterion-Referenced Test Interpretations
431. Doctoral Seminar: Counseling and Health Psychology
437X. Recent Theoretical Advances in Intellectual Development

RESEARCH AND EVALUATION METHODS (REM)
111. Introduction to Philosophy of Social Science (Same as Philosophy 61.)
211X. Advanced Topics in Philosophy of Social Sciences (Same as Philosophy 166/266.)
250A,B. Statistical Analysis in Education Research I
250C. Statistical Analysis in Educational Research II: Advanced Regression and Multivariate Analysis
251. Experimental Methods in Educational Research
252. Introduction to Test Theory (Same as Psychology 248.)
257. Introduction to Statistical Analysis I and II (Same as Psychology 152.)
278. Introduction to Issues in Evaluation
303X. Qualitative Inquiry in Education
321A,B. Qualitative Methods of Educational Research: Issues in Design and Data Collection
353A. Problems in Measurement: Item Response Theory (Same as Psychology 249A.)
353B. Problems in Measurement: Factor Analysis (Same as Psychology 249B.)
426. Theory and Practice in Criterion-Referenced Test Interpretations
460. Advanced Seminar in Evaluation Design
493A,B. Seminar on Methodological Problems in Educational Research

SOCIAL SCIENCES IN EDUCATION (SSE)
105. American Education and Public Policy (Same as History 158B, Political Science 186K.)
111. Introduction to Philosophy of Social Science (Same as Philosophy 61.)
116X. Anthropological Perspectives on American Culture (Same as Anthropology 15.)
131. Economics of Women's Education and Work (Same as Feminist Studies 129.)
170. Gender and Education (Same as Feminist Studies 130, Sociology 112.)
197. Education and the Status of Women: An International Perspective (Same as Sociology 117.)
201. History of Education in the United States (Same as History 158, African and Afro-American Studies 201.)
203. Models of the Child in Contemporary Educational Thought
210. Sociology of Education (Same as Sociology 210.)
211X. Advanced Topics in Philosophy of Social Science (Same as Philosophy 166/266.)
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.)
220D. History of School Reform: Origins, Policies, and Outcomes
245X. Sociology of Mass Schooling (Same as Sociology 245.)
250X. Investing in the Education of the Disadvantaged
263. Education as a Social Science
276. Women and Moral Theory
280. Training Seminar: The Ethnography of Schooling (Same as Anthropology 214.)
288. Social Diversity and Educational Reform
304. The Philosophical and Educational Thought of John Dewey
306A. Education and Economic Development
306B. Education and Political Change (Same as Political Science 221.)
306C. Education and Sociocultural Change (Same as Anthropology 239.)
306D. Sociology of Development and Education (Same as Sociology 306.)
307. 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: Design and Evaluation (Same as Sociology 242B.)
315. Cultural Transmission: Education in Cross-Cultural Perspective (Same as Anthropology 266.)
376. Education and Theories of the State
408. Research Workshop in International Development Education

DIRECTED READING AND RESEARCH, DISSERTATION, AND PRACTICA (ALL AREA COURSES)

180. Directed Reading in Education—Master's degree students.
190. Directed Research in Education—Master's degree students.
199X. Undergraduate Honors Seminar
230X. Education and Values
450. Research and Evaluation
453. Doctoral Dissertation
470. Practicum—For advanced graduate students. Not for STEP students.
470E. Practicum in Evaluation—For Evaluation Consortium members.
480. Directed Reading—For advanced graduate students.
490. Directed Research—For advanced graduate students.
SCHOOL OF ENGINEERING

Dean: James F. Gibbons
Senior Associate Dean: Charles H. Kruger
Associate Deans: Kenneth S. Down (Business Affairs), David L. Freyberg (Undergraduate Education), Dwain N. Fullerton (External Relations), Gordon Kino (Space Planning), Elliott Levinthal (Research), Noe P. Lozano (Minority and Affirmative Action Programs)
Assistant Dean: Kathy Davis (Human Resources)
Acting Assistant Dean: Cheryll Hawthorne-Searight (Undergraduate Minority Programs)

Faculty Teaching General Engineering Courses
Associate Professors: John C. Bravman, David L. Freyberg, Peter W. Glynn, Lambertus Hesselink, Bruce B. Lusignan, M. Elizabeth Paté-Cornell, Peter Pinsky, Stephen Rock
Assistant Professors: Jeffrey R. Koseff, Stephen Monismith, M. Godfrey Mungal
Lecturers: David Lougee, Gerd D. Wallenstein
Consulting Professor: Philip G. Abrahamson

School of Engineering Advisory Committee on Engineering in Biology and Medicine: Charles R. Steele (Mechanical Engineering), Chairman; Dennis Carter (Mechanical Engineering), I-Dee Chang (Aeronautics and Astronautics), Lambertus Hesselink (Aeronautics and Astronautics), Albert Macovski, Channing R. Robertson (Chemical Engineering), Gior Wiederhold (Computer Science, Medicine), Felix Zajac (Mechanical Engineering)

The school has 10 academic departments: Aeronautics and Astronautics, Chemical Engineering, Civil Engineering, Computer Science, Electrical Engineering, Engineering-Economic Systems, Industrial Engineering and Engineering Management, Materials Science and Engineering, Mechanical Engineering, and Operations Research. These departments and one interdisciplinary program, Scientific Computing and Computational Mathematics, are responsible for graduate curricula, research activities, and the departmental components of the undergraduate curricula. In research, where faculty interest and competence embrace both engineering and the supporting sciences, there are not only numerous programs within the school but also several inter-school activities, including the Microwave Laboratory, the Center for Materials Research, the Center for Space Science and Astrophysics, the Radio Astronomy Institute, the Joint Institute for Aeronautics, the Institute for Electronics in Medicine, and the program in Product Design. Petroleum Engineering is offered through the School of Earth Sciences.

Instruction in engineering is offered primarily 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 and intend to major in engineering should take mathematics in high school to as high a level as is offered. (See the "Mathematics" section of this bulletin for information on advanced placement in mathematics.) High school courses in physics, chemistry, and computer science are strongly recommended but not required. Additional elective coursework 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." In addition, students should work toward completing the equivalent of Stanford's foreign language requirement and 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, who have wide variations in preparation, to plan full programs for each quarter and to progress toward graduation without undue delay.

Transfer credit is 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 reasonable evaluation of the courses taken prior to transfer. Inquiries may be addressed to the Associate Dean for Undergraduate Education in the School of Engineering at Stanford.

3/2 DEGREE PROGRAMS

The 3/2 engineering program at Stanford is a special opportunity which allows a student to complete three years at a liberal arts college followed by two years at Stanford. After completing the five-year program, the student is awarded two degrees, a B.S. in Engineering from Stanford and an A.B. from the liberal arts college.

Candidates for this special dual-degree program are considered as regular transfer applicants and are expected to meet the same admissions standards as all other transfer candidates. This distinguishes the Stanford 3/2 program from those of most other institutions which "guarantee" admission to students who meet certain grade and course requirements and are recommended by the 3/2 coordinator of the liberal arts college.

All 3/2 transfer applicants are required to submit the transfer application forms, a final secondary school transcript, official transcripts from each college attended, and the official results of either the College Board Scholastic Aptitude Test (SAT) or the American College Test (ACT). All materials must be submitted by the regular transfer deadline.

In addition to the above mentioned documents, dual-degree candidates are required to have a letter of recommendation sent from the liberal arts college 3/2 program coordinator. Also required is a letter from the appropriate academic dean indicating the intention of the liberal arts college to award the bachelor of arts degree, not the bachelor of science degree, upon completion of the required number of course credits. Applications are only accepted from students attending a liberal arts college which does not offer a degree program in engineering.

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 sufficiently flexible that many decisions on individual courses are left to the student and the advisor. For a student with a well-defined educational goal, there is a great deal of latitude.

In addition to the special requirements for engineering majors described below, all undergraduate engineering students are subject to the University distribution, writing, and foreign language requirements outlined in the first pages of this bulletin. Most engineering programs automatically satisfy the University distribution requirements in Area 6 (Mathematical Sciences), Area 7 (Natural Sciences), and Area 8 (Technology and Applied Sciences). Depending on the program chosen, students will have the equivalent of from one to three quarters of free electives to bring the total number of units to 180.

BACHELOR OF SCIENCE

Departments within the School of Engineering offer programs leading to the degree of Bachelor of Science in the following fields: Chemical Engineering, Civil Engineering, Computer Science, Electrical Engineering, Industrial Engineering, Materials Science and Engineering, and Mechanical Engineering. The School of Engineering itself offers interdisciplinary programs leading to the Bachelor of Science degree in Engineering with specializations in Aeronautics and Astronautics, Computer Systems Engineering, and Product Design. In addition, students may elect an Individually Designed Major leading to the degree of Bachelor of Science in Engineering.
**ACCREDITATION**

The Accreditation Board for Engineering and Technology (ABET) accredits college engineering programs on a nationwide basis. At Stanford, the following undergraduate curricula are accredited: Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, and Petroleum Engineering (School of Earth Sciences). The Department of Aeronautics and Astronautics offers an accredited program at the master’s degree level.

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 Associate Dean for Undergraduate Education, Terman 208.

**POLICY ON SATISFACTORY/NO CREDIT GRADING AND MINIMUM LETTER GRADE INDICATOR**

All courses taken to satisfy major requirements (including the requirements for mathematics; science; engineering fundamentals; Values, Technology, Science, and Society; and engineering depth) for all engineering students (including both departmental majors) must be taken for a letter grade.

For departmental majors, the minimum LGI (letter grade indicator) for all courses taken in fulfillment of the Engineering Fundamentals requirement and the Engineering Depth requirement is 2.0. For School of Engineering majors, the minimum LGI on all engineering courses taken in fulfillment of the major requirements is 2.0.

**DEPARTMENTAL MAJORS**

Curricula for majors offered by the Departments of Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering and Engineering Management, Materials Science and Engineering, and Mechanical Engineering have the following components: mathematics (21 units minimum, see Note 1); science (20 units minimum, see Note 2); engineering fundamentals (five course minimum, see Note 3); Values, Technology, Science, and Society (VTSS) (one course minimum, see Note 4); engineering depth (45 units minimum, see course listings below). Included within the courses taken to fulfill the preceding curriculum components is a requirement for 8 units minimum of experimentation (see below).

The curriculum for the major offered by the Department of Computer Science has separate requirements as described below.

**EXPERIMENTATION**

Departmental major programs must include 8 units of experimentation. Laboratory courses taken in the sciences as well as experimental work taken in courses within the School of Engineering can be used in fulfillment of this requirement. By careful planning, the experimentation requirement should not necessitate additional coursework beyond that required to meet the other components of an engineering major. A list of courses and their experimentation content (in units) can be found in the *School of Engineering Undergraduate Handbook* which can be obtained from the office of the Associate Dean for Undergraduate Education, Terman 208.

**CHEMICAL ENGINEERING**

Mathematics: 21 units minimum (see Note 1)
Science: 20 units minimum* (see Note 2)
Engineering Fundamentals:
5 courses** (see Note 3)
Val., Tech., Sci., & Soc.: 1 course (see Note 4)

Engineering Depth:
Chem. 36. Chemical Separations 3
Chem. 130. Theory and Practice of Identification 4
Chem. 131. Organic Polynuclear Compounds 3
Chem. 151. Inorganic Chemistry 1 3
Chem. 173. Physical Chemistry 3
Chem. 175. Physical Chemistry 3
Chem. Engr. 100. Mathematical Methods in Chemical Engineering 3
Chem. Engr. 110. Equilibrium Thermodynamics 3
Chem. Engr. 120. Separations Processes 3
Chem. Engr. 140. Fluid Mechanics 3
Chem. Engr. 180. Chemical Engineering Laboratory 45

* Sciences courses should include Chem. 31, 33, and 35.
** Chem. 171 may be substituted for Engr. 30 in Engineering Fundamentals.

**CIVIL ENGINEERING (C.E.)**

Mathematics: 21 units minimum (see Note 1)
Science: 20 units minimum (see Note 2)
Engineering Fundamentals:
5 courses (see Note 3)
Val., Tech., Sci., & Soc.: 1 course (see Note 4)

Engineering Depth:
C.E. 130. Introduction to Urban Planning 3
C.E. 150. Legal and Professional Aspects of Civil Engineering 3
C.E. 160. Water Resources Engineering 4
C.E. 170. Environmental Science and Technology 3
C.E. 180. Elementary Structural Analysis 4
C.E. 190. Geotechnical Engineering 4
Engr. 11. Mechanics of Materials I 4
Engr. 21. Mechanics of Fluids 3
Engr. 21 A. Mechanics of Fluids Lab 2
Additional Civil Engineering Courses* 15

* The additional units must be C.E. courses selected with the approval of the student’s advisor.

Specialty areas in C.E. available at Stanford include: Computer-Aided Civil Engineering, Construction Engineering and Science, Environmental and Water Studies, Geomechanics, Structural and Water Resources. A list of recommended courses for the students interested in any of these areas is available in the School of Engineering Undergraduate Handbook or from the Department of Civil Engineering office.

Special Requirements: all candidates for the B.S. degree in Civil Engineering must take Engineering 10, 106A; Engineering 60, Engineering Economics; and Engineering 70, Introduction to Software Engineering. These courses may also be used in partial fulfillment of the Engineering Fundamentals requirement. In addition, students must have experience in drafting, either computer-aided or manual, as obtained in high school, through work experience, or by taking Mechanical Engineering 102.

** Computer Science (C.S.)

Mathematics: (25 units)
Math. 41, 42, 43. Calculus and Analytic Geometry 15
Math. 103 or 113. Linear Algebra 3
C.S. 157. Logic and Automated Reasoning 4
Math. Elective* 3

Science: (12 units)
Phys. 51. Mechanics 4
Phys. 53. Electricity and Magnetism 4
Other Science† 4

Engineering Basics: (10 units)
C.S. 106X. Programming Methodology and Abstractions (Accelerated)
or C.S. 106A and 106B
or C.S. 106H and 106B 5
Engr. 40. Electronics 5
Val., Tech., Sci., & Soc.: 1 course** (see Note 4)

Computer Science Courses: (47 units)
C.S. 107. Programming Paradigms 4
C.S. 109A,B. Introduction to Computer Science 8
C.S. 110. Introduction to Computer Systems and Assembly Language Programming 4
C.S. 140. Concurrent Programming 3
C.S. 143. Compilers 4
C.S. 154. Introduction to Automata and Complexity Theory 4
C.S. 161. Discrete Structures and Algorithms 4
C.S. 221. Introduction to Artificial Intelligence 3
C.S. 240A. Operating Systems 4
Elect. Engr. 182. Computer Organization 3
Project Courses†† 6

* Any course of 3 or more units from the School of Engineering list (see Note 1) may be taken.
† Other science courses are to be taken from the School of Engineering list (see Note 2), plus Psych. 102, 106, 108. Physics 61 and 62 or Physics 21 and 23 may be taken instead of Physics 51 and 53, as long as a total of 12 science units are taken
** C.S. 201 also fulfills this requirement.
†† The following project courses are acceptable: a total of 6 units must be taken: C.S. 191 (3-6 units), 194 (3-6 units), 225A,B (6 units). Further details can be found in the School of Engineering Undergraduate Handbook.

** Electrical Engineering (E.E.)

Mathematics: 21 units minimum* (see Note 1)
Science: 20 units minimum** (see Note 2)
Engineering Fundamentals:
5 courses*** (see Note 3)
Val., Tech., Sci., & Soc.: 1 course (see Note 4)

Engineering Depth:
E.E. 101, 102. Circuits 6
E.E. 105A. Controls 3
E.E. 111, 112, 113. Electronics 9
E.E. 121, 122. Digital and Analog Laboratory 6
E.E. 141. Electromagnetic Fundamentals 3
Engr. 102E. Writing for Electrical Engineering 1

Specialty Courses†† 9
One course in Design† 3
Electrical Engineering Electives 5

* Mathematics should include 130
† The design course may, but need not, be part of the specialty sequence. The following courses satisfy this requirement: E.E. 104, 105B, 139, 183, 206, 207A, 208, 211, 213, 221, 246, 252, 254, 261, 281.
** Science is to include one course in both Physics and Chemistry
†† Three courses from one of the specialty areas shown below (consultation with an advisor in the selection of these course is especially important).
*** Engineering Fundamentals should include Engr. 40 and 70X.

Computer Hardware: E.E. 181, 182, 183, 281
Computer Software: E.E. 181, 257, 288
Controls: Engr. 105B, 207A, 208, 209, 211, 213, 221, 246, 252, 254, 261
Signal Processing: E.E. 104, 261, 264, 281

** Industrial Engineering (I.E.)

Mathematics: 21 units minimum* (see Note 1)
Science: 20 units minimum** (see Note 2)
Engineering Fundamentals:
5 courses*** (see Note 3)
Val., Tech., Sci., & Soc.: 1 course (see Note 4)

Engineering Depth:
Comp. Sci. 106B or 106X. Software Engineering 5
I.E. 100. Organizations: Theory and Management 4
I.E. 121. Statistics and Quality 4
I.E. 125. Work Design 5
I.E. 133. Industrial Accounting 3
I.E. 180 or 183 or 186. Senior Project 4
I.E. 235. Introduction to Financial Decisions 4
I.E. 260. Analysis of Production Systems 4
Stat. 110, Statistical Methods 4

* Math courses should include Stat. 116 and Math. 103.
** Engineering Fundamentals courses must include Engr. 40, 60, and 70A.

MATERIALS SCIENCE AND ENGINEERING (M.S.E.)

Mathematics: 21 units minimum (See Note 1)
Science: 20 units minimum (See Note 2)
Engineering Fundamentals:
5 courses (See Note 3)
Val., Tech., Sci., & Soc.: 1 course (See Note 4)
Engineering Depth:
Engr. 51. Materials Technology for Structural Applications 3
Engr. 52. Electronic Materials Science 3
M.S.E. 150. Atomic Arrangements in Solids 5
M.S.E. 151. Thermodynamics and Phase Equilibria 5
M.S.E. 152. Rate Processes in Materials 4
M.S.E. 155. Mechanical Behavior of Solids 4
M.S.E. 158. Electrical, Optical, and Magnetic Properties of Materials 4
M.S.E. 160, 161, 162. Experimental Methods 6
Restricted Electives* 11

* 11 units from the following list: Chem. 173, 175; Elect. Engr. 111, 112, 113; Engr. 5, 11, 104.

MECHANICAL ENGINEERING (M.E.)

Mathematics: 21 units minimum (See Note 1)
Science: 20 units minimum (See Note 2)
Engineering Fundamentals:
5 courses (See Note 3)
Val., Tech., Sci., & Soc.: 1 course (See Note 4)
Engineering Depth:
Engr. 10. Applied Mechanics: Statics 3
Engr. 11. Mechanics of Materials I 4
M.E. 33. Introductory Fluids Engineering 4
M.E. 101. Visual Thinking 3
M.E. 103. Manufacturing Technology 4
M.E. 111. Stress, Strain, & Strength 3
M.E. 112. Mechanical Systems 3
M.E. 113. Engineering Design 3
M.E. 131A. Fluid Mechanics 4
M.E. 131B. Heat Transfer 5
M.E. 131C. Thermosciences 5
M.E. 161. Mechanical Vibrations 4

PETROLEUM ENGINEERING

Petroleum Engineering is offered by the School of Earth Sciences. Consult the appropriate sections of this bulletin for requirements.

SCHOOL OF ENGINEERING MAJORS

The School of Engineering offers the degree of Bachelor of Science in Engineering. School of Engineering programs must be approved by the Undergraduate Council of the school. There are two types of programs: majors which have been proposed by cognizant faculty groups and have been pre-approved by the council, and Individually Designed Majors. At present, there are three pre-approved majors, Aeronautics and Astronautics, Computer Systems Engineering, and Product Design. Total units required for these majors must be at least 90 and not more than 107. These majors are not accredited by ABET.

AERONAUTICS AND ASTRONAUTICS (A.A.)

Mathematics: 21 units minimum (See Note 1)
Science: 20 units minimum (See Note 2)
Engineering Fundamentals:
5 courses (See Note 3)
Val., Tech., Sci., & Soc.: 1 course (See Note 4)
Engineering Depth:
A.A. 100. Introduction to Aero and Astro 3
A.A. 131. Experimentation in Aero/Astro 3
A.A. 192. Vector and Tensor Analysis 3
A.A. 200A. Applied Aerodynamics 3
A.A. 210A. Fundamentals of Compressive Flow 3
Engr. 10. Applied Mechanics: Statics 3
Engr. 11. Mechanics of Materials I 4
Engr. 104. Dynamic Response 3
Math. 130. Differential Equations 3
Mech. Engr. 33. Introduction to Fluids Engineering 4
Mech. Engr. 131B. Fluid Mechanics 3
Restricted Electives* 6


COMPUTER SYSTEMS ENGINEERING (C.S.E.)

Mathematics: (21 units)
Math. 41, 42, 43, 44. Calculus 18
Math. 103 or 113. Linear Algebra 3
Science: (12 units)
Phys. 51. Mechanics 4
Phys. 53. Electricity and Magnetism 4
Phys. 55. Light and Heat 4
Basic Engineering: (10 units)
Engr. 40. Electronics 5
Engr. 70X. Programming Methodology and Abstractions (or Comp. Sci. 106A and B) 5
Depth: (49 units)
Comp. Sci. 107. Programming Paradigms 4
Comp. Sci. 109A, B. Introduction to Computer Science 8
INDIVIDUALLY DESIGNED MAJORS (I.D.M.)

I.D.M.'s are intended for undergraduates interested in pursuing engineering programs that fall outside the purview of departmental majors or the pre-approved School of Engineering majors. Programs are designed by students, with the assistance of two faculty advisors of their choice, and presented to the Undergraduate Council for approval. The degree is designated Bachelor of Science in Engineering: (proposed title).

Students must submit written proposals to the Undergraduate Council, Terman 208, detailing their programs. Programs must comply with the following requirements: Mathematics (21 units minimum, see Note 1 below), Science (17 units minimum, see Note 2), Engineering course (40 units minimum) with additional courses to bring the total to at least 90 and not more than 107 units. (Students may take additional courses beyond the 107 units, but the I.D.M. proposal must be limited to a maximum of 107 units.) Each proposal should begin with a statement that 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. A proposed title for the major, to be included on the official University transcript, should be included.

The proposal statement should be followed by a list of courses to be counted toward the major; normally the courses selected should represent a well-coordinated sequence that provides mastery of the important principles and techniques in a well-defined field. In some circumstances, especially if the proposal indicates that the goal of the major is to prepare the student for graduate work outside of engineering, a more general engineering program may be appropriate. The proposal must be signed by two faculty members whose signatures certify that they endorse the major as described in the proposal and agree to serve as the student's permanent advisors. One of the faculty members, who must be from the School of Engineering, acts as primary advisor, and the proposal must be accompanied by a statement from that person giving his or her appraisal of the academic viability of the proposed major.

Students proposing I.D.M.'s must have at least three quarters of undergraduate work remaining at Stanford after their proposals are submitted. Any changes in a previously approved major must be endorsed by the faculty advisors and reapproved by the Undergraduate Council. Proposals are reviewed and acted upon once per quarter. Proposals should be submitted to the Associate Dean for Undergraduate Education, Terman 208.

**Note 1 (Mathematics)—** 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 calculus to the level of Math. 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. To meet ABET accreditation criteria, a student's program must include study of differential equations.

Note 2 (Science)—A strong background in the basic concepts and principles of physical science in such fields as physics, chemistry, geology, and biology is essential for engineering. To meet ABET accreditation criteria, a student's program must include study of both chemistry and physics, with at least 9 units in one or the other.

Courses which satisfy the science requirement are: Biology 30, 31, 32, 33, 35, 36, 135; Geol. 1 or 2, and 3; Phys. 51, 53, 54, 55, 56, 57, 58 (preferred sequence for engineers); Phys. 21, 22, 23, 24, 25, 26; Phys. 61, 62, 63.

Note 3 (Engineering Fundamentals)—The Engineering Fundamentals requirement is satisfied by a nucleus of technically rigorous, introductory courses chosen from the various engineering disciplines. It is intended to serve several purposes. First, it provides students with a breadth of knowledge concerning the major fields of endeavor within engineering. Second, it allows the incoming engineering student an opportunity to explore a number of courses before embarking on a specific academic major. Third, the individual classes each offer a reasonably deep insight into a contemporary technological subject for the interested non-engineer.

The requirement is met by taking five courses from the following list:

- Engr. 10. Applied Mechanics: Statics, or Engr. 12. Intermediate Dynamics
- Engr. 20. Introduction to Chemical Engineering
- Engr. 30. Engineering Thermodynamics
- Engr. 40. Electronics
- Engr. 50. Introductory Science of Materials
- Engr. 60. Engineering Economics

or Engr. 62. Introduction to Operations Research

Research I

Engr. 70A or 70X. Introduction to Software Engineering

Note 4 (Val., Tech., Sci., & Soc.)—It is important to obtain a broad understanding of engineering in its human, social, and cultural contexts. To introduce this aspect of professional development, most engineering majors require one course on the interaction of technology with values and beliefs, social institutions, or behavior.


PROGRAMS IN MANUFACTURING

Programs in manufacturing are available at the undergraduate, M.S., and Ph.D. levels. The undergraduate program of the Department of Industrial Engineering and Engineering Management provides general preparation for any student interested in manufacturing. More specific interests can be accommodated through Individually Designed Majors (I.D.M.s).

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 bulletin.

DUAL AND COTERMINAL DEGREE PROGRAMS

A Stanford undergraduate may work simultaneously toward two bachelor's degrees or toward a bachelor's and a master's degree, i.e., 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 are needed for a combined program.

Dual A.B. and B.S. Degree Program—To qualify for both degrees, a student must: (1) complete the stated University 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.)

Coterminal Bachelor/Master Program—A Stanford undergraduate may work simultaneously toward a bachelor's degree and a master's degree. To qualify for both degrees, a student must (1) complete the stated University and departmental requirements for each degree, (2) complete 15 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 the 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; (4) complete the department and University requirements for the master's degree and apply for the degree through the Graduate Program Office.

Admission to the coterminal program requires admission to graduate status by the pertinent department. Admission criteria vary from department to department.

Procedure for Applying for Admission to Coterminal Degree Programs—A Stanford undergraduate may apply (using the University coterminal application form) for admission to the coterminal bachelor/master program after
the beginning of the eighth quarter of undergraduate work and no later than the end of the 11th quarter of undergraduate work, and at least four quarters in advance of the anticipated date of conferral of the master's degree. Students seeking a graduate degree in engineering must apply to the pertinent department.

**GRADUATE ADMISSION**

Application for admission with graduate standing in the school should be made to the Graduate Admissions Office 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 chair 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, geology, or mathematics.

**THE HONORS COOPERATIVE PROGRAMS**

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 courses and obtain a graduate degree 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 of 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). This four channel system transmits courses to nearly 200 corporate sites in the San Francisco Bay Area, enabling students to receive live courses and interact via audio from their company sites. Students can also take graduate classes via SITN's Non Credit Option (NCO) and audit programs. In addition, students at sites in other parts of the country can take courses by participating in the Tutored Videotape Instruction (TVI) program. Further details can be obtained from the Stanford Instructional Television Network (415) 723-3000, 401 Durand, Stanford, CA 94305-4036.

**REGISTRATION**

New graduate students should follow procedures for registration as listed in the University's quarterly Time Schedule. Advisor assignments can be obtained from department offices.

**GRADUATE CURRICULA**

For further details about the following 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 department 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.

Departments and divisions of the school offer graduate curricula, as follows:

**AERONAUTICS AND ASTRONAUTICS**

- 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
- Composite Materials
- Computational Fluid Mechanics
- Flight Mechanics
- Gaskinetics
- Guidance and Control
- Hypersonic and Physical Gas Dynamics
- Modern Optical Diagnostics in Fluid Mechanics
- Physical Gasdynamics
- Propulsion
- Robotics
- Waves and Vibrations

**CHEMICAL ENGINEERING**

- Applied Statistical Mechanics
- Biochemical Engineering
- Equilibrium and Transport Properties of Colloidal Dispersions
- Hydrodynamic Stability
- Kinetics and Catalysis
- Newtonian and Non-Newtonian Fluid Mechanics
- Polymer Physics
- Rheo-optics of Polymeric Liquids and Colloidal Suspensions
- Surface and Interface Science
CIVIL ENGINEERING
Construction Engineering and Management*
  Construction Engineering Management
Environmental and Water Studies*
  Environmental Engineering and Science
  Water Resources
Structural Engineering and Geomechanics*
  Geomechanics
  Structural Engineering
* An emphasis in Computer-Aided Civil Engineering can be designated.

COMPUTER SCIENCE
Automated Deduction
Autonomous Agents
Complexity Theory
Computational Geometry
Computer Architecture
Database Systems
Declarative Programming
Design and Analysis of Algorithms
Digital Design, VLSI, and CAD
Distributed and Parallel Computation
Graphics and User Interfaces
Knowledge-Based and Expert Systems
Knowledge Representation and Logic
Networks, Distributed Systems, and Operating Systems
Programming Languages and Systems
Robot Control and Planning
Scientific Computing
Theory of Programming Languages

ELECTRICAL ENGINEERING
Computer Hardware
Computer Languages and Operating Systems
Control and Systems Engineering
Digital Communication
Electronic Circuits
Electronic Devices and Technology
Fields and Waves
Information Theory and Coding
Lasers and Quantum Electronics
Network Systems
Optics and Imaging
Radio Science
Signal Processing
Solid State Materials and Devices
Transmission Systems and Telephony
VLSI Design

ENGINEERING IN BIOLOGY AND MEDICINE
Biostatistics
Design for Medical Applications
Information Processing in and for Biomedical Systems
Mechanics of Hearing
Medical Imaging
Neuromuscular Biomechanics
Orthopedic Biomechanics
Rehabilitation Engineering
Transport Phenomena in Biological Systems

ENGINEERING-ECONOMIC SYSTEMS
Business Systems
Decision Analysis
Economic Analysis
Energy Modeling and Analysis
Information Policy
Intelligent Systems
Mathematical Systems Analysis
Social Analysis

INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT
Engineering Economy—Financial Analysis
Engineering Management
Manufacturing Systems Engineering
Organizational Design and Control
Production Systems

MATERIALS SCIENCE AND ENGINEERING
Electrical and Optical Behavior of Solids
Electron Microscopy
Energy Storage
Fracture
Imperfections in Crystals
Kinetics
Magnetic Behavior of Solids
Phase Transformations
Photovoltaic Materials
Physical Ceramics
Physical Metallurgy
Solid State Chemistry
Structural Analysis
Thermodynamics
Thin Films
X-ray Diffraction

MECHANICAL ENGINEERING
Biomechanics
Combustion
Composites, Fracture of Solids
Continuum Mechanics
Controls
Dynamics
Energy Conversion

ENGINEERING
Interdisciplinary Programs
Interdepartmental Programs
Engineering Design
Environmental Measurements
Experimental Mechanics
Fluid Mechanics
Heat Transfer
High Temperature Gasdynamics
Kinematics
Manufacturing Systems Engineering
Optimization
Product Design
Robotics
Solar Energy
Thermodynamics
Transport Processes
Turbulence

OPERATIONS RESEARCH
Applied Probability
Combinatorial Optimization
Dynamic Programming
Energy and Economic Modeling
Inventory Theory
Mathematical Programming
Networks
Queueing Theory
Reliability Theory
Simulation Methodology

SCIENTIFIC COMPUTING AND
COMPUTATIONAL MATHEMATICS
See the “Scientific Computing and Com- putational Mathematics” section of this bulletin.

SPACE SCIENCE
See the “Center for Space Science and Astrophysics” section of this bulletin.

ENGINEERING IN BIOLOGY
AND MEDICINE
Though Stanford does not have a formal department of bioengineering, there are approximately 10 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 graduate level. The faculty working in bioengineering are in various departments of the School of Engineering, and a list of their names, together with a summary of their research interests, is available from the committee chair. The program in bioengineering is open only to students who are admitted to, and enrolled in, a department in the School of Engineering. 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 immobilized microbial cell function and physiology in compact bioreactors, protein absorption from sheared suspensions onto polymer films, protein conformation at fluid/polymer interfaces, and factors which influence growth and product formation in genetically engineered mammalian cells is pursued in the Department of Chemical Engineering. Faculty in Mechanical Engineering are doing research on neuromuscular dynamics, the mechanics of hearing, computer aided clinical neurology, bone mechanics, orthopedic biomechanics, and robotic aids for disabled. Cardiovascular dynamics and haemodynamics are being studied in Computer Science. In Electrical Engineering, advanced analysis techniques are applied to signal processing EKG, EEG, 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 Professors Carter, Leifer, or Zajac, Mechanical Engineering.)

The typical graduate student in bioengineering first seriously confronts the medical or biological aspects of his or her education at the master's degree level. Prior courses in biology, chemistry, etc., are beneficial, but students are admitted and advanced primarily on their engineering abilities. Advanced courses in physiology are generally taken only by Ph.D. students. The student's advisor assists in constructing a program of study incorporating these courses and also satisfying the degree requirements of the department in which the student 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.

A student wishing to earn the M.S. in Engineering while pursuing the M.D. degree must apply separately for admission to the M.D. program and an engineering department. 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 is 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 a national competition basis.

MANUFACTURING

Programs in manufacturing are available at the undergraduate, master's, and Ph.D. level. Master's-level programs are offered by the Industrial Engineering and Engineering Management (I.E.-E.M.) Department and as joint programs by I.E.-E.M. and Mechanical Engineering. The graduate program in Computer-Aided Civil Engineering (C.E.) includes an option for manufacturing/construction automation. The C.E. program in Construction is also a "manufacturing" program for students interested in facility and public works manufacturing. All of these programs take advantage of modern computer technology.

Doctoral programs related to manufacturing are available in a number of departments and involve research projects ranging from machine tool design to the integration of data bases into production software.

For detailed information about the master's and Ph.D. programs, see the sections in this bulletin pertaining to industrial, mechanical, and civil engineering. Also, a separate pamphlet, Manufacturing Programs at Stanford, is available in Terman 202.

GRADUATE PROGRAMS

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. 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.

MASTER OF SCIENCE IN ENGINEERING

The degree of Master of Science in Engineering is available to students 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. Each student's program is administered by the particular department in which it is lodged and must meet the standard of quality of that department.

Applications for admission to the program should indicate the department in the school in which the student expects to take most of her or his courses. Transfer into this program is also possible from any departmental 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 students 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 is 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 the "Graduate Division Special Programs" section in this bulletin. University regulations for the Doctor of Philosophy are given in the "Degrees" section in this bulletin. Further information is found in 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 forms may be obtained from the chair 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 several departments of the School of Engineering, under the supervision of those listed below.

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.

PRIMARILY FOR UNDERGRADUATES

5. The Microscopic World of Technology—Introduction to the microscopic world of technology through optical and electron microscopes. A discussion and participation in the application of various microscopes to study technological components. Experiments involve examination of silicon integrated circuits or broken metal parts at magnifications ranging from 10X to 1,000,000X.

3 units (Sinclair) not given 1990-91

6. Engineering at Stanford—Weekly seminar for freshman and undeclared sophomores interested in engineering. Provides information on engineering as a career and profession, the various engineering majors, and the resources available for engineering undergraduates. Speakers include department representatives, faculty and industry researchers, and representatives from Overseas Studies, Career Planning and Placement, and the Undergraduate Advising Center.

1 unit, Aut (Freyberg) M 3:15-4:45

7. Professional Development for Minority Engineers—(Same as African and African American Studies 127.) Assists students in understanding the basic benefits and opportunities available to Blacks in the various fields of engineering. The emphasis is on diversity. Experts from various fields 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 one's own business; opportunities for Black engineers and business in Third World countries; trips to industrial and academic laboratories. Students have weekly reading assignments with a short paper due each week; a final term paper is assigned.

3 units, Spr (Bates) by arrangement

10. Applied Mechanics: Statics—Equilibrium of particles; moments, couples; equilibrium of rigid bodies; analysis of trusses, frames, machines, dry fiction; hydrostatic forces. Vectors and vector algebra are introduced and used. Prerequisite: Physics 51. (DR:8)

3 units, Aut (Bershader) Win (Van Dyke) Spr (Howard) problem sessions by arrangement

11. Mechanics of Materials I—Introduction to the mechanics of deformable structures under tension, compression, shear, torsion, and bending. Analysis of stresses, strains, and deformations. Also, Mohr's circle, pressure vessels, and columns. Prerequisite: 10.

4 units, Win (Steele) MWF 9 Spr (Howard) 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; gyroscopes; 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 (Powell) MWF 8 Spr (Ashley) MWF 10 problem sessions by arrangement

20. Introduction to Chemical Engineering—Overview of chemical engineering through discussion and engineering analysis of physical and chemical processes. Topics: overall material and energy balance, concepts of rate processes, heat and mass transport, and kinetics of chemical reactions. Applications of these concepts to areas of current technological importance: control, biotechnology, large scale production of chemicals and materials processing. Prerequisite: Chemistry 51.

3 units, Spr (Robertson, Homsy) MWF 10

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; continuity energy and momentum principles; the control volume analysis; laminar and turbulent flows; internal flows in specific engineering applications. Prerequisites: 10, Physics 51, and Math. 23 or 43. Recommended: 12.

3 units, Aut (McCarty) MWF 10
Spr (Monismith) MWF 9

2 units, Aut (Koseff, Monismith) M 2:15
Spr (Koseff, Monismith) M 1:15
plus 2 hours by arrangement

30. Engineering Thermodynamics—Introduction to the concepts of energy and entropy from elementary considerations of the microscopic nature of matter. Use of basic thermodynamics 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. (Mungal) MWF 10
Win (Reynolds) MWF 10

35. Automobile Technology—An engineering description of today's automobile, how it works, and why its designed the way it is. How the auto affects air pollution and aspects of engine design for improving exhaust emissions. Alternate power plants and fuels and their options for the long term. Aimed at non-scientists. (DR:8)

3 units, Aut (DeBra) TTh 1:15-2:30

40. Introductory Electronics—Overview of electronic engineering. Electrical quantities, and their measurement including the operation of the oscilloscope. Digital logic circuits and their functions including the elementary microprocessor. Basic function of electronic components including ideal diodes and transistors; tuned circuits. Laboratory assignments complement the lecture. Prerequisites: Physics 53 or equivalent, one course of calculus, and elementary competence on personal computers. (DR:8)

5 units, Aut (Pease) MWF 11-12:15
Win (Masters) MWF 11-12:15
Spr (Staff) MWF 11-12:15
3-hour lab weekly by arrangement


3 units, Win (Braerman) MWF 11
Spr (Sinclair) MWF 11

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. Materials selection and processing for engineering applications. Prerequisite: 50.
3 units, Win (Staff) MWF 2.15

52. Electronic Materials Science—Overview of materials issues in modern electronics technology. Materials parameters required of integrated circuits and microelectronic devices. IC fabrication processes including crystal growth, deposition of epitaxial layers and thin films, diffusion, ion implantation, oxidation, etching, and lithography. Electronic materials properties, crystalline defects, phase equilibria and kinetics of process reactions. Selected additional topics. Prerequisite: 50.
3 units, Spr (Hagstrom) TTh 9-10:15

60. Engineering Economics—Economic analysis for choice among alternatives. Use of compound interest calculations. Selection of appropriate minimum attractive rates of return. Effects of depreciation and income tax. Analysis of decisions under uncertainty. May be taken by freshmen, but recommended for second year or higher students. Prerequisite: Math. 41 or equivalent. Recommended: previous knowledge of elementary probability.

3 units, Aut (Pate-Cornell, Staff) sec 1 MWF 11
sec 2 TTh 2:15-3:30
Win TTh 9:30-10:50

62. 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. Prerequisite: Math. 43 or consent of instructor. (DR:8)

4 units, Aut (Hillier) MWF 1-2:05
Spr (Staff) MWF 1-2:05
70A. Programming Methodology—(Enroll in Computer Science 106A.) (DR:8)
70X. Programming Methodology and Abstractions (Accelerated)—(Enroll in Computer Science 106X.) (DR:8)
75. Introduction to Small Computer Hardware and Interfacing—(Enroll in Mechanical Engineering 75.)

100. Teaching Public Speaking—Theory and practice of teaching public speaking and presentation development. Lectures and discussions on developing an instructional plan, using audiovisual equipment for instruction, devising tutoring techniques, and teaching delivery, organization, audience analysis, visual aids, and unique speaking situations. Weekly practice speaking. Students serve as apprentice speech tutors. Those completing course may become paid speech instructors in the Technical Communications Program. Admission by consent of instructor.

3 units, Aut, Win, Spr (Lougee, Staff)
M 7:30-10 p.m., Th 12:15

102E. Technical/Professional Writing for Electrical Engineers—Required of Electrical Engineering majors. Examines process of writing technical/professional documents. Lectures, writing assignments, individual conferences. Prerequisite or corequisite: Electrical Engineering 121, or consent of instructor.

1 unit, Win, Spr (Lougee) W 4:15-5:05

102S. Writing: Special Projects—Structured writing instruction for students working on non-course-related materials (theses, dissertations, journal articles). Weekly individual conferences.
1-5 units, Aut, Win, Spr (Staff)

102W. Technical and Professional Writing—Explores systematically the process of writing technical and professional documents; lectures and discussions on analyzing audiences, defining 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) TTh 11

103. Public Speaking/Presentation Development—Introduction to the full range of speaking activities, from impromptu talks to carefully rehearsed formal professional presentations. How to: organize and write speeches for a variety of occasions, analyze audiences, create and use appropriate visual aids, combat nervousness, deliver informative and persuasive speeches effectively. Develops confidence in one’s speaking ability through weekly practice in class, rehearsals in one-on-one tutorials, and videotaped feedback. Open to all, but priority given to engineering students. Enrollment limited.

3 units, Aut, Win, Spr (Staff)
T, W, or Th 7:30-10 p.m.


3 units, Aut (Powell) MW 11-12:15


3 units, Aut (Boyd) MWF 9
Win (Cannon) MW 11-12:15


3 units, Spr (Franklin) MWF 9

108. Computer Visualization in Engineering—Techniques for visualizing engineering and scientific phenomena on personal computer screens for design, visualization, and instructional purposes. Elementary principles of computer visualization; applications in engineering, science, and education. Introduction to Macintosh computer programming using Microsoft Quickbasic, the Desktop Interface, resources, and the Macintosh Toolbox. Elementary 2D and 3D graphics and animation techniques and numerical computation and simulation methods. Students write a program to demonstrate an engineering or scientific topic of personal interest, using BASIC or another language of their choice. Open to undergraduates and graduates. Prerequisite: Computer Science 106B or 106X.

3 units, (Siegmund) MWF 1:15
110. Statistical Issues in Manufacturing—(Enroll in Operations Research 180.) Introduction to statistical ideas used in the design and control of modern manufacturing systems. Relationship to the strategic issues involved in global competitiveness. Topics: introduction to basic probability and statistics, Markov chains, queueing networks, simulation. Applications to production and scheduling, just-in-time inventory management, quality control, materials requirement planning. Software packages described and used. Prerequisite: Math. 43 or permission of the instructor.
4 units, Spr (Glynn) MTWTH 2:15-3:05

190. Creative Problem Solving—(Same as Industrial Engineering 201; VTSS 181.) Problem solving emphasizing problem definition, creativity, and the interpersonal and organizational factors that influence thinking. Common blocks to problem solving and methods of dealing with them. The advantages of integrating various problem solving strategies through the use of reading, abstracted problem situations, and projects.
3 units (Adams) given 1991-1992

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. Students make arrangements with individual faculty and enroll in the section number corresponding to the particular faculty member. By consent only.
1 or more units, any quarter (Staff) by arrangement

PRIMARILY FOR GRADUATE STUDENTS

4 units, Win (Staff) MWF 1:15
lab by arrangement

207A. Digital Control Design—The digital computer in feedback control. Sampling, z-transforms, digital filters, discretization of continuous compensation, discrete compensation design, quantization errors. Root-locus and frequency response design methods. Laboratory experiments on a personal computer with an interface to an analog system. Limited enrollment. Prerequisite: 105A.
3 units, Aut (DeBra) TTh 11-12:15
Win (Parkinson) TTh 8-9:15
Spr (Rock) TTh 11-12:15

207B. State-Space Digital Control Design—Design of digital control systems using the state-space approach. Pole placement and introduction to LQR design methods for the single-input single-output case. Least squares identification of an unknown system. Laboratory experiments on a personal computer with an interface to an analog system. Prerequisites: 207A, Math. 103 or Electrical Engineering 363, or Mechanical Engineering 200A.
3 units, Win (Franklin) MWF 9
Spr (Powell) TTh 11-12:15

3 units, Spr (Bryson) TTh 2:45-4

3 units, Spr (Staff) TTh 8-9:15

213. Current Progress in Worldwide Telecommunications—Seminar survey on trends in worldwide standardized services. Examples: Integrated Services Digital Networks (ISDN), broadband services based on fiber optics, choice between video cables and fiber optics, choice between video cables and broadcasting satellites. Documentary sources are the publications of the International Telecommunication Union (ITU). Focus is on competitive interactions or technology, entrepreneurship, and governmental control or regulation for divergent national markets. Individual study of technical standardization and related cases may be continued under Engineering-Economic Systems 292.
3 units, Spr (Staff) TTh 8-9:15

220A. Methods of Mathematical Physics—(Enroll in Mathematics 220A.) 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, with illustration examples. Prerequisite: some familiarity with differential equations and functions of a complex variable.

3 units, Aut (Keller)

220B. Methods of Mathematical Physics—(Enroll in Mathematics 220B.) Continuation of 220A.
3 units, Win (Ward)

220C. Methods of Mathematical Physics—(Enroll in Mathematics 220C.) Continuation of 220B.
3 units, Spr (Lowengrub)

221. The Nature of Technology in Modern Society—(Same as VTSS 106.) Development of unified consideration of technology, science, society, and human values. Basic patterns underlying the physical bases of human societies. Systems covering areas of major human concern and the disciplines that study them. The world views of technology, science, and other disciplines, and the problems and advantages associated with combining them. Necessary routes to better connect science and technology with society and values, and suggested agenda for clarification of unresolved conflicts and for the provision of a better basis for cooperative interdisciplinary work. The bases of cooperation in groups. Limited enrollment. (DR:5)

4 units, Spr (Carnochan, Kline)

235A,B. Space Systems Engineering—40-50 students, mostly from engineering and science, but also from business, form a team to prepare a preliminary design study of a space system. Systems designed in previous years include a Mars Exploration System, International Weather Systems, and Shuttle-Launched Science Platform System. About 20 invited speakers from government and industry give 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. Prerequisite: senior or graduate standing in engineering or physics, or consent of instructor.

235A. 3 units, Win (Lusignan) TTh 12:30-2:30 and two hours by arrangement

235B. 3 units, Spr (Lusignan) TTh 12:30-2:30 and two hours by arrangement

270A. Introduction to Modern Optics—Recent developments in modern optics. Two term sequence. Emphasis is on understanding of physical principles. Topics: geometrical optics, ray matrices, Maxwell's equations, interferometry, diffraction phenomena using Fourier optics. Prerequisite: some familiarity with Fourier transforms.

3 units, Aut (Hesselink) MW 2:15-3:30

270B. Advanced Modern Optics—Sequel to 270A, emphasizing recent developments in modern optics with applications in signal processing and imaging. Topics: optical signal properties of materials, polarization, photorefractive, optical signal processing, and optical computing. Prerequisite: 270A, or equivalent.

3 units, Spr (Hesselink)

280. Bioengineering Seminar—(Same as Mechanical Engineering 280.) Invited speakers present research topics at the interfaces of biology, medicine, physics, and engineering. Primarily for graduate and medical students.

1 unit, Aut. Win, Spr (Carter) T 4:15

297A,B,C. Ethics of Development in a Global Environment (EDGE)—(Same as Political Science 140A,B,C.) A series of speakers on current development issues emphasizing problems of poorer nations. Autumn Quarter: basic world resources (energy, food, housing, population, and environment) and the political development and dependencies of developing regions. Winter Quarter: 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: the roles of individuals in national and international institutions dealing with the problems of developing countries. The speakers represent a range of political, professional, and national backgrounds and present candid and differing points of view. Gives students who plan to work in developing countries, or in institutions dealing with developing countries, a better knowledge of the challenges and issues with which they must deal. One unit credit for attendance of the speaker series; 3 units additional credit for optional workshops treating selected issues in more depth. (Sequential registration not required.)

1 or 4 units, Aut, Win, Spr (Fagen, Lusignan) lecture W 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 1 unit, without letter grade; a letter grade is given for talks.

1 unit, Aut, Win, Spr (Staff) T 4:15

299. Special Studies in Engineering—Special studies, laboratory work, or reading under the direction of a faculty member. Students enroll in the section number corresponding to the
particular faculty member. Consent of the instructor only.
1 or more units, any quarter (Staff) by arrangement

AERONAUTICS AND ASTRONAUTICS

Emeriti: (Professors) Holt Ashley (on active duty), John V. Breakwell (on active duty), Chi-Chang Chao, Nicholas J. Hoff, Krishna-murti Karamcheti, Erastus H. Lee, Jean Mayers, Richard S. Shevell (on active duty), Walter G. Vincenti
Chairman: George S. Springer
Associate Chairman: Daniel Bershader
Professors (Research): Dean R. Chapman, Leonard Roberts
Associate Professor: Stephen Rock
Assistant Professors: Fu-Kuo Chang, Ilan Kroo, Sanjiva Lele
Consulting Professors: David Altman, Robert T. Jones, Harvard Lomax, Emery Reeves, Vincent Salmon, Fredric H. Schmitz, Clarence A. Syvertson, Steven W. Tsai
Visiting Professor: Nicholas Rott

This department prepares students for professional careers 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—one oriented toward the sciences, the other emphasizing engineering. Specific programs are available in the following areas:
Acoustics
Aerodynamics
Aerelasticity
Aerophysics and Experimental Space Science
Aerospace Robotics
Aerospace Structures
Aerospace Systems Synthesis and Design
Analytical and Experimental Methods in Solid and Fluid Mechanics
Biomedical Solid and Fluid Mechanics
Composite Materials
Computational Fluid Dynamics
Flight Mechanics
Gaskinetics
Guidance and Control
Hypersonic and Physical Gas Dynamics
Modern Optical Diagnostics in Fluid Mechanics
Propulsion
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
Aerelasticity
Aircraft Performance and Control
Applied Aerodynamics
Astrodynamics
Bio-Fluid Mechanics and Physiological Acoustics
Computational Fluid Dynamics
Control of Flexible Spacecraft
Control of Robots, including Space Robots
Conventional and Composite Structures/
Materials Systems Optimization
Differential Games
Experimental Space Sciences
Geophysics
Hypersonic Aerophysics and Trans-Atmospheric Flight
Hypersonic Flight
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
Shock Tube Studies of Vortex Interactions
Structural Aeroacoustics
Wave Propagation

INSTRUCTION AND RESEARCH FACILITIES

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 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^-6 g); spacecraft thrustor evaluation chamber for force measurement down to a dyne; spherical gyro rotors 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 tethered satellite simulation and 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 flatter 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.

The Aerospace Robotics Laboratory (ARL) is developing advanced robot systems and control techniques applicable to industrial automation and space robotics. Experimental research facilities include: very-flexible-beam manipulators, SCARA, configured manipulators with flexible drive trains, quick mini-manipulators, and pairs of cooperating manipulators. A collection of model free-flying space robots that experience the dynamics of space through the use of air-cushion support systems allows work in space manipulator system dynamics.

The ARL computing facilities include a dozen Sun-3 and Sun-4 workstations for control system design, analysis, and simulation, for real-time software development, for mechanical and electrical CAD, and for documentation. The workstations are complemented by a collection of real-time control computers networked via the lab-wide LAN. These microprocessor-based, single-board computers are used in multiprocessor configurations for implementing and testing control algorithms on experimental hardware.

The ARL and the Computer Science Robotics Laboratory are the partners in Stanford's Center for Automation and Manufacturing Science (CAMS). An ultra-precision machining laboratory is also part of the center.

Research in hypervelocity fluid dynamics, aerophysics, and vortex interactions makes use of the Stanford high-pressure shock tube, a device that 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, especially holographic interferometry and high-speed spectroscopy.

Research in turbulent reacting flows is carried out in the Turbulence/Combustion Laboratory. This laboratory is centered around a variable pressure flow facility which permits studies of reacting flows under pressure conditions ranging from vacuum to 10 atmospheres. The apparatus is fully instrumented for laser diagnostics and fast local data acquisition. Current research includes studies of pulsed flames, development of particle tracking velocimetry, and visualization of the small scale structure of turbulent jets.

Diagnosties of shock-wave phenomena emphasize modern optical methods, including resonant interferometry and holography. Other recently outfitted laboratories deal 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 freeflight range equipment, and hot-wire application with a small low-turbulence air-flow apparatus. An experiment using laser holography is currently being designed. A continuous low-speed wind tunnel with an 18" x 18" working section and speeds to 200 feet per second is available for use in instructional laboratories and research. Cooperative programs between the department and the nearby NASA-Ames Research Center have permitted research students access to several of the extensive collection of fluid- and aero-dynamic research facilities and advanced instrumentation at the NASA labs.

Excellent facilities exist in the Fourier Optics and Optical Diagnostics Laboratory for the development and evaluation of new diagnostic
techniques, including stable continuous wave and pulsed laser sources, extensive optical and electronic equipment, and a complete stand-alone digital image processing computer, linked to a Sun 3-260, several Sun work stations, and two Silicon Graphics Iris machines.

The Experimental Fluid Dynamics group has developed an extensive capability in modern, state-of-the-art optical diagnostics methods for fluids studies, including several applications of laser techniques, interferometry, and Fourier optics. Special opportunities exist for students with overlapping interests in fluid dynamics and experimental physics.

Included among the facilities in the Durand Building are the Structures and Composites Laboratories for studying and testing the behavior of small-scale structures of metal and fiber-reinforced composites. Equipment is also available to fabricate composite material structural elements made by autoclave curing and by filament winding.

Service facilities in the building include a full machine shop, chemistry laboratory, an aeronautics library, several conference rooms, and extensive computer equipment including many 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 department has over 100 computers in the Durand Building for use in the academic and research programs. Two clusters of PCs and Macintoshes are available for student use, and each research group is equipped with clusters of PCs, Macintoshes, or workstations.

There are other computer and terminal clusters throughout the campus. Terminals in these facilities provide for individual on-line, time-shared computation with the campus academic computer system (AIR). They are available to all students at no cost for their coursework or unsponsored research.

Through the consortium arrangement between Stanford and the nearby NASA-Ames Research Center, students and faculty have access to one of the best and most extensive collections of experimental aeronautical research facilities in the world, as well as the latest generation of super-computers.

INSTITUTES AND RESEARCH PROGRAMS

Several faculty of the Department of Aeronautics and Astronautics (A.A.) participate in the Center for Space Science and Astrophysics (CSSA). Graduate students in the department can arrange a program which emphasizes astronautics, planetary, and space sciences and to work with faculty associated with CSSA.

At the master's level, a program in Computational Fluid Dynamics (CFD) is an option within the general structure of the master's requirements. At this level, students interested in a still greater emphasis on CFD may register for the M.S. in Engineering or Engineering Science (see below) and design a program in consultation with specialized needs. Students intending to seek a Ph.D. degree with an emphasis on CFD should take the CFD series A.A. 214A, B, C during their master's year. 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. Research topics in CFD are supervised by a number of faculty members in both the Department of Mechanical Engineering and of Aeronautics and Astronautics. Students undertaking theses in CFD generally utilize the large computer facilities of the NASA-Ames Research Center through a cooperative program with the University.

The Joint Institute for Aeronautics and Acoustics (JIAA), co-sponsored by Stanford University and NASA-Ames Research Center, was originated in 1973 to provide long-term cooperative research in conjunction with graduate education. Specializations encompassed by the institute include aerodynamics, fluid mechanics, flight dynamics, systems analysis, guidance, and navigation. The Stanford faculty and staff interface with the center staff, utilizing unique research facilities and experiencing leadership in long-term complex research, as well as resolving problems facing the aeronautics industry. The institute uses several specially designed laboratories: a blow-down facility to study the mixing and acoustic characteristics of jets issuing from different nozzle configurations at both subsonic and supersonic speeds, and an instrument laboratory equipped with data acquisition and analysis equipment with modern mini-computers. A large anechoic chamber and several wind tunnels at NASA are actively used by the JIAA's faculty, staff, and students.

GENERAL INFORMATION

The department has a very active student branch of the American Institute of Aeronautics and Astronautics which sponsors weekly films covering aerospace topics and monthly socials. It also conducts visits to nearby research, government, and industrial facilities, and special events like Shuttle landings.

A brochure describing and illustrating the facilities and programs of the Department of Aeronautics and Astronautics is available on re-
quest to the student services manager of the department.

ADMISSION
To be eligible for registration in the department, a student must have received the bachelor's degree in engineering, physical science, mathematics, or an acceptable equivalent. Students who have not yet received a master's degree in a closely allied discipline should apply to the master's program; eligibility for the Ph.D. program is considered after the master's year (see "Doctor of Philosophy" below). Applications for all degree programs are accepted throughout the year. (Applications for fellowship aid must be received by February 1 for the next Autumn Quarter.)

Information about admission to the Honors Cooperative Program is contained in the "School of Engineering" section of this bulletin.

WAIVERS AND TRANSFER CREDITS
All students who receive instructor-approved waivers of required courses for the M.S., Engineer, and Ph.D. degrees in Aeronautics and Astronautics by virtue of substantially equivalent and satisfactorily performed coursework at other institutions should have such action documented in their record folders. A format memo (approved by the course instructor and advisor) to the Candidacy Committee via the student services office indicating (1) the Stanford University course number and title, and (2) the institution, number(s), and title(s) of the course(s) wherein substantially equivalent material was treated, will suffice. Compliance with this procedure accelerates 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 taken as a graduate student in which equivalence to Stanford courses is established and for which a letter grade indicator 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 this bulletin.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE
An interdisciplinary program in Aeronautics and Astronautics leading to the Bachelor of Science degree in Engineering is available. 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. As a graduate level department, Aeronautics and Astronautics has no other undergraduate component.

COTERMINAL PROGRAM
This special program allows Stanford undergraduates an opportunity to work simultaneously toward a Bachelor of Science in another field and a Master of Science degree in Aeronautical and Astronautical Engineering. General requirements for this program and admissions procedures are described in the "School of Engineering" section of this bulletin. Admission is granted or denied through the departmental faculty Admissions and Awards Committee. A coterminal student must meet the course and scholarship requirements detailed for the Master of Science below.

GRADUATE PROGRAMS

MASTER OF SCIENCE
The University's basic requirements for the master's degree are outlined in the "Advanced Degrees" section of this bulletin. Students with an aeronautical engineering background 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 engineering may find it necessary to take certain prerequisite courses, which would lengthen the time required to obtain the master's degree. The following are departmental requirements.

SCHOLARSHIP REQUIREMENTS
A minimum letter grade indicator (LGI) of 2.75 is required to fulfill the department's M.S. degree requirements and a 3.0 is the minimum required for eligibility to attempt the Ph.D. qualifying examination. Thus, it is incumbent upon both M.S. 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., A. A. 129, 295, 297, and 298). Insufficient grade points upon which to base the LGI may delay expected degree awards, or, if appropriate, result in refusal of permission to take the qualifying examinations. In any event, candidates with LGIs of 3.0 through 3.2 must request the permission of the Candidacy Committee to attempt the qualifying examinations.

AERONAUTICS AND ASTRONAUTICS (A.A.)
(45 Quarter Units)
All candidates for this degree are expected to meet the basic course (Category A) requirements, provided they have not already taken substantially equivalent courses in fluid me-
The fundamental mathematics prerequisites are calculus, ordinary differential equations, and vector analysis. During graduate study, 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 6 units in applied mathematics taken from: Mech. Engr. 200A or Math. 113 (linear algebra); Mech. Engr. 200B or Math. 131 and 132 (partial differential equations); Mech. Engr. 201 or Math. 106 (complex variables); Comp. Sci. 137 (computer science); Statistics 116 or 110 (probability); A.A. 192; or A.A. 214A; or (2) informally through matriculation in those basic (breadth) and technical electives (depth) courses which strongly emphasize methods of applied mathematics.

Courses used for informal fulfillment of the Category B requirements must be approved in advance by the advisor and the department's Candidacy Chair. Note that 25% of the major-field Ph.D. qualifying examination is devoted to pertinent mathematics. Note, also, that when the mathematics requirement is satisfied via the informal route, 6 units of additional coursework must appear in Category C, technical electives.

C. Technical Electives—Candidates, in consultation with their advisors, 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 one course (taken from either the major or peripheral fields) for each basic course which is waived, and by two courses if the mathematics requirement is satisfied informally.

D. Other Electives—It is recommended that all candidates enroll in at least one humanities or social science course. Practicing courses in, for example, art, music, and physical education, do not qualify in this category.

ENGINEERING
(45 Quarter Units)

Students whose career objectives require a more interdisciplinary program than is possible in the M.S. program in Aeronautics and Astronautics (A.A.) may pursue a program for an M.S. degree in Engineering. This program is described in the School of Engineering "Graduate Programs of Study" section of this bulletin.

Sponsorship by the Aeronautics and Astronautics Department in the more general program requires that the student file a petition for admission to this program before completing 18 units of the proposed graduate program. The proposed program must include at least 12 units of graduate level work in the department and meet rigorous standards of technical breadth and depth comparable to the regular A.A. master of science program. 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 M.S. degree in Aeronautical and Astronautical Engineering.

ACCREDITATION

The ABET-accredited degree of "Master of Science in Aeronautics and Astronautics: Aeronautical and Astronautical Engineering" is available to those students who enter the department's M.S. program with an ABET-accredited B.S. If the ABET-accredited B.S. is not in Aeronautics and Astronautics, the M.S. program must include 6 units of A.A. design courses.

ENGINEER

The University's basic requirements for the Engineer degree are outlined in the "Degrees" section of this bulletin. The following are department requirements. The candidate's study program must fulfill the department's requirements for the master's degree or a sub-
 substantial equivalent. Beyond the master’s degree, a total of 45 units of work is required, including a minimum of 30 units of courses chosen as follows:

1. Twenty-four 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) gas kinetics, (k) guidance and control, (l) physical gas dynamics, (m) propulsion, and (n) waves and vibrations.

2. Six units of free electives.

Candidates for the degree of Engineer are expected to have a minimum letter grade indicator of 3.0 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 coursework at Stanford.

3. The student’s having completed 3 units of a directed research problem (A.A. 290).

4. In the second year of graduate study, the student’s passing an oral Ph.D. qualifying examination given by the department during Autumn and Spring Quarters (following midterm exams but before Dead Week).

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 in which the student requires departmental consultation to complete dissertation work.

University Oral and Dissertation—The Ph.D. candidate is required to take the University oral examination after the dissertation is substantially completed (with the dissertation draft in writing) but before final approval. 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 (four selected faculty members, plus a chairman from a department not represented on the examining committee). The University oral normally occurs toward the end of the fourth graduate year. Once the oral has been passed, the student finalizes the dissertation for reading committee review and final approval. Forms for the Ph.D. reading committee and University oral scheduling are submitted with a one-page dissertation abstract at least three weeks prior to the date approved for the oral by the student’s advisor.

Ph.D. MINOR

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 20 units of graduate level courses in the Department of Aeronautics and Astronautics, following a program (and performance) approved by the department’s Candidacy Chair.

FELLOWSHIPS AND ASSISTANTSHIPS

Fellowships and course or research assistantships are available to qualified graduate students. Fellowships sponsored by Gift Funds, Stanford University, and Industrial Affiliates of Stanford University in Aeronautics and Astronautics, provide grants 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. A half-time course or research assistantship provides a semi-monthly living stipend and a 9-unit tuition grant per quarter. Research assistants may be 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 dissertation.

Further information and application forms may be obtained upon request to the Graduate Admissions Office.

COURSES

100. Introduction to Aeronautics and Astronautics—The principles of fluid flow, flight, and propulsion; the creation of lift and drag, aero-dynamic performance including take-off, climb, range, and landing performance, structural concepts, propulsive 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. (DR:8)
3 units, Aut (Kroo) TTh 11-12:15

104. Dynamic Response—(Enroll in Engineering 104.)

105A. Feedback Control Design—(Enroll in Engineering 105A.)

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 (I. Chang, Billingham, Ballard, Bubenheim, Chichester, Clearwater, Cohen, Des Marais, Hargens, Holton, Kanavarioti, Kanki, Lawless, MacElroy, Tomko, Wydeven) 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. Requirements formally satisfied by four laboratory experiments from the major areas, including fluid dynamics, structural mechanics, guidance and control, and propulsion, or informally through an individual experimental project with a faculty supervisor and approved by the course faculty.
3 units, Spr (Cantwell) lec. first week T, 1:15-4:05; lab T or Th 1:15-4:05

132. Introduction to Modern Optics—(Enroll in Engineering 270A.)

3 units, Win (Salmon) MWF 10

3 units, Aut (Salmon) TTh 1:15-2:30

3 units, Aut (I. Chang) 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. Vehicle equations of motion, their applications to performance and dynamic response, and the forms of aerodynamic data needed for their solution. Review of mathematical formulations for the fluid dynamic laws, leading to statements useful in theoretical aerodynamics. Discussion of the paneling and finite-difference approaches to airload prediction; Green's theorem and source-doublet superposition. Two-dimensional airfoils, incompressible flow, analyzed by superposition methods and by conformal transformation. Estimation of pressure distributions and resultant airloads. Aerodynamics of subsonic finite wings by various methods. Slender wings and bodies. Introductory treatment of boundary layers, viscous drag, displacement effects, and separation. Prerequisites: 100 and 210A, or equivalents.
3 units, Win (Kroo) MWF 10

201A. Fundamentals of Acoustics—Acoustic equations for a stationary homogeneous fluid; wave equation; plane, spherical, and cylindrical waves; harmonic (monochromatic) waves; simple sound radiators; reflection and transmission of sound at interfaces between different media; multipole analysis of sound radiation; Kirchoff integral representation; scattering and diffraction of sound; propagation through ducts—dispersion, attenuation, group velocity; sound in enclosed regions—reverberation; absorption and dispersion; radiation from moving sources; propagation in the atmosphere and underwater. Prerequisites: first year graduate standing in engineering, mathematics, sciences, or consent of instructor.
3 units (Staff) not given 1990-91

204. Classical Aerodynamics—Selected topics emphasizing important results of classical wing theory. Early theories of Lanchester, Kutta and Joukowski. Adaptation of Joukowski theory to modern airfoils and the home computer. Munk's thin airfoil theory. Reverse flow and reciprocal
theorems. Slender wing theory, swept wings, oblique wings. Material for outside reading (NASA RP 1050) and computer program available. Prerequisites: knowledge of elementary aerodynamics and complex variables.

1 unit, Win (Jones) M 3:15-4:15

205. Current Topics in Aerodynamic Design—Fundamental theory and simple computational methods are employed in a survey of recent aerodynamic design developments. Topics: airfoil developments (natural laminar flow, low Reynolds number airfoils, supercritical sections), wing design (optimization, winglets, swept forward, and oblique wings), unconventional configurations (canard, 3-surface, tailless designs), propulsion (prop-fans, propellers, flapping flight), and applications of CFD in aircraft design. "Hands-on" experience with aerodynamic design problems using back-of-the-envelope analyses, micro-computer based programs, and super-computer results. Prerequisite: 200A, preferably 241A.

3 units, Spr (Kroo) MWF 3:15

206. Fluid Dynamics—(Enroll in Mechanical Engineering 258.)

207. Introduction to Turbulence—(Enroll in Mechanical Engineering 261A.)

208. Aerodynamics of Aircraft Dynamic Response and Stability—Alternative to 200A for those interested in control and guidance of flight vehicles. Vehicle equations of motion, emphasizing applications to the analysis of dynamic performance, open-loop stability, and forced response. Forms and sources of aerodynamic data needed for the study of these maneuvers. Static stability and trim. Introduction to theory for airfoils, wings and bodies; paneling methods. Response to small disturbances, the estimation of stability derivatives, and control-surface effects. Natural modes of the aircraft and their relationship to flying qualities. Oblique and sweptforward wings, canards and other modern control configurations. Takeoff, landing, propulsion-system effects, stability and control near the stall. Other topics in applied aerodynamics as time permits. Prerequisites: 100 and 210A, or equivalents.

3 units, Win (Ashley) MWF 10


3 units (I. Chang)

Alternate years, given 1991-92

210A. Fundamentals of Compressible Flow—Emphasis on the development of the full three-dimensional nonsteady field equations and the associated constitutive relations representing the working fluid. Examples 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. Prerequisites: 192 (may be taken concurrently) and Mechanical Engineering 131B or equivalents.

3 units, Aut (Baganoff) MWF 1:15

Spr (Bershader) MWF 1:15

210B. Fundamentals of Compressible Flow—Continuation of 210A with emphasis on more general flow geometry. Use of exact solutions to explore the hypersonic limit. Identification of similarity parameters. Review of solution methods for the linearized potential equation with applications to wings and bodies in steady flow; relation to physical acoustics and wave motion in nonsteady flow. Nonlinear solutions for nonsteady constant area flow and introduction to Riemann invariants. Elements of the theory of characteristics; nozzle design; extension to nonisentropic flow. Real gas effects in compressible flow. Flows in various gas dynamic testing facilities. Prerequisite: 210A.

3 units, Win (Baganoff) MWF 1:15

211. Physical Gas Dynamics—(Enroll in Mechanical Engineering 262A.)

212. Introductory Hypersonic Aerophysics—Characterization of planetary atmospheres in the context of hypervelocity vehicle flight and energy exchange. Dynamic and thermal fluid flow features of the vehicle environment over a wide range of velocities and altitudes. Energies, specific heats, and shock jump analyses for gases with internal excitation, dissociation, and ionization. Introduction to finite chemical rate processes, e.g., vibrational relaxation. Combined effects of viscosity, heat conductivity and dissociation on thermal posture of the boundary layer, surface heat transfer and drag, with application to stagnation-point heat transfer. Block-body radiation and introduction to radiative vs. convective heating of hypervelocity vehicles. Field trip(s) to nearby aerospace facilities. Guest lecturer to discuss a current hypersonic project. Recommended: familiarity with the elementary concepts of compressible flow.

3 units, Win (Bershader) TTh 8-9:15
213. Atmospheric Entry—High-speed atmospheric entry subjects vehicles to intense heating, decelerations, and structural loads. These are formulated and their intensity determined for a variety of flight paths. The trajectories range from nonlifting (ballistic) to constant lift and variable lift paths. Different heat shielding methods and their effectiveness compared. Applications: the Space Shuttle, aerospace plane, Mars return missions, and atmospheric probe vehicles. Comprehension of fundamental physical principles is emphasized. Recommended: understanding of compressible, equilibrium, and real gas flows (210A and/or 212).

3 units, Spr (Tauber) TTh 8-9:15

214A. Numerical Methods in Fluid Mechanics—The basic principles underlying the Navier-Stokes equations. Relations between time-accurate and relaxation methods. Implicit and explicit methods combined with flux splitting and space factorization. Considerations of accuracy, stability of numerical methods, and programming complexity. Prerequisites: a knowledge of linear algebra and Mechanical Engineering 200A, 200B, or equivalent approved by instructor.

3 units, Aut (Lomax) MWF 8


3 units, Win (MacCormack) MWF 11


3 units, Spr (MacCormack) MWF 11


3 units, Win (Warming) TTh 9:30-10:45 alternate years, not given 1991-92

216. Computational Fluid Dynamics Applications—Elements of computational fluid dynamics. Methods of solution for the nonlinear potential; Euler and Navier-Stokes equations emphasizing aerodynamic application. Topics: independent-variable transformation procedures, regeneration techniques, metric differencing algorithms, spacial differencing algorithms and iteration schemes. Selected theoretical concepts are numerically tested with student generated computer programs. Prerequisite: 214A or consent of instructor.

3 units, Spr (Holst) TTh 9-10:15

217. Geophysical Fluid Dynamics—(Enroll in Mechanical Engineering 260.)

218. Similitude in Engineering Mechanics—(Enroll in Mechanical Engineering 206.)


220. Optical Methods in Engineering Science—The design and understanding of modern optical systems. Topics: geometrical optics, aberration theory, systems layout, applications such as microscopes, telescopes, optical processors. Computer ray tracing program is used for class demonstrations and as a design tool. Prerequisite: Engineering 170, or Electrical Engineering 366, or equivalent.

3 units (Hesselink) alternate years, given 1991-92

221. Hypervelocity Flight—Flowfields about advanced aeromaneuvering vehicles at moderate to very high altitudes (around 100 km). The Navier-Stokes equations and the macroscopic gradient vector applied to real gas flowfields including the transport of mass, momentum, energy, chemical species, and surplus charge for dissociating and ionizing gases. The effects of chemical concentration, thermal, pressure and forced diffusion, radiative transfer, and ablation. Consideration of chemical equilibrium, and chemical and thermodynamic nonequilibrium (for flight at very high altitude). Recommended: 212 or equivalent material.

3 units, Aut (Howe) MWF 2:15

222. Modern Developments in Reacting Flows—Advanced treatise on the principles of chemical kinetics at high temperatures and low densities and their effects on the flows around the hypersonic vehicles. Collision processes leading to rotational, vibrational, and electronic excitation; master equation; vibration-dissociation coupling; conservation equations; CFD tech-
niques for reacting flows; effects of chemical reactions on aerodynamic forces and heat transfer rates, and comparison between the calculations and the experimental data from laboratory measurements and flights. Prerequisite: 212 or equivalent.

3 units, Win (Park) MW 2:15-3:30

225. Stochastic Processes in Aeronautics—Applications of probability theory to problems in aeronautics, emphasizing random behavior in fluid, thermodynamic, chemical, structural, and control systems of aerospace interest. The random-walk model introduces basic concepts and provides the common thread connecting the various topics. The time evolution of probability distributions, linking problems in chemical kinetics, rarefied gas flows, thermodynamic nonequilibrium, and finite difference methods in fluid mechanics. Statistical variables, power spectra, correlation functions, transform techniques, the response of a linear system to a random forcing function, and to the statistical theory of turbulence. Stochastic models on microcomputers are part of homework assignments.

3 units, Spr (Baganoff) MWF 1:15 alternate years, not given 1991-92

226. Modern Photodiagnostics in Gasdynamic Research—Introduction to laser-based optical measurement techniques and their applications to aerodynamic and combustion flows. Topics: measurement requirements and methods in modern gasdynamic research; sources of uncertainty and noise in photometric measurements; laser velocimetry, linear and nonlinear laser spectroscopic methods including laser-induced fluorescence, coherent Raman processes, and multi-photon processes. Emphasis is on the fundamental physical principles associated with the use of these processes for gasdynamic measurements. Recommended: 211 and 212.

3 units (McKenzie) alternate years, given 1991-92

227. Atmospheric and Space Physics—(Same as Mechanical Engineering 246.) Introduction to geophysics and astronomy emphasizing 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. The principal features of the interaction of the solar wind with the Earth and other objects in the solar system.

3 units, Aut (Spreiter) TTh 2:45-4:45 alternate years, given 1991-92


3 units (I. Chang) not given 1990-91

230. Basic Aerodynamics of Rotary Wing Aircraft and Power Generators—Recent advances in rotary wing technology as applied to helicopter and VTOL aircraft, and the windmill. Fundamental aerodynamics of rotors, including general momentum theory, blade element theory, and an introduction to vortex theory. Aerodynamic and mission performance of the modern helicopter and other VTOL aircraft using simple preliminary design methods.

3 units (Schmitz) alternate years, given 1991-92

231. Dynamics and Control of Rotary Wing Aircraft—Known methods of controlling the modern helicopter and other VTOL aircraft (tilt-rotor, tilt-wing, jet) and questions of control uniqueness and redundancy. Equations governing flapping and feathering of "rigid" and "soft" rotor systems including rigid blade response to control and body motion inputs. The VTOL aircraft as a dynamic body using linearization techniques. Laplace transform-root locus techniques deduce the vehicle's dynamic stability and open loop response characteristics. These are related to ease of control by a human operator with and without feedback compensation. Emphasis on basic understanding of principles involved. Prerequisite: 230 or equivalent.

3 units (Schmitz, Lebacqz) alternate years, given 1991-92

232. Structural Dynamics and Aeroelasticity of Rotary Wing Aircraft—Handling the aeroelastic problems of rotating blades. The kinematics of finite rotation describe nonlinear deflections in the blade. The principle of virtual work obtains equations of motion including the contributions of simple aerodynamic models. Model and finite element solution techniques compared. Effects of aeroelastic couplings on the stability of rotating blades. Ground and air resonance problems of
233. Preliminary Design and Experimental Methods for Rotary Wing Aircraft—The preliminary design procedures for rotary wing aircraft using graphical and modern computational methods. The important scaling parameters of rotorcraft and procedures for flight testing, wind-tunnel testing, and ground based simulation. A model helicopter is designed, constructed, and flown. Some wind tunnel testing and ground based simulation of a model helicopter is performed. Prerequisite: 230, 231. Recommended: 230, 231.

3 units (Staff)
alternate years, given 1991-92

234. Dynamics, Control, and Flying Qualities of V/STOL Aircraft—The effects of airframe and propulsion system design on manual control of V/STOL aircraft. Topics: influence of mission requirements on pilot control strategy; examples of analytical models of the pilot for use in closed-loop analysis and synthesis; decoupled longitudinal and lateral-directional control during hover and forward flight as an extension of conventional aircraft stability and control, emphasizing the unique features of V/STOL configurations; and coupled six-degree-of-freedom control situations pertinent to specific mission applications of the helicopter. Examples of the influence of coupled airframe-rotor system dynamics for these aircraft. Improvement of control characteristics of the basic aircraft through use of control augmentation systems and the influence of digital systems on the design of these control augmentation modes. Prerequisites: 230, 231. Recommended: 232.

3 units, Win (Schmitz, Staff) MWF 3:15
alternate years, not given 1991-92

235A, B. Space Systems Engineering—(Enrollment in Engineering 235A, B.)

236. Spacecraft Design—Design of unmanned spacecraft and spacecraft subsystems with concentration on identification of design drivers and current design methods. Topics: spacecraft configuration design, mechanical design, structure and thermal subsystem design, attitude control, electric power, command and telemetry, and design integration and operations.

3 units, Win (Reeves) WF 11-12:15

237. Compressible Aerodynamics and Noise of Rotary Wing Aircraft—Potential methods for the aerodynamic analysis of rotary-wing aircraft, generalized to develop the classical vortex analysis, and applied to the incompressible flow problem. Acceleration potential methods are extended to the linear compressible flow problem and to a nonlinear compressible aerodynamic formulation. These techniques are used to formulate the discrete frequency noise of rotary-wing aircraft and horizontal axis windmills. Linear and nonlinear formulations predict rotor impulsive noise. Other sources of rotor noise surveyed as to their relative importance commercially. Prerequisite: 230. Recommended: 231.

3 units, Spr (Schmitz, Yu) MWF 3:15
alternate years, not given 1991-92

240A. Analysis of Structures—Elements of one- and two-dimensional elasticity theory. Boundary value problems; energy methods; analyses of solid and thin walled section beams, trusses, frames, rings, semimonocoque structures. Prerequisite: Civil Engineering 114 or equivalent.

3 units, Aut (Springer) MWF 8-9

241A, B. Introduction to Aircraft Design, Synthesis, and Analysis—The total development of new aircraft systems emphasizing commercial aircraft; the underlying economic and technological factors that create markets for new aircraft from rational and historical viewpoints; methods of determining market demands and system mission performance requirements; techniques of optimizing configurations to comply with requirements emphasizing the interaction of various disciplines—aerodynamics, structures, propulsion, guidance, payload, and ground support; parametric studies; applied aerodynamic and design concepts for use in configuration analysis—airplane layout, wing design, high lift systems, drag, stability and control requirements, and tail sizing. Application to an individually chosen aeronautical system; applied structural fundamentals emphasizing fatigue and fail-safe considerations; design load determination; weight estimation; propulsion system performance and installation; engine types; environmental problems—noise and smoke; performance estimation—takeoff, climb, cruise, and landing. Direct and indirect operating costs prediction and interpretation. Aircraft functional systems—hydraulic, electrical, environmental control; avionics; importance and achievement of aircraft reliability and maintainability.

241A. 3 units, Win (Kroo) MWF 2:15
241B. 3 units, Spr (Kroo) MWF 2:15

3 units, Aut (Rock) MWF 2:15

243A. Spacecraft Attitude Dynamics I—(Enroll in Mechanical Engineering 232A.)

243B. Spacecraft Attitude Dynamics II—(Enroll in Mechanical Engineering 232B.)


3 units, Aut (Ashley) MWF 9

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. 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 9 alternate years, not given 1991-92

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. Topics: optimization, coupling between aeroelastic phenomena and automatic controls systems, and problems of power machinery, windmills, etc. Prerequisite: 244B.

3 units, Spr (Ashley) MWF 10 alternate years, not given 1991-92

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 Mechanics—(Enroll in Mechanical Engineering 242A.)

249B. Nonlinear Continuum Mechanics—(Enroll in Mechanical Engineering 242B.)


3 units, Aut (F. Chang) TTh 1:15-2:30

253A. Waves and Vibrations—(Enroll in Mechanical Engineering 236A.)

253B. Wave Propagation—(Enroll in Mechanical Engineering 236B.)

256. Mechanics of Composites—Fiber reinforced composites. Stress, strain, and strength of composite laminates and honeycomb structures. Failure modes and failure criteria. Environmental effects. Manufacturing processes. Design of composite structures. Individual design project required of each student, resulting in a usable computer software. Prerequisite: Engineering II or equivalent.

3 units, Win (Springer) MWF 9

114 SCHOOL OF ENGINEERING

the materials. Prerequisites: 256 or consent of instructor.

3 units, Spr (F. Chang) MF 8:30-9:45

261A. Introduction to Turbulence—(Enroll in Mechanical Engineering 261A.)

268. Digital Image Processing—Topics: physical descriptions of continuous images; properties of the human visual system; sampling and quantization of image; matrix representation of image forming and image processing system; unitary transforms; image enhancement and restoration; scene matching and recognition, and applications. Demonstrations. Students write image processing algorithms. Prerequisites: Electrical Engineering 261 or equivalent, Mathematics 113S or Electrical Engineering 363.

3 units (Powell) alternate years, given 1991-92

270. Linear System Theory—(Enroll in Electrical Engineering 363.)

271A. Dynamics and Control of Spacecraft and Aircraft—The dynamic behavior of spacecraft and aircraft, and the design of automatic control systems for them. For spacecraft in orbit: natural longitudinal and lateral dynamic behavior and the design of attitude control systems using combinations of gravity gradient, reaction thrusting and reaction wheels or control moment gyros. For aircraft: natural longitudinal and lateral dynamic behavior and the design of autopilots for flight path control, automatic landing, etc. Prerequisites: 200A or 208, 242, Engineering 105, or equivalents.

3 units, Spr (Cannon) MW 11-12:15


3 units, Aut (Bryson) MWF 8


3 units (DeBra) alternate years, given 1991-92


3 units (Powell) alternate years, given 1991-92

273A. Digital Control Design—(Enroll in Engineering 207A.)

273B. State-Space Digital Control Design—(Enroll in Engineering 207B.)

273C. Optimal Control and Estimation—(Enroll in Engineering 207C.)

275. Fluid Power Control—(Enroll in Mechanical Engineering 229.)

276. Control System Design and Simulation—(Enroll in Engineering 206.)

277. Nonlinear Control—(Enroll in Engineering 209.)


3 units, Win (Bryson) TTh 2:45-4


3 units, Win (Breakwell) MWF 11

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 8-9:15

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 nonlinear oscillations and orbital analysis; nonlinear resonances. Prerequisite: 279A.

3 units, Spr (Breakwell) MWF 11
alternate years, not given 1991-92

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. Prerequisites: 278A, 279A, or equivalent.

3 units (Breakwell)
alternate years, given 1991-92

280. Rocket Propulsion Fundamentals—Introduction to 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. Prerequisite: thermodynamics or elementary gas dynamics.

3 units, Win (Chang) MWF 3:15

283A. Aircraft Propulsion I—Design and performance of airbreathing engines. Topics: an introduction to 1-D gas dynamics; physical parameters and cycle analysis of ramjets, turbojets, turbosfans 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 11-12:15

283B. Aircraft Propulsion II—The off design and dynamic behavior of airbreathing engines. Topics: 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. Application to the design of a small aircraft gas turbine engine. Prerequisite: 283A or consent of instructor.

3 units (Cantwell)
alternate years, given 1991-92

286. Advanced Space Propulsion—Topics from recent developments in rocket propulsion, solid-fueled ramjet, ducted rocket, hybrid rockets, dual-fuel and mixed-mode rockets, composite engine and trans-atmospheric space propulsion systems, advanced space propulsion concepts, combustion, electric propulsion and applications to satellite control and station-keeping.

3 units (I. Chang, Altman)
alternate years, given 1991-92

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.

1-5 units, any quarter (Staff)

297. Seminar in Mechanics and Control of Flight—Problems in all branches of vehicle control, guidance, and instrumentation presented by researchers on and off 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, Aut, Win, Spr (DeBra) W 4:15

298. Seminar in Fluid Mechanics—(Enroll in Engineering 298.)


2-15 units, any quarter (Staff)
by arrangement


2-15 units, any quarter (Staff)
by arrangement

351A,B,C. Advanced Fluid Mechanics—(Enroll in Mechanical Engineering 351A,B,C.)

370. Advanced Modern Optics—(Enroll in Engineering 270B.)
CHEMICAL ENGINEERING*

Emeriti: (Professor) Andreas Acrivos
Chairman: George M. Homsy

Professors: Michel Boudart, Curtis W. Frank, Gerald C. Fuller, George M. Homsy, Robert J. Madix, Franklin M. Orr, Jr. (by courtesy), Channing R. Robertson, John Ross (by courtesy), Douglass J. Wilde (by courtesy)

Associate Professor: Charles F. Goochee
Assistant Professors: Alice P. Gast, Eric S. G. Shaqfeh

Senior Lecturers: James C. Schlatter, Robert H. Schwaar

Lecturer: Conrad Schadt

Consulting Professors: Daniel J. Auerbach, Ralph Dalla Betta, Enrique Iglesia, Ralph Landau, Helmut Poppa, John F. Rabolt

UNDERGRADUATE PROGRAM
BACHELOR OF SCIENCE

The 45-unit engineering depth sequence required for the Bachelor of Science (see “School of Engineering” section of this bulletin) provides a background in the fundamentals of chemistry and basic training in separation processes, engineering thermodynamics, transport phenomena, process analysis and control, plant design, and applied chemical kinetics. The B.S. program in Chemical Engineering additionally requires basic courses in physics, mathematics, chemistry, and engineering.

Otherwise, there is no set B.S. program for Chemical Engineering to follow. A sample program is available from the department’s 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 coursework is available for graduate 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 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, Computer Science, Electrical Engineering, Materials Science and Engineering, Mechanical Engineering, Operations Research, Applied Physics, Biological Sciences, Chemistry, Mathematics, Physics, Statistics, and the School of Earth Sciences, and (b) all upper-division undergraduate courses in Biological Sciences, Computer Science (108 and above), Mathematics, Physics, and Statistics. (2) Undergraduate courses in chemical engineering excluding 100, 110, 120, 130, 180A,B may be included as part of the 45-unit master’s program. Departures must be approved by petition of the student to the chairman of the Department of Chemical Engineering. Credit toward the M.S. degree is not given for Chemical Engineering Special Topics courses numbered 270-278, or for the colloquium, 300. Note, however, that the student must register for 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; 290, however, may not be substituted for any of the required four lecture courses in the Chemical Engineering Research 200-lecture series. A written report describing the results of this research must be submitted to and approved by the research advisor.

To ensure that an appropriately balanced program is taken by all M.S. candidates, the student’s program must be approved by the departmentally appointed graduate advisor, and a program proposal for the master’s degree 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 45-unit M.S. degree requirements must be taken for letter grades, if offered, with the minimum average letter grade indicator of 3.0.

* The curriculum leading to the B.S. degree in chemistry is described in the “School of Humanities and Sciences” section of this bulletin.
ENGINEER

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 coursework (excluding chemical engineering courses numbered 270-300) including 220, 221, 222, 230, and 231, and a minimum of 27 units of research are required. The remaining electives must be advanced technical courses chosen with the consent of the departmental advisor according to the guidelines noted for the M.S. in Chemical Engineering. All courses must be taken for a letter grade, if offered, and a minimum average letter grade indicator of 3.0 must be maintained.

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 degree, a student may request to be examined on the Engineer 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 81 total units (including research) and 48 units of coursework is required for the Ph.D. degree, including 220, 221, 222, 230, and 231. 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 is eligible to apply for the M.S. degree in Chemical Engineering. The remaining courses, to total 48 units, may be chosen from the basic sciences and engineering and must include at least one additional graduate chemical engineering course. Students may participate in a research project during their first year. Following consultation with their advisor, they may register for up to 6 units of chemical engineering research. These research units may be applied toward the 36-unit requirement for the M.S. but may not be applied toward the 48-unit course requirement for the Ph.D. degree. No credit is 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 an average letter grade indicator of 3.0 must be maintained.

Teaching Requirement—All Ph.D. candidates, regardless of the source of their financial support, are required to gain teaching experience as an integral part of graduate training in the Department of Chemical Engineering.

Qualifying Examination—To be advanced to candidacy for the Ph.D. degree, the student must pass a preliminary qualifying examination. First-year students are 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 is used as the basis for deciding whether or not these students will be allowed to choose research advisors and begin thesis research in the Spring Quarter of their first year. Failure of this examination leads to termination of the student’s study with an M.S. degree and precludes financial aid beyond that already promised. Students passing the examination described above take a qualifying examination consisting of an oral defense of their research work before the faculty early in the Autumn Quarter of their second year.

Dissertation 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 in 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 dissertation, 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 is scheduled. This exam, based on the candidate’s dissertation research, is in the form of a public seminar followed by private questioning by an examining faculty committee. After satisfactory performance in the examination and submission of the dissertation to the Graduate Program Office, 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, applied statistical mechanics, equilibrium and transport properties of colloidal dispersions, polymer adsorption, rheo-optics of polymeric liquids and
colloidal suspensions, hydrodynamic stability, polymer science, surface and interface science, kinetics and catalysis, 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 1 preceding the start of the academic year for which the award is to be made.

COURSES

PRIMARILY FOR UNDERGRADUATE STUDENTS

20. Introduction to Chemical Engineering—(Enroll in Engineering 20.)
3 units, Spr (Homsy, Robertson)

3 units, Aut (Goochee) MWF 9

110. Equilibrium Thermodynamics—Thermodynamic properties; equations of state; properties of non-ideal systems including mixtures; phase equilibria and chemical equilibria. Prerequisite: Chemistry 171.
3 units, Win (Goochee) MWF 9

120. Separation 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, field flow fractionation. Prerequisite: 110 or equivalent.
3 units, Spr (Gast) MWF 10

130. Principles of Design of Chemical Reactions and Reactors—Chemical kinetics, elementary steps, mechanisms, rate-limiting steps and the quasi-steady state approximations. Ideal isothermal and non-isothermal reactors; design principles. Multiplicity, ignition, and extinction in stirred tank reactors; limitations of thermodynamic equilibrium. Departures from ideality, residence time distributions, dispersion in fixed beds, mass transfer limitations. Prerequisites: 110, 140, 150, Chemistry 171, 173.
3 units, Win (Madix) MWF 11-12:15

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; 100 and Math. 130, or equivalent.
3 units, Win (Staff) MWF 9

150. Energy and Mass Transport—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, Spr (Fuller) MWF 9

160. Chemical Engineering Plant Design—Application of chemical engineering principles to design of practical plants for manufacture of chemicals and related materials. Topics: 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

180A,B—Chemical Engineering Laboratory—Investigation of a number of experimental aspects of chemical engineering science emphasizing development of communications skills. Experiments illustrating subjects covered in the lecture courses 110, 120, 130, 140, 150 have been developed. Six experiments must be performed.
TTh 12-1 plus lab by arrangement
180A. 3 units, Win (Robertson, Frank)
180B. 2 units, Spr (Robertson, Frank)

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 engi-
PRIMARILY FOR
GRADUATE STUDENTS

In addition to the courses listed below, graduate students in chemical engineering are normally expected 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 (Homsky) TTh 9:30-10:45


3 units, Win (Fuller) TTh 9:30-10:45

222. Transport Phenomena II—Continuation of 221 emphasizing boundary layer phenomena, heat and mass transport, transport with chemical reaction, and reaction-diffusion systems. High Reynolds number flows; boundary layers, vorticity layers. Transport for low and high Peclet numbers in unbounded flows; transport in tubes, Leveque approximations; applications in membrane transport; transport in flows with closed streamlines, drops, bubbles, and interphase transport. Prerequisite: 221.

3 units, Spr (Homsky) TTh 9:30-10:45

223. Microrheology—Flow phenomena of polymeric and colloidal liquids; fundamental concepts of rheology; measurement techniques in rheometry; molecular models of dilute and concentrated polymer solution dynamics (both flexible and rigid macromolecules); prediction of rheo-optical properties from molecular models; dynamics of colloidal suspensions.

3 units (Fuller) given 1991-92


3 units, Aut (Fuller) TTh 10:45-12

230. Molecular Thermodynamics—Review of classical thermodynamics. Introduction to statistical thermodynamics; microcanonical, canonical, and grand canonical ensemble; partition function. Application to phase equilibria of polymer solutions; liquid lattice theory; phase diagrams; phase stability. Intermolecular forces and introduction to distribution functions; liquid state theory; integral equations; and perturbation theory.

3 units, Aut (Gast) MWF 2:15-3:30


3 units, Win (Boudart, Madix) MWF 2:15-3:30


3 units, Aut (Goochee) TTh 1:15-2:30


3 units (Frank) given 1991-92
271-279. 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  
271A, B, C. Adsorption and Catalysis. (Boudart)  
272A, B, C. Biochemical Engineering. (Goochee)  
273A, B, C. Bioengineering. (Robertson)  
274A, B, C. Microrheology. (Fuller)  
275A, B, C. Surface and Interface Science. (Madix)  
276A, B, C. Polymer Physics. (Frank)  
277A, B, C. Stability of Fluid Motions. (Homsy)  
278A, B, C. Statistical Mechanics of Dispersed Systems. (Cast)  
279A, B, C. Transport Mechanics. (Shaqfeh)  

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  

300. Colloquium—Students 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: Haresh C. Shah  
Associate Chairmen: Paul V. Roberts, Clyde B. Tatum  
Associate Professors: David L. Freyberg, Dunja Gričić-Galić, Anne S. Kiremidjian, Peter K. Kitandis, Peter M. Pinsky (on leave Spring)  
Professors (Research): C. Allin Cornell, Martin Reinhard, Paul M. Teicholz  
Professor (Teaching): Gilbert M. Masters  
Courtesy Professors: Thomas J. Hughes, George S. Springer  
Lecturer: John F. Cory III  
Acting Assistant Professor: Bruce D. Honeyman  
Consulting Professors: John A. Blume, John F. Peel Brahtz, Angelos N. Findikakis, Hasan Kamil, Michael C. Kavanaugh, Robert W. Medearis, Anshel J. Schiff, Charles Thiel, Jr., Theodore C. Zsutty  
Consulting Associate Professors: Robert E. Clark, Stephen F. Klitz, John C. Kunz, Martin W. MacCann, Piotr D. Moncearz, Michael W. Walton  
Consulting Assistant Professor: Viorica Lopez-Avila  

The undergraduate curriculum 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 fundamentals, permit students to obtain either a broad general civil engineering education or a more specialized education in a specific branch, such as construction, environmental engineering, water resources, structures, or a great variety of other branches. Laboratory facilities are available to students in construction, fluid mechanics, environmental engineering and science, struc-
tural and earthquake engineering, and experimental stress analysis.

At least one year of graduate study is strongly recommended for the professional practice of civil engineering. Students who contemplate advanced study at Stanford should discuss their plans with their advisors in the junior or senior year. The coterminal B.S.-M.S. program should be considered by students desiring an integrated five-year program.

The Civil Engineering Department, in collaboration with other departments of the University, offers graduate degree programs in: Construction Engineering and Management Environmental and Water Studies Environmental Engineering and Water Resources Science Structural Engineering and Geomechanics Geomechanics Structural Engineering Research work and instruction under these programs is carried out in the following facilities: the building energy laboratory, the concrete laboratory, the Environmental Fluid Mechanics Laboratory (EFML), the Stanford Construction Research Laboratory (SCRL), the structural engineering laboratory, and the water quality control research and teaching laboratories. Research in earthquake engineering is conducted in the John A. Blume Earthquake Engineering Center, and the Stanford/USGS Institute for Research in Earthquake Engineering and Seismology. Research on control of hazardous substances is coordinated within the Western Region Hazardous Substance Research Center. Office space is provided for most of the graduate students who are research or teaching assistants. In addition to these departmental centers and laboratories, a new center has been formed in collaboration with the Department of Computer Science. The major thrust of the Center for Integrated Facilities Engineering (CIFE) is to employ advanced CAD database, artificial intelligence, and communications concepts to integrate the presently fragmented participants in the facility development process and to facilitate construction automation. CIFE is stimulating significant new research and educational activities in the two departments.

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. It 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 include: estimating; equipment and methods; planning and control techniques; planning and control applications; managing human resources; project and company organizations; concrete construction; building systems; 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 program leads to the degrees of Master of Science, Engineer, and Ph. D. Students with undergraduate degrees in chemical, electrical, mechanical, mining, or petroleum engineering who do not wish to satisfy the undergraduate prerequisite courses for the Master of Science in Civil Engineering-Construction Engineering and Management degree, have the option of meeting the same graduate course requirements as the above and obtaining the Master of Science in Engineering-Construction Engineering and Management degree. A limited number of graduate students are supported each year through the sponsored research activities of the Stanford Construction Research Laboratory.

The Construction Program faculty and students are active participants in the new Center for Integrated Facilities Engineering (CIFE), launched in 1987. Several current post-M.S. students are working on problems involving design-construction interface issues and are obtaining second M.S. degrees in Computer Science or Artificial Intelligence.

The program maintains very close ties with the construction industry through the Stanford Construction Institute. Students participate in weekly discussions with visiting lecturers from all sectors of the U.S. construction industry.

ENVIRONMENTAL AND WATER STUDIES

This program covers a broad spectrum of specialties, including environmental engineering and science, water resources, 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 environmental and 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 program are in environmental engineering and science and in water resources.

Within the Environmental Engineering and Science Program a major focus is on water, but much broader aspects of environmental concerns and planning activities are covered as well. Thus, the chemical, biological, and engineering aspects of water supply, water pollution and hazardous substance control and the fate and effects of pollutants in surface and ground waters can be covered in depth through the environmental engineering and science courses. Additional courses are available in air pollution and in environmental planning and impact assessment. Research on hazardous substances is coordinated through the Western Region Hazardous Substance Research Center. The objective of this newly formed center, sponsored by the U.S. Environmental Protection Agency, is to promote through fundamental and applied research the development of alternative and advanced physical, chemical, and biological processes for the treatment of hazardous substance in the environment, with an emphasis on groundwater contamination.

The Water Resources Program focuses on developing an understanding of the physical processes controlling the movement of mass, energy, and momentum in the water environment. The program also considers environmental and institutional issues involved in planning water resources development projects. Environmental fluid mechanics courses address fluid transport and mixing processes, turbulence and its modeling, the fluid mechanics of stratified flows, natural flows in coastal waters, estuaries, lakes and open channels, and experimental methods. Hydrology courses consider stochastic methods in both surface and subsurface hydrology, watershed hydrology and modeling, and flow and transport in porous media. Planning courses emphasize environmental policy implementation and the concept of sustainable water resources development. Courses from many other programs and departments both complement and supplement the Water Resources Program offerings. Some examples include: Environmental Engineering and Science (chemical and microbiological processes), Mechanical Engineering (applied math, fluid mechanics, heat transfer, experimental methods), Applied Earth Sciences (hydrogeology, geostatistics), Computer Science (numerical methods), Petroleum Engineering (reservoir engineering, well-test analysis), Statistics (probability and statistics).

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. The Stanford laboratories for water quality control and environmental fluid mechanics are well-equipped and instrumented for advanced research and instruction.

STRUCTURAL ENGINEERING AND GEOMECHANICS

Structural engineering encompasses teaching and research programs in earthquake engineering and structural dynamics, risk and reliability analysis, structural analysis and design, and computational mechanics. The programs are designed to provide a broad knowledge in these fields and to prepare students for industrial or academic careers. Academic programs can be designed to meet the needs of students wishing to launch careers as structural analysts, designers, and consultants on large and small projects. Students have the opportunity to balance strong engineering fundamentals with modern computational methods.

Coursework in earthquake engineering and structural dynamics provides an understanding of the earthquake phenomenon, the resulting ground shaking, and in-depth knowledge on the behavior, analysis, and design of various types of structures under seismic or other dynamic forces. Advanced analytical and experimental research in earthquake engineering is conducted at the John A. Blume Earthquake Engineering Center, which houses static and dynamic testing equipment, including two shaking tables. The VAX8350 computer facility and the microcomputer clusters at the center are available for instruction and research work by students and faculty. Research at the interface between earthquake engineering and the earth sciences is conducted at the Stanford/USGS Institute for Research in Earthquake Engineering and Seismology.

The Reliability and Risk Analysis Program focuses on instruction and research in advanced methods for structural safety evaluation and design, and methods for loss estimation from damage and failures of structures. Coursework combines strong background in structural analysis and design with probability theory and statistics. An integral part of research in this
program is seismic risk and reliability of large structural systems.

The Structural Analysis and Design Program focuses on conceptual and detailed design of structural systems and on computational methods for predicting the static and dynamic response of structures. Included are courses that emphasize earthquake resistant design and computer-aided design. Related coursework is available from other departments such as mechanical engineering, materials science and engineering, and computer science.

The Computational Mechanics Program emphasizes the application of modern computing methods to structural engineering and geomechanics. It draws on the disciplines of mechanics, mathematics, and computer science, encompasses numerical structural and geometrical analysis, including finite element analysis.

Students with primary interests in the application of the principles of applied mechanics to problems involving geologic materials have the option of enrolling in a degree program in Geomechanics. This program focuses on instruction and research in theoretical soil and rock mechanics, computational methods, and analysis and design of foundations and earth structures. In addition to the program's course offerings, related courses are available in structural engineering, earth sciences, water resources, and construction engineering.

Structural Engineering and Geomechanics faculty and students also work at the Center for Integrated Facility Engineering utilizing modern CAD and CAE facilities.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Students who major in Civil Engineering must complete the requirements for the B.S. degree listed under "Undergraduate Programs" in the School of Engineering section of this bulletin. Suggested courses to be taken in satisfaction of the requirements in mathematics, science, and engineering fundamentals are available from the Civil Engineering office. 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.

HONORS PROGRAM

This program leads to a Bachelor of Science with Honors in Civil Engineering. It is designed to encourage highly qualified students to undertake a more intensive study of civil engineering than is required for the normal major, with courses and research work of high distinction.

The program involves an in-depth research study in an area proposed to and agreed to by a Civil Engineering (C.E.) 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 a letter grade indicator of at least 3.5 for coursework at Stanford, and this grade record must be maintained to graduation. The thesis is supervised by a C.E. faculty advisor, and must involve input from the School of Engineering Writing Program via Engineering 102S or equivalent. Students are encouraged to present their results in a seminar for faculty and other students. Up to 10 units of C.E. 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.

GRADUATE PROGRAMS

Admission—Apply to the Office of Graduate Admissions. Applications require submission of the application form, statement of purpose, three letters of recommendation, results of the Graduate Record Examination, and transcripts of courses taken at colleges and universities. 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 and program for 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 application must be made to the Department of Civil Engineering.

MASTER OF SCIENCE

The University requirements governing the Master of Science (M.S.), the Engineer, and Doctor of Philosophy (Ph.D.) are described in the "Degrees" section of this bulletin.
Programs are available leading to the degree of M.S. in Civil Engineering with the following special field designation on the diploma: Computer-Aided Civil Engineering, Construction Engineering and Management, Environmental Engineering and Science, Geomechanics, Structural Engineering, and Water Resources. Detailed statements of the requirements for all master's degrees and the specific designation may be secured by request to the Civil Engineering Department.

Students admitted to graduate study with a Bachelor's Degree in Civil Engineering (or its equivalent) from an accredited curriculum can satisfy the requirements for the degree of M.S. in Civil Engineering by completing a minimum of three quarters of full tuition registration and a minimum of 45 units of study beyond the Bachelor's Degree. At least 36 of the units must be taken at Stanford. A minimum 2.75 letter grade indicator (LGI) is required for candidates to be recommended for the M.S. degree. No thesis is required.

The program of study must be approved by the faculty of the department and should include at least 45 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. Candidates for the M.S. Degree in Civil Engineering who do not have a Bachelor's Degree in Civil Engineering may, in addition to the above, be required to complete those undergraduate courses that are deemed important to their graduate programs. In such cases, more than three quarters of residence is usually required to obtain the degree.

ENGINEER

A student with an M.S. in Civil Engineering may satisfy the requirements of the Degree of Engineer in Civil Engineering by completing, in residence, 45 or more units of work (3 quarters minimum) including an acceptable thesis (12 to 15 units) and maintaining a "B" LGI average (3.0) or higher. The program of study must be approved by the member(s) of the faculty of the department.

This degree is recommended for those desiring additional graduate education, especially those planning a career in professional practice. The thesis normally should be started in the first quarter of graduate study after the M.S. degree. Programs are offered in the fields of specialization mentioned for the M.S. degree.

DOCTOR OF PHILOSOPHY

The Ph.D. is offered under the general regulations of the University as set forth in the "Degrees" section 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 complete the equivalent of one 50 percent time teaching assistantship for one quarter. Further information about Ph.D. requirements and regulations is found in the department handout "Information and a Typical Timetable for the Ph.D. Degree."

The first year of graduate study can be represented by the M.S. program described above. The second year is devoted partly to additional courses of graduate study and partly to the preliminary work toward a dissertation. The third and subsequent years are applied to further coursework and to the completion of an acceptable dissertation.

The program of study is 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 serves 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. Following essential completion of research, students are required to pass the University oral examination, which is a dissertation defense.

Ph.D. MINOR

A Ph.D. minor is a program outside a major department. A minor is not a requirement for any degree, but is available when agreed upon by the student and the major and minor departments. Requirements for a minor are established by the minor department. Acceptance of the minor as part of the total Ph.D. program is determined by the major department. Application for candidacy must be approved by both the major and the minor department, and
the minor department must be represented at the University oral examination. A student desiring a Ph.D. minor in Civil Engineering (C.E.) must have a minor program advisor who is a regular C.E. faculty member in the program of the designated subfield. This advisor must be a member of the student's University oral examination committee and the reading committee for the dissertation.

The program must include at least 20 units of graduate-level coursework (i.e., courses numbered 200 or above, excluding special studies and thesis) in C.E. completed at Stanford University. The list of courses must form a coherent program and must be approved by the minor program advisor and the C.E. chairperson. An average LGI of at least 3.0 must be achieved in these courses.

FINANCIAL ASSISTANCE

The department maintains a large and continuing program of financial aid for graduate students. Applications for financial aid and assistantships should be filed by January 1; it is important that GRE scores be available at that time.

Teaching assistantships carry stipends for as much as one-half time work as teaching aides during the academic year. Research assistantships also are 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 Ph.D. 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.

COURSES

UNDERGRADUATE

3 units, Spr (Smith) MWF 10

125. Introduction to Computer-Aided Civil Engineering—Introduction to the use of computer hardware and software tools in civil engineering practice and research at Stanford. Survey of computer-aided engineering (CAE) and introduces the computer hardware available, the operating systems for the hardware, the software available on those systems (e.g., text editors, word processors, spreadsheets, interpreters, compilers, communications packages, etc.). Weekly, two-hour lecture on general hardware/software/CAE principles and a weekly, 90-minute interactive lab presenting hardware/software basics with hands-on practice. Pre/co-requisite: Computer Science 106A or satisfactory equivalent course in structured programming.
3 units, Aut (Howard) Th 3:15-5:30
lab M or T 3:15-4:45

126. Introduction to Computer-Aided Drafting Using Auto CAD—(Graduate students enroll in 211.) Introductory hands-on series of tutorial walks through the basic functions and features of AutoCAD, the leading PC-based drafting software. From simple 2D drafting (plans, elevations, dimensioning) to full 3D modeling, exploring how this technology can be applied to architecture, civil engineering, product design, and urban planning problems.
2 units, Spr (Staff) by arrangement

3 units (Iacofano)
alternate years, given 1991-92

140. Surveying—Care and use of instruments; leveling; topographic surveying; triangulation; horizontal and vertical curves; engineering astronomy. Enrollment limited to 27; priority given to seniors in civil engineering.
4 units, Spr (Cory) TTh 11
lab TTh 1:15-4:05

144. Construction Engineering and Management—Techniques for coordinating decisions and actions of the participants involved in the design and construction of civil engineering projects. 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; appropriate for business or other non-C.E. majors who wish to become "informed buyers" of construction services.
3 units, Win (Staff) MW 11-12:15

145. Construction Equipment and Methods—Construction engineering fundamentals; equipment economics; selection and efficient application of equipment; analysis of production output and costs. Prerequisites: Engineering 10 and 60.
3 units, Spr (Staff) MWF 9; one or more field trips by arrangement

150. Legal and Professional Aspects of Civil Engineering—Fundamental concepts of contract

3 units, Win (Staff) TTh 7:45-9


4 units, Win (Freyberg) MWF 9 T 4:15

161. Open Channel Flow—Study of steady and unsteady flow in man-made and natural channels and rivers. Part I: the basic equations and theory (the mass, momentum, and energy equations). Part II: applying this theory to analyzing steady and unsteady flows. Examples: the design of flood-control channels, flood wave routing in natural systems, and the dam-break problem. Informal laboratory illustrates the concepts developed in class. Prerequisite: Engineering 21 or its equivalent.

3 units, Aut (Koseff) MWF 10


3 units, Win (Koseff) MWF 11

170. Environmental Science and Technology—(Same as VTSS 182.) Introduction to the causes, effects, and methods of controlling environmental degradation. Global warming, stratospheric ozone depletion, urban and indoor air quality, and hazardous waste management. For science and nonscience majors. (DR:8)

3 units, Aut (Koseff) MWF 8

171. Environmental Planning—(Same as VTSS 183; graduate students register for 228.) 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, and water quality impacts. Open to all students. Recommended: 170 and one year of college mathematics.

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

172. Engineering Analysis of Current Environmental Problems—Introduction to engineering methods used for studying and seeking solutions to current environmental problems. Topics: global cycles and their perturbation; regional issues such as acid rainfall and groundwater contamination; and local problems such as indoor air pollution, biomagnification of trace substances, and drinking water purity. Prerequisites: Math. 42, Chemistry 31. Recommended: 170.

3 units, Win (Hildemann, Masters) TTh 11-12:15

176. Small Scale Energy Systems—Theoretical and practical considerations involved in the design of small scale energy systems, emphasizing renewable energy systems and energy conservation. Building energy requirements, passive solar heating, daylighting, photovoltaic and wind electric systems, and solar domestic water heating. (DR:8)

3 units, Spr (Masters) MW 11-12:15

177. Building Energy Laboratory—Measurement of small building heat losses, infiltration, indoor air quality, use of thermal mass. Efficiency measurements of solar thermal and photovoltaic energy systems. Use of the microcomputer as a lab instrument. Prerequisite: concurrent or previous enrollment in 176.

2 units, Spr (Masters) F 11-12:15

one-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 work, area elastic loads; indeterminate analysis by superposition equations, slope-deflection, moment distribution. Introduction to matrix methods and computer methods of structural analysis. Prerequisites: Engineering 11 and a year of calculus. Recommended: 114.

4 units, Aut (Kirmedijian) TTh 10-11:50

181. Design and Steel Structures—Concepts of elastic design of structures; types of loading, structural systems; 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. Prerequisites: Engineering 11 and Civil Engineering 180, or equivalent.

3 units, Win (Law) MW 2:15-4:05

182. Design of Reinforced Concrete Structures—Properties of concrete and reinforcing steel; behavior of structural elements subject to bending moments, shear forces, torsion, axial loads, and combined actions; design of beams, slabs, columns and footings; strength design
and serviceability requirements; design of simple structural systems for buildings. Prerequisites: Engineering 11 and Civil Engineering 180, or equivalent.

3 units, Spr (Krawinkler) WTh 2:15-4:05

190. Geotechnical Engineering—Introduction to basic principles of soil mechanics. Soil classification, shear strength and stress-strain behavior of soils; consolidation theory; analysis and design of earth retaining structures; introduction to shallow and deep foundation design; slope stability. Includes laboratory projects. Prerequisite: Engineering 11.

4 units, Aut (Borja) MWF 11

197A,B,C. Professional Development Seminar—Weekly presentations by practicing engineers on topics relevant to students planning to enter the civil engineering profession. 197B puts students in the role of project managers, designing and building a concrete canoe for national competition. Normally taken by juniors and seniors.

197A. 1 unit, Aut (Staff) F 3:15
197B. 1 unit, Win (Staff) F 3:15
197C. 1 unit, Spr (Staff) F 3:15

199. Directed Reading or Special Studies in Civil Engineering—Practice in execution of an engineering investigation; preparation of a written report on the investigation. Student must obtain a faculty sponsor.

1 or more units, any quarter (Staff) by arrangement

PRIMARILY FOR GRADUATE STUDENTS

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. Prerequisites: graduate standing, Math. 43.

4 units, Aut (Winterstein) TTh 1:15-3:05

204. Structural Reliability—Probability models for loads and resistance; definition of failure events of structural components and systems; statistical uncertainties; first and second order reliability methods; simulation methods in reliability analysis; solution techniques for complex systems; application to structural codes. Prerequisite: 203 or equivalent.

4 units, Spr (Kiremidjian) TTh 10-11:50

211. Introduction to Computer-Aided Drafting using AutoCAD—(Same as 126.) For students who desire graduate credit.

2 units, Spr (Staff) by arrangement

212A,B. Advanced Topics in Computer-Aided Civil Engineering—The use and development of advanced computer tools for civil engineering applications. Topics: software engineering, data structures, user interfaces, database management systems, and computer graphics. 212A: hands-on experience with a variety of software tools and applications of concepts in structured engineering programming, 212B: students work in groups to plan and design medium-size computer applications. Prerequisite: 125 or equivalent.

212A. 4 units, Win (Howard) Th 1:15-2:30
212B. 3 units, Spr (Howard) by arrangement

214. Expert Systems in Civil Engineering—Introduction to applications of Artificial Intelligence to civil engineering problems: relevant concepts from Artificial Intelligence and Expert Systems; illustrations of these concepts through discussion of previous development efforts. Projects involve development of microcomputer-based expert systems that capture knowledge in civil engineering. Instructor guidance and critique of applications at all stages of development. Class size limited; enrollment by permission of instructor. Prerequisite: 210 or equivalent.

4 units, Spr (Levitt) MWF 10 one-hour lab by arrangement

218A,B,C. Seminar in Computer-Aided Civil Engineering—Seminar on ongoing research in the department and elsewhere on advanced computer applications in civil engineering. Each CACE student presents one or more seminars in the series. Strongly recommended for CACE students; others admitted by permission of instructor.

1 unit, Aut, Win, Spr (Howard, Levitt) T 12:15-1:05

223. Architecture-Process and Practice—Overall view of the process and practice of architecture. Taught by five practicing architects and one contractor, and coordinated and supported by the Center for Integrated Facility Engineering (CIFE). Each stage of the architectural life cycle is presented by one of the outside faculty including design awareness (spaces, forms, organization), site planning and layout, programming of requirements, design, administration and project management, construction management (cost, schedule). The technology used by architects. The design of a homeless shelter (by student teams) illustrates each aspect
of the course. Open to juniors, seniors, and graduate students. Enrollment limited to 25.

3 units, Aut (Teicholz, Staff) MW 9
lab F 12:30-3:20

228. Environmental Planning—(Same as 171.)
Additional assignments for students who desire graduate credit.
4 units, Win (Ortolano) TTh 1:15-3:45
alternate years, not given 1991-92

240. Analysis and Design of Construction Operations—Understanding, analyzing, designing, and improving work at the site. Data acquisition, analysis, simulation, modeling, and design. Emphasis on work methods development, productivity, and safety. Corequisite: 241 or equivalent experience.
4 units, Aut (Staff) TTh 8-10

241. Techniques of Project Planning and Control—Analytical techniques for planning and controlling the design and construction of projects. Concepts of networking techniques including treatment of uncertainty, subnetworks, resource allocation and leveling, time/cost tradeoffs and specification requirements.
3 units, Win (Staff) TTh 9-10:30

242. Cases and Special Topics in Managing Construction—Integration and application of techniques for managing individual construction projects and construction companies. Case studies for application of techniques covered in the prerequisite courses. Techniques for strategic planning in construction companies. Requires individual and group efforts on problems and case studies. Prerequisites: 240, 241, 250, or instructor's permission.
3 units, Spr (Tatum) TTh 9-10:50

243. Computer Applications in Construction—Analysis, design, development, and implementation of computer-based systems for construction engineering and management. Supporting topics cover computer hardware and software technology. Seminar-laboratory requires individual and group projects, building upon construction knowledge and experience. Enrollment limited to 20; priority given to students in graduate construction program. Prerequisites: 210, 240, and a computer course equivalent to Engineering 70A.
5 units (Paulson, Katz) not given 1990-91

3 units, not given 1990-91

247. Construction Finance—In-depth look at the problems of a chief financial officer for a medium size construction company. Banking relationships, lines of credit, letters of credit, loans, dealing with bankrupt or insolvent suppliers and subcontractors, and examination of investment policies and procedures.
3 units, Win (Medearis) MWF 8

248. Construction Financing in Real Estate and Land Development Problems—The interrelationships between all of the variables that make up a successful real estate project. Emphasis is on financial aspects involved in land acquisition, land development, construction, permanent lending, and project management. Also, aspects of joint venturing, including the control of functions and equity financing. Enrollment limited to 20; priority given to students in the graduate construction program. Prerequisites: Engineering 60, Industrial Engineering 133 or equivalent.
3 units, Spr (Medearis) MF 7:30-8:50
plus one hour by arrangement

249. Labor and Industrial Relations in Construction—The history, laws, institutions, and social and economic forces affecting labor and industrial relations in construction; covers union and open-shop sectors.
3 units, Spr (Clark, Walton) W 3:15-6:05

250. Organization and Management of Human Resources in Construction—A theoretical framework and group problem solving exercises to understand the behavior of people in the workplace: individually, in small groups, and in organizational units. A systematic approach for the analysis of a project or company's coordination requirements, and for the design of a system of market, hierarchical, and social coordination devices to facilitate the work of interdependent teams of specialists in project-oriented activities. Students work in small groups to develop solutions to case study problems assigned weekly.
4 units, Aut (Levitt) MW 2:15-3:30

251. Economics of the Construction Industry—Micro- and macroeconomics of the construction industry. Macroeconomics stresses markets for resources used in construction (labor, materials, subcontracts, equipment, finance) and market for products of the industry (residential, commercial, institutional, and public works facilities). Microeconomics stresses theory of the firm and applied management organizations in the industry. Seminar format, students read literature and prepare and present papers analyzing the structure and function of some part of the con

4 units, Spr (Staff) MW 1:15-3:05

255. Concrete Construction—Technical aspects of the methods and operations involved in concrete construction. Includes concrete production, formwork, field operations for transporting, placing, finishing, and curing, and special techniques.

4 units, Aut (Tatum) MW 9-11

257. Building Systems and Industrial Construction—Analyzes basic design concepts, components and standard materials, and construction operations for major building systems. Topics: heating, ventilating, and air conditioning (HVAC) systems; piping systems; and electrical systems. Coverage of HVAC systems includes types of systems, major components, ductwork, control systems, and testing and balancing. The piping section covers water, waste, fire protection, and process systems, including materials, equipment, valves, installation, and testing. Coverage of electrical systems focuses on power distribution, including wiring, electrical equipment raceway systems, and installation and checkout. Student groups analyze actual building or process systems and prepare oral and written reports describing the design, materials, and construction.

4 units, Win (Tatum) MW 9-10:50

258A,B,C. Donald E. Watson 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) M, T, W, or Th 7:30-10 p.m.

258B. 1 unit, Win (Staff) M, T, W, or Th 7:30-10 p.m.

258C. 1 unit, Spr (Staff) M, T, W, or Th 7:30-10 p.m.

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 consult specialists from the construction industry and use of University facilities. Prerequisites: graduate standing in construction and consent of instructor. See 299 for alternative for individual studies.

259A. 1-3 units, Aut (Staff) by arrangement

259B. 1-3 units, Win (Staff) by arrangement

259C. 1-3 units, Spr (Staff) by arrangement


3 units, Aut (Kitanidis) TTh 8:30-9:50

262. Transport and Mixing in Surface Water Flows—Same as 162 with additional assignments for students who desire graduate credit.

3 units, Win (Koseff) MWF 11

263. Modeling Environmental Flows—Introduction to turbulence concepts and models, and to basic concepts of computer modeling of turbulence. Application of models to open channel, estuary, lake, and reservoir simulations. Use of computer models for flood wave routing in dendritic river systems, for reservoir dynamics and for stream water quality. Prerequisites: 262, 264.

4 units, Spr (Koseff) TTh 8:30-9:50

264. Hydrodynamics—The flow of incompressible, viscous fluid; emphasis on developing an understanding of fluid dynamics that can be applied to environmental flows. Topics: kinematics of fluid flow; equations of mass and momentum conservation (including density variations); some exact solutions to the Navier-Stokes equations; appropriate analysis of fluid flows including Stokes flows, potential flows, and laminar boundary layers; and an introduction to the effects of rotation and stratification through scaling analysis of fluid flows. Prerequisites: Engineering 21 or equivalent; and some knowledge of vector calculus.

3 units, Aut (Monismith) MWF 1:15
265. Sustainable Water Resources Development—Analysis of alternative definitions of sustainable development and "eco-development," and delineation of criteria for judging sustainability of projects. Application of criteria to evaluate the sustainability of water resources development projects in the U.S. and in several developing countries. Cases illustrate the role of political, social, economic, and environmental factors in decision making. Evaluation of benefit-cost analysis, multi-objective project evaluation, and environmental impact assessment as policy instruments for enhancing the sustainability of future projects. Additional class meetings arranged to plan and present term projects. Enrollment limited; preference given to students in Environmental and Water Studies program.

3-4 units, Spr (Ortolano) T 3:15-5:05

266. Environmental Policy Design and Implementation—Analysis of markets, administered systems, the courts, and negotiation as bases for environmental quality management programs. Case examples involving hazardous substance management, and air and water quality management, demonstrate how existing management programs combine various "social choice" mechanics. Cases provide a basis of examining the political process of environmental policy formulation in the U.S. and help analyze theories that attempt to explain environmental policy implementation. Additional class meetings arranged to plan and present term projects. Limited enrollment with preference given to students in Environmental and Water Studies program.

3-4 units, Spr (Ortolano) TTh II-1


3 units, Spr (Kitanidis) MWF 10


3 units, Win (Kitanidis) TTh 8:30-9:50

269. 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 1 unit, without letter grade; a letter grade is given for students presenting talks.

1 unit, Aut, Win, Spr (Staff) T 4:15

270. Movement, Fate, and Effects of Contaminants in Surface Waters and Groundwater—Transport of chemical constituents in surface and groundwater, including advection, dispersion, sorption, interphase mass transfer, and transformation; water quality requirements for various beneficial uses. Emphasis on the behavior of hazardous waste contaminants. Recommended: Engineering 21. Prerequisites: undergraduate chemistry and calculus.

3 units, Aut (Semprini) MWF 8

271A. Water Quality Control I—Physical and chemical unit operations for water and wastewater treatment, emphasizing 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 by flocculation, sedimentation, filtration, disinfection, and absorption. Recommended 273. Prerequisites: 270 and Engineering 21.

3 units, Win (Roberts) MWF 9

271B. Water Quality Control II—Biological processes for transformation of environmental contaminants. Unit processes for biological treatment including dispersed growth and fixed-film systems. Aerobic and anaerobic process microbial ecology and kinetics, with applications to the treatment of municipal and industrial wastewaters, hazardous chemicals, and groundwater. Prerequisites: 270 and 274.

3 units, Win (McCarty) MWF 8

271C. Water Quality Control III—Analysis of specialized wastewater treatment processes, such as absorption and air stripping. Emphasis on physical and chemical processes in treatment of hazardous wastes, especially contaminated
272. Treatment of Industrial and Hazardous Wastes—Critical review of process design issues associated with physical, chemical, biological, and thermal processes used to treat liquid or solid industrial and hazardous wastes, and to remediate hazardous waste sites. Topics: federal regulatory basis for hazardous and industrial waste management, sources and characteristics of industrial and hazardous waste, inplant environmental surveys, management options for control of wastes, especially waste reduction and minimization, and assessment of emerging technologies to provide permanent solutions to disposal of hazardous wastes.

273. Aquatic Chemistry—(Same as Applied Earth Sciences 224.) Chemical principles and application of those principles to the analysis and solution of problems in aqueous geochemistry (temperatures near 25°C and atmospheric pressure). Emphasis on the analysis of natural water systems and to the understanding and solution of specific chemical problems in water purification technology and water pollution control. Prerequisites: Chemistry 31 and 33, or equivalent.

274. Environmental Microbiology—Fundamental aspects of microbiology and biochemistry; microbial physiology, metabolism and growth, genetics, taxonomy and ecology as related to water and soil environments. The role of major groups in microorganisms as pollutants, as purifying agents, and as agents of biogeochemical change. Connections with environmental pollution and water quality control processes.

275A. Water Quality Control Processes I—Laboratory and pilot plant studies of physical and chemical processes for the treatment of water and wastewaters. Prerequisites: 271A, 273, and 273A.

275B. Water Quality Control Processes II—Laboratory and pilot plant studies of aerobic and anaerobic biological processes for the treatment of water and waste waters. Prerequisites: 271B and 273A (or equivalent) and 274.


278B. Air Pollution Aerosols—Characterization of atmospheric particulate matter: size distri-

3 units, Spr (Hildemann) TWF 1:15


1 unit, Spr (Staff) W 4:15


4 units, Aut (Pinsky) MWF 10-11

computer lab F 1-2


4 units, Win (Pinsky) TTh 11-12:15

computer lab F 1-2

282A. Earthquake Engineering I—Earthquake phenomena, faulting, ground motion; study of past major earthquakes; effects of earthquakes on man-made structures; response spectra; Fourier spectra; structural dynamics; analysis and design of structures; building codes; current research in earthquake engineering. Recommended: 296A.

3 units, Win (Kiremidjian) MWF 10

282B. Earthquake Engineering II—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, Spr (Shah) MWF 11


4 units, Sum (Kelkar) TTh 9-10:50

285. Design of Structures I—Steel design; inelastic behavior of structures; strength of structural elements; collapse loads for frames. Reinforced concrete design; design of two-way slab systems; yield line analysis of slabs. Prerequisites: basic courses in design of steel and reinforced concrete structures.

4 units, Aut (Krawinkler) TTh 11

W 2:15-4:05

286. Design of Structures II—General aspects of design; serviceability and failure criteria; types of loading: methods of design; structural systems for buildings; analysis and design of buildings for gravity loads and lateral loads, earthquake resistant design; effects of dynamic loading on strength and ductility of structural elements. Prerequisites: basic courses in design of steel and reinforced concrete structures.

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

287. Structural Performance and Failures—Basic concepts in definition of satisfactory structural
performance; key elements in structural performance; types of failures, ranging from reduced serviceability to total collapse; failure sources and their root cause allocation; failure prevention mechanisms; illustration with real life examples.

2 units, Spr (Moncarz) M 3:15-5:05


3 units, Spr (Law) MW 1:15-2:30

289. Theoretical and Computational Soil Mechanics—Computational techniques for solving systems of nonlinear equations; fundamentals of constitutive modeling; flow through porous media including free surface flows; Biot's three-dimensional consolidation theory; soil-structure interaction; finite element formulation; computing assignments. Prerequisites: 190, 281B, or equivalents.

3 units, Spr (Borja) MWF 10
alternate years, not given 1991-92

290. Advanced Soil Mechanics—Fundamentals of soil behavior; stress-strain and strength behavior of soils; constitutive theories for geotechnical materials; soil plasticity and concept of yielding; Cam-Clay plasticity; cap models; computing assignments. Prerequisites: 190, 281B, or equivalents.

3 units (Borja) alternate years, given 1991-92

291. Foundation Engineering and Earth Structures—Types, characteristics, analysis, and design of shallow and deep foundations including footing, mats, piles, and piers; solution of retaining wall problems by limit equilibrium method; slope stability analysis by method of slices including search algorithms for the critical circle; computing assignment. Prerequisite: 190 or equivalent.

3 units, Win (Borja) MWF 11

292. Earth Structures—Analysis and design of earth retaining systems; theorems of plastic collapse, upper and lower bound solutions, limit equilibrium method; static and dynamic slope stability; earth and rockfill dam design. Prerequisite: 190 or equivalent.

2 units (Borja) alternate years, given 1991-92

293. Experimental Soil Mechanics Laboratory—Stress-strain-strength behavior of soils. Six laboratory experiments. Prerequisite: 190 or equivalent.

1 unit, Win (Borja) by arrangement

296A. Structural Dynamics I—Vibrations and dynamic response of simple structures under time-dependent loads; dynamic analysis of single and multiple degrees of freedom systems; response spectra; support motion.

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

296B. Structural Dynamics II—Introduction to the methods of structural dynamics for framed structures and continuous systems discretized by the finite element method; mode-superposition method; numerical solution of eigenvalue problems; direct integration methods including the Newmark family of algorithms; reduction and dynamic substructuring methods; introduction to nonlinear analysis; analytical solutions and wave propagation for simple elements. Programming procedures for the implementation of the mode-superposition and direct integration methods in computer programs for structural analysis. Prerequisite: 296A.

3 units, Win (Smith) MWF 9

298. Structural Engineering and Geomechanics Seminar—Lectures on topics of current interest. Recommended for all graduate students.

1 unit, Win (Staff) W 4:15

299. Independent Study in Civil Engineering—Directed study for graduate students on subjects of mutual interest to students and faculty. Student must obtain faculty sponsor.

1-3 units, any quarter, by arrangement

300. Thesis—Investigation of an engineering problem; required of candidates for degree of Engineer.

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


4 units, Win (Staff) MWF 1:15-2:30

water flow and transport. Macrodistribution. Pre-
requisite: 267 or permission of instructor.
3 units (Kitanidis)
alternate years, given 1991-92

4 units, Win (Monismith) MWF 10-11:20
alternate years, not given 1991-92

364. Natural Flows—Stratified homogenous flows in lakes, reservoirs, and estuaries. Depending on student interest, topics selected from: the behavior of turbulence in stratified fluids, mixed-layer dynamics, wind-driven flows and upwelling in lakes, reservoir outflows and inflows, tidal motions, and gravitational circulation in estuaries.
4 units (Monismith)
alternate years, given 1991-92

2 units (Reinhard)
alternate years, given 1991-92

372. Mass Transfer in Aqueous Systems—Basic concepts of diffusion and interphase mass transfer, and the role of mass transfer limitations in the fundamental processes that affect water quality. Applications to water treatment and transport in the hydrosphere, including surface and groundwater, and to hazardous chemical behavior.
2 units (Roberts) given 1991-92

373. Hydrogeochemical Cycles—Processes and mechanisms responsible for the natural circulation of major, minor, and trace elements through the hydrosphere, atmosphere, lithosphere, and biosphere. Emphasis on a mechanistic interpretation of global cycling of elements and perturbations intercepting the normal processes. Chemical weathering processes, biotransformations of elements, residence times in various environmental compartments. Prerequisites: 273 and 274.
2 units (Leckie)
alternate years, given 1991-92

374. Microbial Degradation of Organic Pollutants—Analysis of mechanisms, biochemistry, and enzymology of microbial degradation of various synthetic organic compounds as influenced by environmental factors, chemical structure, and concentration of substrates. Evolutionary and genetic explanations for existing metabolic pathways. The phenomena of biodegradability and recalcitrance, detoxification, activation and biomagnification.
3 units, Spr (Grbić-Galić) MWF 11
alternate years, not given 1991-92

376. Instrumental Analysis in Environmental Sciences—Theory and practice of instrumental methods used in environmental engineering and sciences, emphasizing determination of organic substances by gas chromatography, mass spectrometry, and high pressure liquid chromatography, mass spectrometry, and high pressure liquid chromatography techniques. Interpretation of mass spectra, adaptation of procedures to specific environmental matrices. Consideration of case studies.
3 units, Sum (Reinhard, Lopez-Avila)
by arrangement,
alternate years, not given 1991-92

379. 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 obtain faculty sponsor. A written report is usually required.
1-5 units, any quarter (Staff)
by arrangement

Aut, Win, Spr (Staff) by arrangement
Five large computer systems at Stanford play a major role in providing computer cycles for research and administrative use.

Most coursework and instruction is done on the systems available at AIR (Academic Information Resources). Students in Computer Science (C.S.) also have access to other systems, each a host on the nation-wide Internet computer research network and on SUNET, the University-wide ethernet system.

The five large systems are:

- **NEON**, a DECsystem 5400 running ULTRIX V3.1. This system is exclusively for student use as a primary "home base" machine for electronic mail and text processing.
- **SUNBURN**, a SUN4/490 running SunOS 4.0.3, is used for departmental administration.
- **SAIL**, a DECsystem-1080 running the WAITS operating system. SAIL supports 64 local display consoles with full graphics capabilities, and also supports other local and remote terminals. It is used primarily by one of the AI groups.
- **GANG-OF-FOUR** is an Alliant FX/8 multiprocessor system running a parallel version of Berkeley Unix. It is used for research in parallel computation in LISP.
- **SUMEX-AIM**, a SUN 4/280 that supports research on knowledge-based systems and applications of artificial intelligence to biomedicine. Students doing research in the Knowledge Systems Laboratory may be granted access to the SUMEX system.

In addition, approximately 12 medium scale Unix operating systems are used by specific research projects at Stanford.

The Computer Science Department also operates approximately 70 SUN workstations, 40 DEC Microvaxs, 30 DECstation 3100's, 10 NeXT machines, 100 Mac II's, 10 Symbolics workstations, 35 TI Explorers, and 20 laser printers of various types, connected together by ethernet.

At present, supported students can receive an account on their sponsored machine, and in addition all C.S. students receive an account on NEON.

**UNDERGRADUATE PROGRAMS**

The department offers a degree in Computer Science, as outlined in the "School of Engineering" section of this bulletin. In addition, there are several inter-disciplinary degrees with a substantial computer science component. The Computer Systems Engineering major (also in Engineering) allows study of issues of both computer hardware and computer software, bridging the gap between traditional C.S. and Electrical Engineering majors. The Symbolic Systems major (in the School of Humanities and Sciences)
offers a chance to explore computer science and its relation to philosophy, linguistics, and psychology. Finally, the Mathematical and Computational Sciences major (also Humanities and Sciences) allows students to explore computer science along with more mathematics, statistics, and operations research.

**GRADUATE PROGRAMS**

**MASTER OF SCIENCE**

The University’s basic requirements for the Master of Science Degree are discussed in the “Degrees” section in this bulletin.

**COMPUTER SCIENCE**

The degree “Master of Science in Computer Science” (M.S.C.S.) is intended as a terminal professional degree and does not lead to the Ph.D. degree. Students planning to obtain the Ph.D. degree should apply directly for admission to the Ph.D. program.

Applications for admission to the Master of Science program must be received by January 1. Exceptions are made for applicants to the M.S.C.S. program who are either Honors Co-op applicants or who are already students at Stanford (including co-terminal applicants). Information on these deadlines is available from the department.

**REQUIREMENTS**

A candidate is required to complete a program of 45 units. At least 36 of these must be graded units, passed with an average 3.0 (“B”) letter grade indicator or better. The 45 units may include no more than 21 units of courses from those listed in Requirements 1 and 2. Thus, students needing to take more than seven of the courses listed in Requirements 1 and 2 actually complete more than 45 units of coursework in this program. Only extremely well-prepared students may expect to finish the program in one year; most complete the program in six quarters. It is expected that an adequately prepared student admitted to the M.S.C.S. program will have taken a number of the “core” courses as an undergraduate. Students hoping to complete the program with 45 units should already have a good background in computer science, including coursework or experience equivalent to all of Requirement 1 and some of the courses in Requirement 2.

**Requirement 1**—The following courses may be needed as prerequisites for other courses in the program: C.S. 22 (for specialization 5 only), 107, 109A, 109B, 110, 112, 140, 145 (for specialization 6 only), 160, Math 109 or 120.

**Requirement 2**—The following “core” courses or their equivalent must be completed: C.S. 137 or 237A, 143, 154 or 254, 157, 161, 212, 221, 240A, Stat. 116. Courses are waived only if evidence is provided that a similar course has been taken elsewhere. Courses that are waived rather than taken may not be counted toward the M.S.C.S. degree. Core courses may be taken on a Satisfactory/No Credit basis provided that a minimum of 36 graded units is presented within the 45-unit program.

**Requirement 3**—At least 1, but no more than 3, units of 500-level seminars must be taken.

**Requirement 4**—A program of 21 units in an area of specialization must be completed. All courses in this area must be taken for letter grades. Six approved programs are listed below. Students may propose to the M.S. program committee other coherent programs that meet their goals and satisfy the basic requirements. Students desiring to include a substantial research project as part of their degree program can arrange with their advisor to replace units in their specialization with a C.S. 393 (Computer Laboratory) project.

1. **Numerical Analysis/Scientific Computation**
   a) C.S. 237A, 237B, 237C.

2. **Systems**
   b) At least three of: C.S. 211, 243, 244, 245, 312, Elect. Engr. 271.

3. **Software Theory**
   a) C.S. 242, 243, 260, 262.
   b) At least one of: C.S. 244, 245, 342, 343, 441.
   c) At least one course from the following: C.S. 254, 263, 360, 363, 367A, 367B.
   d) At least one additional course from (3b) or (3c).

4. **Theoretical Computer Science**
   a) At least three of: C.S. 257, 260, 262, 264.

5. **Symbolic and Heuristic Computation**
   a) C.S. 222, 225 or 226 or 227, 257, or 323.
6. Database (23 units)
   a) C.S. 245, 345, 395.
   b) At least two of: C.S. 225, 244, 262, 347.

   Requirements—Additional elective units must be technical courses (numbered 100 or above) related to the degree program and approved by the advisor. Elective courses may be taken on a Satisfactory/No Credit basis provided that a minimum of 36 graded units is presented within the 45-unit program.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. are discussed in the "Degrees" section in this bulletin. Applications to the Ph.D. program must reach the Office of Graduate Admissions by January 1. The following are departmental requirements (see the Computer Science Graduate Programs Administrator for further details):

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 Ph.D. program committee.

2. Each student, to remain in the Ph.D. program, must satisfy the "breadth" requirement covering introductory level graduate material in major areas of computer science. Once a student fulfills 5 of the 7 "whole" areas of the "breadth" requirement, he or she may apply for admission to candidacy for the Ph.D. This must be done by the end of the second year in the program. The student must completely satisfy the "breadth" requirement by the end of nine quarters (excluding summers), and must pass a qualifying exam in the general area of the expected dissertation.

3. As part of the training for the Ph.D., the student is required to complete one of the following options of teaching service. These exact requirements are subject to revision for the class entering 1990-91:
   a) Two units (a unit is 10 hours per week for one quarter) as a teaching assistant for courses numbered 300 or above.
   b) Four units as a teaching assistant for courses numbered 108 to 299.
   c) Two units as a teaching assistant for a course numbered 300 or above, and 2 units as a teaching assistant for courses numbered between 108 and 299.
   d) One unit as a teaching assistant for a course numbered 300 or above, and 2 units as a teaching assistant for courses numbered between 108 and 299.

4. The most important requirement 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.)

5. The student must pass a University oral examination in the form of a defense of the dissertation. It is usually 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.

Ph.D. MINOR

For a minor in Computer Science, a candidate must complete 20 units of computer science coursework, including at least three of the master's core courses to provide breadth, and one course numbered 300 to provide depth. The remaining courses must be numbered 200 or above. One of the courses taken must include a significant programming project to demonstrate programming proficiency. A letter grade indicator of 3.0 or better must be maintained.

TEACHING AND RESEARCH ASSISTANTSHIPS

Graduate student assistantships are available. Half-time assistants receive a tuition scholarship for 9 units per quarter during the academic year, and in addition receive a monthly stipend. Duties for half-time assistants during the academic year involve 20 hours of work per week. Teaching assistants (TAs) help an instructor teach a course by conducting discussion sections, consulting with students, grading examinations, etc. Research assistants (RAs) help faculty and senior staff members with research in computer science. 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 these positions are open to a limited number of master's students in the department. However, master's students should not plan on being appointed to an assistantship.

Students with fellowships may have the opportunity to supplement their stipends by serving as graduate student assistants.

**COURSES**

**GUIDE TO SELECTING INTRODUCTORY COURSES**

Students arriving at Stanford have widely differing backgrounds and widely differing goals, but most find that the ability to use computers effectively is beneficial to their education. The Computer Science Department offers many introductory courses to help meet the needs of many different students and this guide is to help in the selection of courses.

C.S. majors and those who need to learn a substantial amount of introductory computer science in preparation for computer-intensive majors in engineering, should take C.S. 106X, 109A,B, and 110. 106X is a fast-paced course for students who have a prior exposure to computer programming and have a degree of mathematical maturity. It covers the principles of software engineering—the construction and evaluation of computer programs—and spends a relatively small amount of time teaching elementary programming skills. The 109A/109B sequence constitutes a broad introduction to the field of computer science. C.S. 110 complements the computer science fundamental sequence by exposing students to a number of programming paradigms and issues in systems and architecture.

Students with little prior experience or who wish to take more time to study the fundamentals of programming should take 106A or 106H, then 106B. Students in 106A need not have prior experience but are expected to have a reasonable degree of mathematical ability. Students interested in a more rigorous and mathematical introduction to programming should take 106H but must have a good working knowledge of calculus.

106A and 106H are for those in engineering and science disciplines who expect to make limited use of computers in their fields. These courses provide training adequate for the occasional use of computer programming to solve problems and provide an introduction to the principles of software engineering and computer programming.

C.S. 105A is for those in non-technical disciplines who expect to make use of computers. The course covers some of the material in 106A but without a technical orientation.

Students who want to learn basic computer skills for tasks unrelated to programming should take C.S. 1, various sections of which are oriented toward different styles and brands of computers.

In summary:

- To learn Computer Science—106X (or 106A,B or 106H,B), 109A,B, 110.
- For significant use—(106A or 106H), 106B.
- For scientific use—106A or 106H.
- For non-technical use—105A.
- For exposure—1.

**NUMBERING SYSTEM**

The first digit of a C.S course number indicates its general level of difficulty:

- 0-99 service courses for non-technical majors
- 100-199 other service courses, basic undergraduate
- 200-299 advanced undergraduate/beginning graduate
- 300-399 advanced graduate
- 400-499 experimental
- 500-599 graduate seminars

The ten's digit indicates the area of Computer Science it addresses:

- 00-99 Introductory, miscellaneous
- 10-19 Hardware Systems
- 20-29 Artificial Language
- 30-39 Numerical Analysis
- 40-49 Software Systems
- 50-59 Mathematical Foundations of Computing
- 60-69 Analysis of Algorithms
- 70-79 Typography and Computational Models of Language
- 90-99 Independent Study and Practicum

**NONMAJOR**

1. Using Computers—The use of specific computer systems. Satisfactory/No Credit introduction to the basic functions of a computer system: word processor, communications facilities, spreadsheets and other software packages. Weekly one hour lecture/demonstration and up to two hours doing an assignment with demonstrated software package. No exams or problem sets. Not a programming course. Section C examines the Apple Macintosh microcomputer. Sections are offered when appropriate staff are available to teach them; see the Time Schedule.

   1C. 1 unit, any quarter (Roberts, Cote, Hastings)

22. Programming in LISP—Introduction to the LISP language and the techniques of manipulating symbolic data, algebraic and logical
expressions, graphs, and computer programs. Progressive exercises develop programming skills and familiarity with a wide range of programming tools. Prerequisite: 106B, 106X, or equivalent.*

4 units, Win (Staff) MWF 3:15

40. Introduction to UNIX and C—The UNIX operating system and C programming language. Covers UNIX commands, shell interface, file programming, file system, processes, signals, interprocess communication, and writing UNIX programs in the C programming language. C programming language issues include data types, control structures, pointers, dynamic memory allocation, libraries, performance, bit operations, and the interface to the UNIX shell. Previous experience in a high-level language other than BASIC required. Prerequisite: 106B, 106X, or equivalent.

3 units, Aut (Kolkowitz) MWF 3:15

50. Problem Solving with Mathematica—Comprehensive introduction to Mathematica, an interactive mathematical software which incorporates a high-level programming language. Use of Mathematica to solve interactively numerical and symbolic problems, plot functions and data in two or three dimensions, manipulate expressions, and interface mathematica to other programs. For engineers, physicists, mathematicians, and others who frequently need to solve mathematical or quantitative problems.

1 unit, Spr (Blachman) T 12-1

UNDERGRADUATE

105A. Introduction to Computers—For non-technical majors to develop a working knowledge of computers as utilized in our society. Two major components: programming and issues. Karel the Robot and Pascal are used to expose students to the concepts of structured programming. Topics: artificial intelligence, databases, spreadsheets, graphics, security and privacy, computer systems, human factors, hardware, and networks. 105A requires considerable interaction between student and computer, but is oriented toward students without a strong math and/or technical background, and assumes no previous computer experience. Students in technical fields and students looking to acquire programming skills are encouraged to take 106A or 106X. (DR:8)

*5 units, Aut (Staff) MWF 2:15

Win (Staff) MWF 1:15

Spr (Staff) MWF 10

106A. Programming Methodology—Broad introduction to the engineering of computer applications using Pascal. Software engineering principles are stressed: design, decomposition, information hiding, procedural abstraction, testing, and reusable software components. Alternatives: 105A, 106H, 106X. Intended for students in technical disciplines, but no prior experience is assumed. (DR:8)

*5 units, Aut (Staff) MWF 2:15

Win (Staff) MWF 1:15

Spr (Staff) MWF 10

106B. Programming Abstractions—Abstraction and its relation to programming. Software engineering principles of data abstraction, opaque types, modules, highly reusable types (e.g., stacks and queues), and data-directed design. Recursion and recursive data structures (linked lists and binary trees). Analysis of running time and space requirements for arbitrary programs including an introduction to elementary recurrence relations. Overview of machine-level representation of data, basic computer architecture, and simple assembly language. Students complete several large programs in Pascal. Prerequisite: 106A or 106H.

*5 units, Aut (Staff) MWF 11

Win (Staff) MWF 2:15

Spr (Staff) MWF 1:15

106H. Introduction to Computer Programming (Honors)—Programming as an intellectual discipline. Systematic design, verification, and testing of programs. Common paradigms of programming. Recursion, dynamic programming, iterative improvement, divide-and-conquer methods. Numerical convergence and precision. No prior programming experience is assumed; knowledge of calculus and tolerance for abstraction are essential. See also: 106A, 106X. Prerequisite: Math. 21 or 42.

*5 units, Spr (Floyd) MWF 10

106X. Programming Methodology and Abstractions (Accelerated)—Covers 70% of the material in 106A,B. Intended as a one-quarter preparation for 109A for students whose previous programming experience is sufficient to help them cover this fundamental material more rapidly. Prerequisite: Math. 3 or equivalent. (DR:8)

*5 units, Aut (Staff) MWF 2:15

Win (Staff) MWF 1:15

Spr (Staff) MWF 1:15

107. Programming Paradigms—A number of programming languages are introduced, possibly: Prolog, Lisp, Smalltalk, C, and Ada. Small programming projects are assigned. Prerequisite: 106B or 106X.

*5 units, Aut (Staff) MWF 2:15

Spr (Ungar) MWF 1:15

* May be taken for 3 units by graduate students
109A,B. Introduction to Computer Science—Two-quarter introduction to the conceptual and mathematical foundations of computer science. Topics: sets, functions, relations, combinatorics, graphs, propositional and predicate logic, formal languages, models of computation, and the theory of algorithms. Proof techniques, modeling, and abstraction serve as themes for the sequence. Functional programming exercises explore and exemplify these concepts. Prerequisite for 109A: 106B or 106X. Prerequisite for 109B: 109A.

109A. (DR:8)
4 units, Aut (Ullman) MWF 10
Win (Staff) MWF 2:15

109B. 4 units, Win (Ullman) MWF 10
Spr (Staff) MWF 2:15

110. Introduction to Computer Systems and Assembly Language Programming—Organization of digital computers, buses, registers, processors, I/O, memory systems, and paced memory. Data representation, data structures, and computer arithmetic. Instruction sets and execution; addressing modes. Assembly language programming, including subroutines, coroutines, interrupts and traps. Surveys operating systems issues and principles of storage management; combines general principles and practice in implementations. Prerequisite: 106B or

4 units, Aut, Spr (Chou) MW 12:50-2:05
Win (Staff) TTh 9:30-10:45

121. Artificial Intelligence: Concepts and Applications—Artificial Intelligence (AI) is the science and technology of building computer programs that reason about problems using knowledge, interact with people in natural language, and perceive images and speech. Survey of work in AI, addressing economic, social, and scientific importance: knowledge representation; problem solving methods; expert systems; natural language and speech understanding; computer vision; machine learning, software tools, and other current research areas. No programming. Prerequisite: 105A or equivalent computer exposure (by permission of instructor).

137. Fundamentals of Numerical Computation—The fundamental issues of numerical computation for the mathematical, computational and physical sciences, and engineering. Problems of accurately computing algebraically exact solutions in the presence of rounding errors and of computing discrete approximations of solutions which are defined on the continuum. The taxonomy of problem classes with methods for their solution and principles useful for analysis of performance and algorithmic development. Topics: error analysis, the solution of linear and nonlinear equations, interpolation and numerical differentiation, the approximation of integrals, and the solution of differential equations. Prerequisites: 106A; Math. 103 or 113 or equivalents.

140. Concurrent Programming—Principles of concurrent programming, including processes, mutual exclusion and synchronization, message-passing and monitors. Emphasis on principles and algorithms, rather than on implementation. Prerequisites: 107 and 110.
3 units, Aut (Lam) MWF 10
Spr (Staff) MWF 9

143. Compilers—Principles and practices in the design of programming language compilers. Topics: lexical analysis, parsing theory (LL, LR, and LALR parsing), symbol tables, type checking, attribute grammars, common representations for records, arrays, and pointers, runtime conventions for procedure calls, storage allocation for variables, and generation of unoptimized code. Half of the homework consists of a project compiler. Prerequisites: 107, 109B, and 110.

3 units, Aut (Dill) TTh 9:30-10:45
Spr (Dill) MWF 1:15

145. Introduction to Databases—Data models, relational database concepts, relational algebra and SQL, Boyce-Codd normal form, interactive database interfaces, programmed interfaces to database systems, transaction management, and the role of databases and computers in application environments. Involves a substantial database system project. Prerequisites: 107 and 110.

*4 units, Aut (Keller) MWF 9

154. Introduction to Automata and Complexity Theory—Regular sets: finite automata, regular expressions, equivalences among notations, methods of proving a language not to be regular; context free languages: grammars, pushdown automata, normal forms for grammars, proving languages non-context free; Turing machines;

* May be taken for 3 units by graduate students
equivalent forms, undecidability. Nondeterministic Turing machines: properties, the class NP, complete problems for NP. Prerequisite: 109B. Alternate: 254.

*4 units, Win (Pratt) MWF 3:15
Spr (Motwani) MWF 10

154N. Introduction to NP Completeness—Turing machines. Reducibilities among problems; Cook's theorem; examples of NP-complete problems. Students participate in approximately the last half of 154. Prerequisite: a knowledge of formal languages and automata as in the first part of 154.

2 units, Win (Pratt) MWF 3:15
Spr (Motwani) MWF 10


*4 or 5 units, Aut (Mitchell) TTh 1:15-2:30
Win (Mitchell) TTh 9:30-10:45
Spr (Genesereth) TTh 9:30-10:45


3 units, Aut (Plotkin) MWF 11


*4 units, Win (Staff) MWF 1:15
Spr (Goldberg) TTh 1:15-2:30

191. Senior Project—Group projects under faculty direction. Register using the section number associated with the instructor.

3-6 units, any quarter (Staff) by arrangement

192. Programming Service Project—Appropriate academic credit (without financial support) is 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

193C. Programming the Macintosh—Students create fully functional Macintosh applications in Pascal. Topics: Macintosh user interface guidelines, fundamental Toolbox and Operating System routines, and various development environments and tools. Prerequisite: 106B or 106X. Recommended: basic knowledge of the Macintosh architecture as in 110.

4 units

193E. Object Oriented User Interface Programming—Students develop applications using Objective-C, Display PostScript, and Interface Builder. Basics of object-oriented programming, the PostScript imaging model, and program development in the Mach environment covered. Other topics: general use of the NeXT computer, sound generation, interapplication communication, indexed text searching, and Mach threads. Lab assignments and a final project. Prerequisites: knowledge of C and 107.

3 units

194. Software Project Laboratory—Experience in designing and implementing large-scale software systems. Working in teams, students complete modest-sized projects through specification, coding, and testing. Topics: design methodologies, object-oriented design, problems of team programming, examples of good software, debugging techniques, and approaches to testing. May be taken multiple quarters for credit to complete a large project. Prerequisite: 106B.

3-6 units, Win (Staff) W 2:15-4:05
Spr (Staff) T 2:15-4:05

196. Microcomputer Consulting—Consulting in a microcomputer environment, focusing on the Apple Macintosh and DOS operating systems. Biweekly lectures outline the microcomputer environment on campus and demonstrate the skills needed to consult in such an environment. Students also work as the on-duty consultant at a campus cluster.

2-3 units, any quarter (Roberts, Virnau)

197A,B,C. AIR Mainframe Consulting—Three-quarter introduction to consulting on AIR (Academic Information Resources) computing services. 197A: weekly lectures, short homework assignments, and consulting with an experienced AIR consultant. 197B: fewer lecture hours on more advanced topics, more emphasis on consulting. 197C: for those interested in working on a special project supervised by the AIR sup-
port staff and/or 197 coordinator; emphasis on consulting and special project work. Lectures and assignments emphasize skills on AIR mainframe services (TOPS-20, UNIX, VM/CMS); also material on computer workstations and other topics. Consultants receive privileges on AIR computers. All interested students should attend an orientation meeting the first day of the quarter; enrollment limited. Prerequisite: consent of 197 coordinator.

197A. 2 units, Aut, Win, Spr (Roberts, Chen) W 7-8:30 p.m.
197B. 2 units, Aut, Win, Spr (Roberts, Chen) Th 7-8:30
197C. 2 units, Aut, Win, Spr (Roberts, Chen) by arrangement

198. Teaching of Computer Science—Teach other students by running a small discussion section for a 106 course, and acting as on-duty help at the computing center. Three weekly meetings to discuss introductory courses in general, the specific course, and techniques of teaching. Application and interview required; see the receptionist in Computer Science/Tressider for information. Prerequisite: 106B or 106X.

4 units, any quarter (Roberts, Fisher, Jones) T 5-6:30

199. Independent Work—Special study under faculty direction, usually leading to a written report. Letter grade given; if this is not appropriate, enroll in 199P. Register using the section number associated with the instructor.

any quarter (Staff) by arrangement

199P. Independent Work—Like 199, but graded either Satisfactory or No Credit.

any quarter (Staff) by arrangement

UNDERGRADUATE AND GRADUATE

200. Undergraduate Colloquium—Weekly presentations by faculty and senior people from industry who informally describe their views of computer science as a field and their experience as computer scientists.

1 unit, Aut, Win, Spr (Roberts) Th 3:15-5:05

201. Computers, Ethics, and Social Responsibility—(Same as Symbolic Systems 100, VTSS 215.) Analysis of ethical and social issues related to the development and use of computer technology. Introduction to relevant background in ethical theory, and social, political, and legal considerations. Analysis of scenarios in specific problem areas, e.g., privacy, reliability and risks of complex systems, and the responsibility of professionals for the applications and consequences of their work. Small group discussion and critical reading of source materials, emphasizing developing analytical skills for approaching these questions. Intended primarily for majors entering computer-related fields. Prerequisite: 106B or 106X.

3-4 units, Spr (Nissenbaum, Winograd) MWF 11

204. Undergraduate Programming and Problem-Solving Seminar—Students work on several problems for which the "best" solution is not known. Participants, in teams, design and implement their solutions. Class meetings exchange ideas and/or provide necessary background for a given problem. Prerequisites: extremely comfortable with programming, and have taken several upperclass C.S. courses beyond 109B.

3-6 units

211. Logic Design—(Enroll in Electrical Engineering 381.) Principles and techniques of logic design. Topics: combinatorial circuit analysis, including hazard detection; combinatorial circuit design including PLA, VLSI, and MSI techniques and testing techniques; IC logic families, flip-flop properties, sequential circuit analysis and synthesis for fundamental and pulse mode circuits; design for testability techniques. Prerequisite: 112 or equivalent.

3 units, Aut (McCluskey) Win (Staff)

212. Computer Architecture and Organization—(Enroll in Electrical Engineering 282.) Structure of systems using processors, memories, input/output (I/O) devices, and I/O interfaces as building blocks. Computer system instruction set design and implementation, including memory hierarchies and pipelining. Issues and tradeoffs involved in the design of computer system architectures with respect to the design of instruction sets. Prerequisite: 112.

3 units, Aut (Hennessy) Win (Staff) Spr (Gupta)

221. Introduction to Artificial Intelligence—A broad technical introduction to core concepts. Topics: knowledge representation, search, deduction, planning, constraint propagation, learning, expert systems, natural language understanding, and vision. General problems, critiques, and fundamental assumptions. Prerequisite: 157 or consent of instructor.

3 units, Aut (Staff) TTh 11-12:15 Spr (Staff) TTh 9:30-10:45

222. Agents—A rigorous treatment of the problems involved in building intelligent agents that interact with the physical world. Topics: the representation of knowledge about states, actions, and procedures, simulation and planning, and knowledge level agents. Prerequisites: 157, 221.

3 units, Aut (Genesereth) TTh 1:15-2:30
225A. Declarative Programming—Introduction to the technology of building programs that use an inference mechanism operating on a declarative knowledge base. Emphasis on declarative representation of domain knowledge, different monotonic and non-monotonic inference methods, and on inference control methods. Some knowledge acquisition techniques. Substantial Lisp programming. Coursework done in teams. Prerequisites: 157, 221, and Lisp.

3 units, Spr (Smith) TTh 9:30-10:45

225B. Declarative Programming Project—Independent project involving the construction and presentation of a substantial declarative program. Corequisite: 225A.

3 units, Spr (Smith) Th 7-9 p.m.

226. Expert System Applications—Expert Systems are the most important of the applications of Artificial Intelligence in the commercial and defense sectors. Topics: the rapid transition of the Expert System technology from laboratories to societal use; what is in an Expert System; what is Knowledge Engineering. Case studies of commercial application in: diagnosis and repair; interpretation of data; manufacturing planning and control; financial services; engineering design, etc. The sources of benefit from Expert Systems. The magnitude of these benefits. What an organization needs to do to realize the benefits. A “what” rather than a “how to build systems” orientation aimed for a broad interdisciplinary audience.

3 units, Win (Quintan) TTh 2:45-4

227. AI Programming in Prolog—Introduction. After the fundamentals, advanced techniques are used to solve problems predominantly from the domain of artificial intelligence.

3 units, Aut (Shoham) MWF 11

228A. Introduction to Knowledge Systems—Foundations for understanding symbols, search, and knowledge-level analysis. Topics: symbol systems, different approaches to semantics, blind, directed, and hierarchical search methods, the verbal data hypothesis for protocol analysis, multi-disciplinary concepts for knowledge acquisition, computational models and reasoning phenomena for classification, configuration, and diagnosis, interfaces from embedded systems to data bases, users, and remote knowledge systems. Prerequisites: familiarity with logic and high-level programming languages.

3 units, Win (Staff) TTh 4:15-5:30

228B. Introduction to Knowledge Systems—Symbol-level topics in reasoning, representation, and machine learning. Topics: concepts from graph theory for efficient constraint satisfaction, search, and truth maintenance systems. Intensional representations and models for reasoning about space, time, certainty, and qualitative models of mechanism. Introduction to concepts and methods for machine learning. Prerequisite: 228A.

3 units, Spr (Stefik) TTh 4:15-5:30

229. Approaches to Machine Learning—Survey of major research paradigms. Topics: inductive learning, explanation-based learning, geneticalgorithms, analogical reasoning, case-based learning, connectionist learning, machine discovery and PAC learning theory. Focus is on representative systems that have been built. What is the learning problem that is being addressed? What are the underlying assumptions? Where does the approach break down?

3 units, Aut (Minton) MW 4:15-5:30

237A, B, C. Advanced Numerical Analysis—Three-quarter graduate sequence to acquaint students in mathematical and physical sciences with the derivation and analysis of methods for solving mathematical problems on digital computers. Organized so students may take the first quarter and then either the second or third according to their interests. 237A: Fundamental concepts of numerical computation. Topics: linear systems of equations, interpolation, numerical differentiation and integration, and the solution of nonlinear equations. 237B: The analysis of structures and data. Topics: the approximation of functions, the matrix eigenvalue problem, least squares approximation and statistical computations. 237C: The simulation of systems governed by ordinary and partial differential equations. Topics: methods for the solution of initial and boundary value problems. Finite difference, finite element, and collocation methods. Courses include analysis of convergence and estimation of truncation and round-off errors. Assigned work includes analytical problems and problems to be solved with the aid of a computer. 237A is prerequisite for 237B and C. Prerequisites: 106A; Math. 103 or 113 (C.S. 237C has the additional prerequisite of Math. 130); or equivalents.

237A. 3 units, Aut (Staff) MW 11
237B. 3 units, Win (Staff) MW 11
237C. 3 units, Spr (Staff) MW 11

240A, B. Operating Systems—Two-quarter sequence in operating systems design and implementation. 240A: Fundamentals of operating system implementation—basic structure; multi-programming, processes, and scheduling; synchronization and communication mechanisms; I/O device management; memory management, segmentation, paging; file systems, directory management, disk allocation. 240B: Deeper coverage of issues that arise in all subsystems of
an operating system; naming and I/O protocols; protection; reliability; performance; user interfaces; and networking. Prerequisite for 240A: 140 or equivalent. Prerequisite for 240B: 240A.

240A. 4 units, Aut (McCory) MWF 1:15
    Win (McCory) MWF 10

240B. 3 units, Win (Hagmann) TTh 2:45-4
    Spr (Staff) MWF 11

242. Programming Languages—Survey of old and new languages: CLU, Prolog, C++, Smalltalk-80, and Fortran. Emphasis on understanding language design goals: expressiveness, readability, and security, and on how a language may be designed to achieve or sacrifice these goals. Wherever possible, course material is from the original papers. Assignments include analysis of the relationships between goals and language designs. Prerequisite: 107.

3 units, Aut (Weise) MWF 2:15

243. Advanced Compiling Techniques—Theoretical and practical aspects of building modern compilers. Topics: machine code generation, optimization techniques, type analysis and checking, language and machine descriptions, compiler-compilers. Three hours lecture, one hour discussion session lead by a TA. Prerequisite: 143 or equivalent.

4 units, Win (Weise) MWF 3:15

244. 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); data link protocols (character-oriented protocols, bit-oriented protocols, error checking, window flow control, and multi-access protocols); network control (datagrams, virtual circuits, routing, and congestion control); transport and session protocols (end-to-end communication, interconnection of networks). Examples and standard protocols are cited for point-to-point, satellite, packet radio, and local area networks.

3 units, Aut (Cheriton) TTh 2:45-4
    Spr (Tobagi) (Enroll in Electrical Engineering 384.)


3 units, Win (Wiederhold) MWF 9

May be taken for 3 units by graduate students

247A, B. Human-Computer Interaction—Issues of human-computer interaction, including: interface design, interface styles, work design, communication structure and organizational factors. Students in small groups develop substantial user-interface prototypes of systems for situations of actual use, applying concepts from readings and interacting in project reviews with faculty and experienced system designers. Prerequisite for 247A: 109B. Prerequisite for 247B: 247A.

247A. 3 units, Win (Winograd) MW 2:15-3:30
    247B. 3 units, Spr (Winograd) MW 2:15-3:30


3 units, Win (Guibas) TTh 1:15-2:30

254. Automata, Languages, and Computability—An enriched version of 154, recommended for graduate students and for undergraduates strong in mathematics. Prerequisites: 106B. Alternate 154.

4 units, Aut (Floyd) MWF 10

257. Automated Deduction and Its Applications—Proving theorems and extracting information from proofs. Uses in software engineering (program synthesis, transformation, and verification) and artificial intelligence (commonsense and robotic planning, natural-language understanding). Foundations of logic programming. Deductive tableaux, nonclausal resolution, the truth behind skolemization, building theories into unification and inference rules, term rewriting. The design of theorem provers. Prerequisite: 157.

3 units, Spr (Waldinger) TTh 2:45-4

258. Introduction to Programming Language Theory—Syntactic, operational, and semantic issues in the mathematical analysis of programming languages. Type systems and non-context-free syntax. Universal algebra and algebraic data types. Operational semantics given by rewrite rules; confluence and termination. Scott-semantics for languages with higher-type functions and recursion. Treatment of side-effects. Prerequisites: 154, and 157 or Philosophy 160A.

3 units, Win (Mitchell) MW 12:50-2:05
260. 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: 160 and Math. 42, or equivalent.
3 units, Win (Floyd) MWF 10

3 units, not given 1990-91

3 units (Staff) alternate years, given 1991-92

264. Introduction to Combinatorial Theory—Elementary combinatorics. Topics: 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. Prerequisites: 160 and Math. 44 or equivalent.
3 units (Dantzig) alternate years, given 1991-92

3 units, Win (Tobagi)

270. Computer Applications in Medicine—(Same as Medical Information Sciences 210.) Medical computer science activities in research and applied environments. Topics: office systems, hospital information systems, medical databases, pharmacy systems, laboratory systems, image analysis, EKG analysis, history taking, library systems, multiphasic health testing, medical computer-aided instruction, decision support systems.
3 units, Aut (Fagan, Shortliffe)
TTh 3:15-4:30

271A. Computer-Based Medical Decision Making—(Same as Medical Information Sciences 211A.) Medical decision-making techniques and methods for implementation in decision support systems. Bayesian statistics, decision analysis, and artificial intelligence (expert systems). Recommended: 270.
3 units, Win (Shortliffe) TTh 3:15-4:30

271B. Computer-Based Medical Decision Making—(Same as Medical Information Sciences 211B.) For students who have completed 271A and wish to implement some of those ideas in a computer project. Computer programming is required in most projects. Enrollment limited. Prerequisite: 271A.
3 units, Spr (Fagan, Musen, Shortliffe)
TTh 3:15-4:30

273. Concepts of Text—(Same as Art 281.) What every literate person should know about the basic principles of the visual organization of text. Subjects include handwriting, typewriting, typography, and computerized documents, perceptual, linguistic, and semiological issues. Consists primarily of visual exercises.
3 units, Spr (Bigelow) TTh 9:30-10:45

275. Computational Linguistics II—(Same as Linguistics 227.) Computational methods in linguistics (phonology, morphology, syntax, semantics, etc.) and applications (translation, expert systems, question answering, etc.) Individually, or in small groups, students complete a programming project involving substantial linguistic theory. The programming language is Lisp or Prolog. Prerequisites: 22 and Linguistics 120.
3-4 units, Spr (Kay)

*4 units, not given 1990-91

PRIMARILY FOR GRADUATE STUDENTS

300. Departmental Lecture Series—Weekly presentations by members of the department faculty, each describing informally his or her current research interests and views of computer

* May be taken for 3 units by graduate students
science as a whole. Recommended for first-year Computer Science graduate students.

1 unit, Aut (Staff) Th 4:15-5:30

304. Programming and Problem Solving 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 and recommended for Ph.D. degree candidates in computer science.

3 units, Win (Staff) TTh 11-12:15

306. Recursive Programming and Proving—Uses 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: 109B.

3 units, Aut (Staff) TTh 2:45-4

309. Industrial Lectureships in Computer Science—Each quarter the department invites outstanding computer scientists to give a course in his/her specialty. Lecturers and topics change yearly; courses may be taken repeatedly. Spring Quarter lecturer is William Coughran, a graduate of the Stanford C.S. department, and a member of the technical staff at AT&T who has made substantial contributions to numerical device simulation.

309A. 3 units, Aut (Staff) TTh 4:15
309B. 3 units, Win (Staff) MW 4:15
309C. Numerical Methods for Device Simulation—Focuses on practical numerical methods for advection-diffusion equations, motivated by semiconductor device simulation. Systems of partial differential equations for modeling devices (e.g., drift-diffusion, energy-balance, and hydrodynamic systems) reviewed. Numerical topics: grid construction procedures; specialized discretization techniques; Newton-like and homotopy algorithms for dealing with the discretized nonlinear systems; appropriate direct and iterative sparse matrix techniques for the linear systems; continuation and transient characterization methods; and aspects of approximation theory needed to relate device and circuit simulation. Prerequisites: Math. 103 or 113, and 137 or 237A.

3 units, Spr (Coughran) MW 4:15

312. Processor Design—(Enroll in Electrical Engineering 382.) Computer arithmetic, high speed algorithms. Pipelined machines, timing templates design issues and cache design. Memory system design for high speed processors. Prerequisite: 212 or equivalent.

3 units, Win (Flynn)

315A. Parallel Computer Architecture and Programming—Design and programming of architectures. Survey of different programming models; study of research and commercial parallel machines designed to support the shared-memory, message-passing, datalow, systolic, and data-parallel paradigms. Interleaved with architectural studies are lectures on techniques for programming parallel computers. Implementation trade-offs dealing with synchronization granularity, communication, data access patterns, and load balancing using case studies from real applications. Integral programming assignments are done on one or more commercial multiprocessors. Prerequisites: 140, 212, and reasonable programming experience.

3 units, Win (Gupta) TTh 11-12:15

315B. Parallel Programming Project—Continuation of 315A. A significant parallel programming project is required. A shared-memory multiprocessor, and possible message-passing machine and Connection Machine for doing the projects. Lectures of parallel programming languages and their implementation, performance debugging of parallel programs, parallel data structures and algorithms. Guest speakers on issues in parallel programming. Prerequisites: 315A or consent of instructor.

3 units, Spr (Gupta) TTh 11-12:15


3 units, alternate years, given 1991-92


3 units, Spr (Staff) alternate years, not given 1991-92

319. Topics in Digital Systems—Advanced material is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number. See Time Schedule for topics currently being offered. by arrangement
323. Nonmonotonic Reasoning—(Same as Philosophy 326.) Formalisms for representing nonmonotonic reasoning and their applications to AI. Nonmonotonic aspects of commonsense knowledge and reasoning. Default logic, autoepistemic logic and circumscription. Computational nonmonotonic reasoning. Applications of nonmonotonic formalisms to inheritance systems, to logic programming, and to reasoning about action using the situation calculus. Prerequisite: a basic knowledge of logic such as 157, or Philosophy 160A.

3 units, Win (McCarthy) TTh 1:15-2:30

324. Semantical Foundations of Knowledge Representation—A formal treatment of reasoning about time, action, knowledge, and uncertainty; emphasis on epistemological questions and their relevance to AI. Topics: the situational calculus, dynamic logic, temporal logics, modal logics of knowledge and belief, fuzzy logic, and probabilistic logic. Prerequisites: an understanding of logic and basic model theory.

3 units, Spr (Shoham) TTh 11-12:15

325. Planning Methods in Artificial Intelligence—Introduction to AI methods for planning courses of action in order to achieve a specified goal from an initial state of the world. Linear planning (means-ends analysis, goal regression), non-linear planning, hierarchical planning, and compromise-based planning. Planning with temporal constraints. Reactive planning architectures. Interaction with execution and learning. Underlying problems—frame, qualification, prediction, and persistence, and notions, such as interdependent subgoals, reviewed and analyzed. Two parts: the basics illustrated with simple examples; and applications in various domains (robotics, process planning, etc.) Prerequisite: 221.

3 units, Spr (Latombe) TTh 9:30-10:45

326. Robot Reasoning—Spatial reasoning. Representing the robot workspace, reasoning about spatial occupancy and motion, and reasoning about and under uncertainty. Path planning, generating trajectories for objects moving among obstacles. Dealing with uncertainties in model, control, and sensing; approaches—program refining, inductive learning, and pre-image backchaining. Planning sensory interaction. Grasp planning, multiple-moving-objects path planning, inference of geometrical positions from spatial relations, and integrated architectures for advanced robot programming systems.

3 units, Spr (Latombe) MW 12:50-2:05

327A. Introduction to Robotic Manipulation—Basics, and a review of current applications. Topics: kinematic structure, coordinate transformations, manipulator solutions, workspace, path selection, control, dynamics, and programming. Recommended: knowledge of matrix algebra and some familiarity with basic control theory and rigid body mechanics.

3 units, Aut (Khatib) MW 2:15

327B. Introduction to Computer Vision—Visual perception by computer with comparisons to psychophysics. Image formation: projection; surface reflectivity models and color; image sensors. Range data analysis: range measurement; representation of surfaces, differential geometry, and local discontinuities. Segmentation and aggregation: local and extended discontinuities; structure and texture. Industrial machine vision. Interpretation of image data: geometric models; generic surface interpretation; graph and network probability methods.

3 units, Win (Binford) TTh 1:15-2:30

327C. Advanced Robotic Manipulation—Selected topics in control systems: robot manipulator task description; end-effector representations and operational coordinate systems; end-effector equations of motion; nonlinear dynamic decoupling; joint torque control and force control; redundant mechanisms and kinematic singularities; obstacle avoidance; kinematic and dynamic characterization of manipulator systems, and design issues. Prerequisites: 327A and consent of instructor.

3 units, Spr (Ho) TTh 1:15-2:30

329. Topics in Artificial Intelligence—Advanced material is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number. See Time Schedule for topics currently being offered.

1-3 units

335. 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 relevant to practical statistical problems. Prerequisites: Statistics at the level of 219-220, matrix algebra, knowledge of a programming language.

3 units, Win (Johnstone) MWF 1:15

339. Topics in Numerical Analysis—Advanced material is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number.

Finite Element Methods for Elliptic PDEs Using Parallel Processing Computers—Gall-
erkin finite element method, and its application to two important elliptic problems. Poisson's equation and Stoke's equation governing incompressible flow. Underlying theory is presented, and resulting error estimates are used to improve the numerical solution using h-refinement and p-refinement techniques. Calculation of local element matrices, and the solution of global systems of linear algebraic equations. Performance of methods analyzed, and implementation on typical parallel architectures discussed.

340. Distributed Systems—Overview of distributed systems, primarily as an extension of uniprocessor operating systems to span networks. Presents the impact of networking on each of the subsystems and issues discussed in 240A,B, including basic architectural models; network-transparent message-passing and remote procedure call; network-wide virtual memory; distributed file systems; encryption, and multi-site concurrency control, replication, and error recovery. Prerequisites: 240B and 244.

3 units, Win (Silvester)


3 units, Spr (Cheriton)

342. Programming Language Design—Exposure to problems of programming language design and known solutions. Possible topics: formal semantics, implementation considerations, extensibility, very high level languages, evaluation of language designs, the innovative features of a variety of modern programming languages. Prerequisites: 242, 243.

3 units, Spr (Weise) MWF 3:15 alternate years, not given 1991-92

343. Topics in Compilers—Focus is on compilers for parallel architectures. Lectures/discussions explore program analysis techniques and code optimizations for a variety of parallel machines, including the superscalars, distributed memory machines, and multiprocessors. A significant project is included. Prerequisite: 243.

3-6 units, Spr (Lam) TTh 2:45-4

344. Computer Networks: Modeling and Analysis—(Enroll in Electrical Engineering 484.) Network functions, architectures 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; 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. Recommended: knowledge of 244. Prerequisite: 265.

3 units, Spr (Tobagi)

345. Theory of Database and Knowledge-Base Systems—Logic as a data model: Horn-clause logic, well-founded negation; object-oriented data models and systems; combining object and logical dictionaries. Database query optimization; algebraic laws, strategy search algorithms, semijoin-based algorithms, acyclic hypergraphs, optimization of massive acyclic joins. Optimization of logic queries: top-down and bottom-up inference, argument-binding patterns and rule/goal graphs, "magi sets" techniques for combining the advantages of bottom-up and top-down processing, optimization of conjunctive queries, generalized transitive closure and left/right-linear recursions, prototype systems using these techniques. Prerequisite: 145 or equivalent.

3 units, Spr (Staff) MWF 10


3 units, Aut (Ceri) MW 3:15-5:05


3 units, Aut (Pratt) TTh II-12:15

348B. Computer Graphics Algorithms, and Architectures—Intermediate course emphasizing image synthesis. Topics: 2D and 3D scan-conversion, visibility for lines, surfaces, and volumes, local and global shading models including
ray tracing and radiosity, texture generation and display, volume rendering, strategies for anti-
aliasing and photorealism, and high-performance architectures for graphics. Written assignments and
programming project. Prerequisite: 248 or consent of instructor. Recommended: 348A.
3 units, Win (Levoy) TTh 11-12:15

348C. Topics in Computer Graphics—In-depth study of one or more active research areas in
computer graphics, depending on student interest. Sample topics: display of multidimensional data, volume visualization, exotic user
interface technologies such as eye tracking, head tracking and head-mounted displays, and parallel algorithms for graphics. Includes a significant project. Prerequisite: consent of instructor.
3 units, Spr (Levoy) TTh 11-12:15

349. Topics in Programming Systems—Advanced material is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number. See Time Schedule for topics currently being offered.
by arrangement

350. Mathematical Theory of Computation—
3 units

351. Topics in Complexity Theory and Lower Bounds—Each year topics are drawn from the following: Basic machine models and complexity measures—their properties and relationships. Complexity classes and their properties; reductions and complete problems. Concrete representative problems from important complexity classes and techniques for establishing limits on the possible efficiency of algorithms. Lower bounds based on the following models of computation: decision trees; straight line programs; communication complexity; branching programs; PRAMs; boolean circuits. Spacetime trade-offs and pebbling games. Prerequisites: 154 and 264, or equivalent.
3 units, Win (Motwani) TTh 2:45-4

352. Foundations of Control Structures—Theory of constructs for controlling program execution. Theories of serial control: verification conditions, partial correctness assertions, weakest precon-
3 units, Spr (Van Glabbeek) TTh 9:30-10:45

3 units, Aut (Van Glabbeek) TTh 9:30-10:45

354. Advanced Computability and Complexity—
The recursion theorem and its applications. Blum's axiomatic theory of computational complexity. Chaitin's theory of program-size complexity and randomness. Program schemata. The inherent time requirements of computer arithmetic. Theoretical limitations on automated mathematics. Prerequisite: 154 or 254, or equivalent.
3 units (Floyd)
alternate years, given 1991-92

356. Reasoning About Knowledge—(Same as Symbolic Systems 356.) Knowledge plays a crucial role in distributed systems, cryptography, and artificial intelligence. Material examines formalizing reasoning about knowledge and extent to which knowledge is applicable to the areas above. Issues: common knowledge, probabilistic knowledge, applying knowledge to analyzing distributed systems, attainable states of knowledge, and modeling resource-bounded reasoning. Prerequisites: mathematical maturity and an acquaintance with propositional logic.
1-3 units, Win (Halpern) F 2:15-4:05

357A. Reactive Systems: The Languages—Re-
active systems maintain an on-going interaction with their environment, e.g., concurrent, distributed, and real-time programs. Basic models of reactive systems: generic transition system, shared variables, semaphores and other synchronization constructs, communication constructs, asynchronous and synchronous message passing, petri nets. Faithful modeling of concurrency: interleaving, fairness. Specification language of temporal logic: temporal operators, future and past formula, axioms and rules, tem-
poral and program validity. Specification of programs: hierarchy of program properties, classes of safety, termination, intermittence, response, persistence, and progress properties. Prerequisite: 157 or equivalent.

3 units, Win (Manna) TTh 11-12:15

357B. Reactive Systems: Verification and Development—Formal methods for verification and development of reactive programs, based on formalism of temporal logic that has been specifically developed to reason about behaviors of reactive programs. Methodologies for formal verification of properties of reactive program: proving safety, liveness, precedence, causality, response, and progress properties. Derived development approaches. State invariances, incremental verification, heuristics, assertion diagrams, overtaking analysis, forward and backward analysis, history variables. Chain and well-founded rules. Verification under assumption of fairness. Programs with large number of similar processes. Real-time programs. Assertional proof methods. Case of finite-state programs and automatic verification tools for this case. Predicate automata. Prerequisites: 157 or equivalent, and 357A.

3 units, Spr (Manna) TTh 11-12:15

358. Topics in Programming Language Theory—Topics of current research interest in the mathematical analysis of programming languages may include: structured operational semantics, domain theory, semantics of concurrency, rich type disciplines, problems of representation independence, and full abstraction. May be repeated for credit. Prerequisites: 154, 157, 258, or equivalents.

3 units, Spr (Mitchell)

359. Topics in Theory of Computation—Advanced material is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number. See Time Schedule for topics currently being offered.

1-3 units, by arrangement

360. Analysis of Algorithms—Advanced course primarily for students doing specialized work in the analysis of algorithms. Presents each of the important paradigms used to analyze algorithms exactly. Combinatorial approaches, generating functions, techniques for exact solution of recurrences, functional operators, and asymptotic methods are studied in connection with important algorithms for sorting and searching.

3 units (Staff) alternate years, given 1991-92

363. Combinatorial Optimization—(Same as Operations Research 349.) Algorithms for optimization of combinatorial structures. Topics: shortest paths, maximum flows, minimum-cost flows, bipartite matching and assignment problem, general matching, stable marriage, polynomial-time algorithms for linear programming, integer programming and unimodality, approximation algorithms for NP-hard problems. Prerequisite: 161 or 264, or equivalent.

3 units, Win (Goldberg) TTh 1:15-2:30


not given 1990-91


3 units, Aut (Motwani)


3 units (Plotkin) alternate years, given 1991-92


3 units, Win (Plotkin) MWF 2:15 alternate years, not given 1991-92
368. Topics in Computational Geometry—Advanced course on 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. Topics: convexity, intersection and range query problems, point location in subdivisions, and sweep-line methods. Additional topics vary yearly: visibility and decomposition problems, collision avoidance and shortest path questions, the use of geometric duality, etc. May be repeated for credit.
3 units, Win (Guibas)

369. Topics in Analysis of Algorithms—Advanced material is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number. See Time Schedule for topics currently being offered.
Win (Broder, Karlin)
Spr (Plotkin)

371. Medical Decision Analysis—(Same as Engineering Economic Systems 235, Medical Information Sciences 235.) Use of decision analysis in medical practice. Student teams analyze specific clinical decision problems as a term project. Topics: the decision making role of patients and physicians, medical preference models, assessing decision models in a clinical context, medical ethics, and designing and using automated medical decision tools. Prerequisites: Engineering Economics Systems 31 or 231, or equivalent. No formal medical background is required.
4 units, Spr (Holtzman, Matheson)

3-4 units, Aut (Winograd) MWF 3:15-4:30

379. Interdisciplinary Topics—Advanced material that relates computer science to other disciplines is often taught for the first time as a "topics" course, perhaps by a faculty member visiting from another institution. Students may therefore enroll repeatedly in a course with this number. See Time Schedule for topics being currently offered.
by arrangement

393. Computer Laboratory—A substantial computer program is designed and implemented, written report required. Recommended as a preparation for dissertation research. For graduate students of Computer Science; consent of instructor required. Register using the section number associated with the instructor.
any quarter (Staff) by arrangement

395. Database Project—Use of database management or file systems for a substantial application, written analysis and evaluation required. For graduate students of Computer Science; consent of instructor required. Register using the section number associated with the instructor.
any quarter (Staff) by arrangement

399. Independent Project.
any quarter (Staff) by arrangement

EXPERIMENTAL

409. Topics in Knowledge-Based Software Engineering—Focuses on how knowledge-based tools can provide automated assistance in developing conventional software. Topics: wide-spectrum and very-high-level languages, formal specifications, correctness-preserving transformation rules, representation and use of programming knowledge (algorithm and data structure design, refinement of data and control structure, program optimization), performance estimation, knowledge-based support for project management, synthesis of parallel programs and architectures. Individual projects. Prerequisites: 22, 243, 257.
3 units, Spr (Smith, Green) TTh 9:30-10:45

426. Genetic Algorithms and Their Applications—Genetic algorithms are mathematical algorithms for search, optimization, and machine learning patterned after the evolutionary processes of reproduction and survival of the fittest. Topics: mathematical justification for genetic algorithms; applications to game-playing, function optimization, pattern recognition, self-programming computers, economies, neural net design, parallel implementations, and Holland Classifier systems.
3 units, Win, Spr (Koza) TTh 1:15-2:30

441. Topics in ADA Programming—The ADA language is used as an example for discussing current research in high level languages for programming large systems and distributed systems. Related developments in specification languages are discussed. Part 1 (the ADA language design and programming techniques): multi-task programming, compilation algorithms for tasking, runtime supervisors for distributed systems in ADA, detection of concurrency error:
comparison of ADA with other high level concurrent languages. Part 2: design of specification languages related to ADA, specification, validation, and verification methods for multi-task programs; environments for programming with specifications. Prerequisite: 107.
3 or 4 units, Win (Luckham) TTh 1:15-2:30

499. Advanced Reading and Research—For graduate students in Computer Science; consent of instructor required. Register using the section number associated with the instructor. any quarter (Staff) by arrangement

GRADUATE SEMINARS

510. Digital Systems Reliability Seminar—(Enroll in Electrical Engineering 385A.) Student-faculty discussions of research problems in the design of reliable digital systems. Specific areas include fault-tolerant systems, design for testability and system reliability. Emphasis on student presentations and Ph.D. thesis research.
1-4 units, Aut (McCluskey) Win, Spr (Staff)

520. Survey of Research Topics in Artificial Intelligence—(Same as Psychology 224.) Topics vary yearly. Some current topics: 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. Often involves distinguished outside lecturers who are specialists in these research topics. Prerequisite: 123 or 221, or equivalent.
1 units, Spr (LaTombe) T 11

1-3 units, Aut, Win, Spr (Gruber)
F 12:05-1:30

523. 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 AI qualifying exam. Prerequisite: 221.
3 units, Win (Staff)

524. Seminar on Expert Systems Research—(Same as Medical Information Sciences 229.) Graduate seminar for students wishing to gain historical perspective and technical understanding of research in knowledge-based systems. Classic work from the 1970s and 80s is compared with current investigation in the areas of knowledge acquisition, knowledge representation, user interfaces, and control of inference. Prerequisite: 221 or equivalent. Enrollment limited to 20.
2 units, Spr (Musen, Shortliffe) M 3:30-5 alternate years, not given 1991-92

527. Robotics Seminar—Recent research in computer vision, manipulation, and mobility; geometric modeling and CAD/CAM. Invited speakers present recent results and summaries of articles from the current literature.
1 unit, Aut, Spr (Khatib) M 4:15

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

1-3 units, any quarter (Golub) M 4:15-5:30

540. 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)

545. Database Research Seminar—Presentations of current research and industrial innovation. Emphasis on discussion and evaluation. Topics: database models, knowledge bases, high performance algorithms, application of artificial intelligence techniques to large and distributed databases, and architecture of future information systems.
1-3 units, Aut, Win, Spr, Sum (Wiederhold) F 3:15

548. Distributed Systems Research Seminar—Recent research in distributed operating systems, computer communications, parallel machines, parallel programming, and distributed applications. Invited speakers from Stanford and elsewhere present topics and results of current interest. Primarily appropriate for Ph.D. students and other researchers in these areas.
1 unit, Aut, Win, Spr (Staff) Th 4:15

801. TGR-M.S. Project.
any quarter (Staff) by arrangement

802. TGR-Ph.D. Dissertation.
any quarter (Staff) by arrangement
ELECTRICAL ENGINEERING


Chairman: Joseph W. Goodman
Vice Chairman: Gene F. Franklin
Associate Chairmen: Martin E. Hellman, Malcolm McWhorter


Associate Professors: David M. Bloom, Giovanni De Micheli, Abbas El Gamal*, John T. Gill III, Mark A. Horowitz, Umran S. Inan, Bruce B. Lusignan, Richard M. Swanson

Assistant Professors: Stephen P. Boyd, John M. Cioffi, Mark Linton, Dwight Nishimura, Teresa H. Y. Meng, David Ungar, Daniel Weise, S. Simon Wong


Consulting Associate Professors: Ruby Lee, Stephen Lundstrom, Roger D. Melen, Susan Owicki, Robert S. Schrieber, Noel P. Thompson, John F. Wakerly, Masao Yamada

Consulting Assistant Professor: Jehoshua Bruck, Norman P. Jouppi, Mehrdad Moslehi, David B. Tuckerman

*On leave one or more quarters

UNDERGRADUATE PROGRAMS

To specialize in Electrical Engineering (E.E.) during the undergraduate period, students should follow the depth sequence given earlier in the general discussion of the School of Engineering.

Majors must receive at least a 2.0 average letter grade indicator (LGI) in courses taken for the E.E. depth requirement.

Note that a Stanford undergraduate may work simultaneously toward the B.S. and M.S. degrees. See the "School of Engineering" correlative section in this bulletin.

GRADUATE PROGRAMS

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. To engage in this profession with competence, four years of undergraduate study and at least one year of postgraduate study are 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 a wider selection of engineering coursework, 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.
APPLICATION FOR ADMISSION

Applications for admission with graduate standing in Electrical Engineering may be obtained from, and sent to, the Office of Graduate Admissions, Building 590, Stanford, CA 94305. Applications are reviewed by this department. Special inquiries should 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 for 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, and for whom the department Committee on Graduate Admissions has been able to identify a faculty research supervisor. No time is lost in first completing the master's degree since a thesis is not required.

MASTER OF SCIENCE

University regulations governing the degree of Master of Science are described in the "Degrees" section in this bulletin.

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. They 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. The student's program proposal must be submitted to the department office during the first quarter of graduate study; modifications may be made later. Supplementary information sheets of detailed requirements, instructions, and a worksheet are available from the department office.

Programs of at least 45 quarter units that meet the following guidelines are normally approved:

1. A sequence of three or more graded electrical engineering courses numbered above 200, to provide depth in one area. The student must maintain an average 3.0 letter grade indicator or better in both the depth area and overall.
2. At least one E.E. course numbered above 200 in each of three additional course areas, outside of the area selected under (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 E.E. 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. Additional coursework to bring the total to 45 or more quarter units, including:
   a) at least 36 graded units,
   b) at least 36 units at or above the 100 level,
   c) at least 30 units in technical areas such as science, mathematics, and engineering; thesis and Special Studies units cannot be included among these 30 units.
5. At least three quarters of E.E. seminars, including 200 or 201 in Autumn Quarter. In case of time conflict, tapes of these classes can be viewed in the Terman Library.

Capable 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 demands that students be adequately prepared in physics, mathematics, circuits, fields, electronics, digital systems, and laboratory work. Skill in modern computing facilities is essential for electrical engineers, and an increasing number of our courses routinely require it. Skill should be acquired 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 45 units, and the time required to meet the degree requirements may be 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. Permission is predicated on the applicant’s academic record, performance in independent work, potential for advanced study, and on the ability of the faculty to supervise such study.

**ELECTRICAL ENGINEERING ADMINISTRATION**

The master’s degree carrying the distinction “Electrical Engineering Administration” on the diploma is conferred upon students who combine not fewer 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. The program length and residence requirements are the same as for the regular Engineer degree described below. 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 master’s program proposal or Engineer application for candidacy.

**ENGINEER**

The degree of Engineer requires a minimum of two academic years (90 quarter units) of study beyond the B.S. degree (three academic quarters beyond the M.S.) including six full-time quarters of approved work as a graduate (of which a minimum of three quarters and 36 quarter units must be in residence at Stanford).

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.

An additional year allows time for a broader program, or a more concentrated program, or whatever arrangement 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. in that it prepares for professional engineering work rather than 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 applicant to follow is: (1) if now working toward the Stanford M.S. degree in Electrical Engineering, request permission to continue graduate studies beyond the master’s degree, using a form obtained from the Electrical Engineering Department Office, or (2) if 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.

During the first quarter of work beyond the M.S. degree, formal application for admission to candidacy for the degree of Engineer is made on a form that can be obtained from the department office. The program of study is prepared by the student with the help of the thesis advisor and submitted to the academic secretary for approval. The form should contain a list of all graduate courses completed at Stanford and elsewhere and all courses yet to be completed.

**DOCTOR OF PHILOSOPHY**

A complete statement regarding the degree of Doctor of Philosophy is found in the "Degrees" section in this bulletin. The requirements are administered by the University Committee on Graduate Studies.

Admission to a graduate program 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 to that application does the student become a candidate for the Doctor of Philosophy degree.

Requirements may be summarized as follows: The student must 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 qualifying examinations given by the faculty of the Electrical Engineering Department; (3) an approved program of courses in electrical engineering and allied subjects; (4) an approved topic of research and a written dissertation, based on research, which must be a contribution to knowledge; (5) an oral examination which is a defense of dissertation research and which is taken near the completion of the doctoral program.

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 must fulfill the M.S. depth requirement, comprise a total of at least 20 units of coursework in electrical engineering (of which 15 units must be graded) and be approved by the department's Ph.D. Degree Committee. A letter grade indicator of at least 3.35 is required.

FINANCIAL ASSISTANCE

The department annually awards a number of fellowships and 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 which 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 pursue and write their theses as an integral part of the assistantship.

Applicants for all three forms of financial assistance should obtain the necessary application forms from the Office of Graduate Admission, Building 590, Stanford, CA 94305.

THE HONORS COOPERATIVE PROGRAM

Many of the department's graduate students are supported by the Honors Cooperative Program, which 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 the "School of Engineering" section of this bulletin.

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 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.

COMPUTER SYSTEMS

Compilers
Computer Aided Design
Computer Architecture
Computer Networks
Computer Organization
Computer Reliability
Concurrent Languages
Concurrent Processes and Processors
Distributed Systems
Local Area Networks
Operating Systems
Performance Measurement and Modeling
Programming Environments
Programming Languages
Program Verification
Software Engineering
User Interfaces
VLSI

INFORMATION SYSTEMS

Adaptive Control and Signal Processing
Adaptive Neural Networks
Biomedical Signal Analysis
CAD and Analysis of Systems
Cryptography and Data Security
Data Communications
Digital Signal Processing
Estimation Theory and Application
Fourier and Statistical Optics
Information and Coding Theory
Medical Imaging
Multivariable Control
Pattern Recognition and Complexity
Quantization and Data Compression
Real-Time Computer Applications
Signal Processing Algorithms and Architectures
Speech and Image Coding

INTEGRATED CIRCUITS
Analog Integrated Circuits
Application-Specific Integrated Circuit Design
Bipolar, MOS, and Other Devices and Circuit Technologies
Computer-Aided Analysis and Design
Custom Integrated Circuits for Computers and Telecommunications
Digital Integrated Circuits
Integrated Sensors and Transducers
Linear Integrated Circuits
Optoelectronic Integrated Circuits
Process, Device, and Circuit Modeling
Semiconductor Manufacturing
VLSI Device Structures and Physics
VLSI Fabrication Technology

LASERS AND QUANTUM ELECTRONICS
Coherent UV and X-Ray Sources
Fiber Optics
Laser Applications in Aeronautics, Biology, Chemistry, Electronics, and Physics
Laser Devices and Laser Physics
Nonlinear Optical Devices
Photoacoustic Phenomena
Picosecond Laser Pulses
Ultra-fast Optics and Electronics

MICROWAVES, ACOUSTICS, AND OPTICS
Acoustic Microscopy
Acousto-optic Devices
Fiber Optics
Holography
Microwave Integrated Circuits and Devices
Nondestructive Testing
Scanning Optical Microscopes

SOLID STATE
Applied Superconductivity
Crystal Preparation: Epitaxy and Ion Implantations, and Molecular Beam Epitaxy
Defect Analysis in Semiconductors
Electron Spectroscopy
Electronic and Optical Properties of Solids
Generation of Focused Particle Beams
Laser, Electron, and Ion Beam Processing and Analysis
Microstructure Fabrication and Applications
Molecular Beam Epitaxy
Novel Packaging Approaches for Electronic Systems

Physics and Chemistry of Surfaces and Interfaces
Semiconductor and Solid State Physics
Solar Energy Conversion
Solid State Devices: Physics and Fabrication
Tunneling Microscopy
Ultrasmall Electron and Photo-devices

SPACE PHYSICS AND RADIOSCIENE
Computer Simulation of Wave-Particle Interactions
Electromagnetic Waves and Plasmas
Electron Beam Experiments in Space
Ionospheric and Magnetospheric Physics
Planetary Exploration
Propagation Studies of Winds and Turbulence
Radio Wave Scattering
Remote Sensing of Atmospheres and Surfaces
Solar-Terrestrial Interactions
Space Engineering (also see Space Science and Astrophysics)
Space Plasma Physics
Space Vehicle Electrodynamics
Very Low Frequency Wave Propagation
VLF Wave-injection Experiments
Wave-induced Particle Precipitation

TELECOMMUNICATIONS AND SPACE INFORMATION SYSTEMS
Communication Channels
Digital Telephone Switching
High Performance Digital Signal Processing
Radar Signal Processing
Radiating Systems
Satellite Communication Stations
Search for Extraterrestrial Intelligence
Space Data Management
Telephone and Data Networks
Voice Signal Processing
Underwater Communications

COURSES
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

The Electrical Engineering (E.E.) Department offers graduate courses (described in the following pages) in these areas:

Communications
Computer Hardware
Computer Languages and Operating Systems
Control and Systems Engineering
Digital Communication
Electronic Circuits
Electronic Devices and Technology
Fields and Waves
Information Theory and Coding
Lasers and Quantum Electronics
Network Systems
Optics and Imaging
Signal Processing
Space and Radio Science
Solid State Materials and Devices
Transmission Systems and Telephony
VLSI Design and CAD

UNDERGRADUATE:

Note that courses listed under the "Engineering" section of this bulletin may be of special interest to E.E. undergraduates.

100A, B. Seminar—Discussion of special topics of interest to electrical engineering undergraduates: research in E.E., the department, graduate schools, career opportunities, and state-of-the-art technology.

1 unit, Aut, Win (Shott) M 4:15


3 units, Aut (Helliwell) MWF 9
Win (Hellman) MWF 9


3 units, Win (Helliwell) MWF 9
Spr (Hellman) MWF 9

104. Digital Signal Processing—Introduction to computer-implemented signal processing systems. Digital impulse response and transfer functions; convolution; sampling theorem; z-transforms; digital Fourier transforms; FFT algorithms; digital filter design. Prerequisite: 102.

3 units, Aut (Peterson) MWF 9
Spr (Inan) MWF 9

105A. Feedback Control Design—(Enroll in Engineering 105A.)

105B. State-Space Control Design—(Enroll in Engineering 105B.)

106. Planetary Exploration—The other worlds of our solar system as revealed by recent space missions. Comparative properties of the terrestrial and Jovian planets; planetary atmospheres, surfaces, interior rings; planetary and satellite orbits and spacecraft trajectories, orbital perturbations; properties of the interplanetary gas, dust, comets, and meteorites. What the planets can tell us about potential terrestrial catastrophes (nuclear winter, runaway greenhouse, collision with an asteroid or large comet). Origin and evolution of planetary systems. Remote sensing from spacecraft at radio, infrared, light, and ultraviolet wavelengths. U.S. and Soviet space programs and their comparative engineering and scientific aspects. Prerequisite: one year of college engineering, mathematics, or physics. (DR:8)

3 units, Spr (Eshleman) MWF 9

108. Computer Visualization in Engineering—(Enroll in Engineering 108.)

111. Electronics I—Fundamental physics of semiconductor devices and their circuit applications. The physical principles of crystal structure, energy bands, charge densities, and charge motion in doped semiconductors, especially silicon; operating principles and device equations for MOS capacitors and field-effect transistors; biasing, small-signal models, and elementary circuit applications of MOSFETS. Prerequisite: Engineering 40. Corequisite: 101.

3 units, Aut (Siegman) MWF 9
Win (da Rosa) MWF 11

112. Electronics II—Basic operating principles and device equations for p-n junction diodes and bipolar junction transistors. Basics of transistor amplifier design using bipolar transistors. Prerequisites: 101, 111.

3 units, Win (Siegman) MWF 10
Spr (da Rosa) MWF 11

113. Electronic Circuits—Bipolar amplifier design including DC bias, small signal performance, multistage amplifiers, frequency response, and feedback. Design and use of bipolar operational amplifiers. Bipolar logic and memory design including gate array and ECL circuit configurations. Introduction to MOS circuit design. Prerequisites: 102, 112.

3 units, Aut (da Rosa) MWF 11
Spr (Wong) MWF 10

121. Digital Design Laboratory—Introduction to digital circuits and their applications. Topics: measurement techniques, logic families, switching speed, Boolean algebra, state machines, digital data transmission, analog and dig-
ELECTRICAL ENGINEERING 159

digital converters, and digital displays. Prerequisite: Engineering 40.
3 units, Win, Spr (Gill) TTh 1:15
3-hour lab weekly by arrangement

122. Analog Laboratory—Design and testing of
analog circuits. Transistor amplifier with feedback; discrete components differential amplifier, op-amps and their applications; active filters and oscillators; regulated power supplies; class AB power amplifier; AM and FM communications. Corequisite: 113.
3 units, Aut (da Rosa) TTh 9:30-10:20
Spr (Dutton) MW 3:15
3-hour lab weekly by arrangement

139. Design Project—A laboratory in which individuals or small teams design, build, and test special circuits or simple systems to provide an introduction to hands-on circuit engineering. Ideally, two students make a team and propose a project. Requirements: a report giving details of the project and test results, a presentation to the class of the design features, and the constructed (hopefully, working) project. Those primarily interested in digital circuits or microprocessors should take 183 or 281. Class limited to 15. Prerequisite 122.
3 units, Win, Spr (Bloom) Th 1:15
lab by arrangement

3 units, Aut (Tyler) MWF 1:15
Win (Inan) MWF 2:15

142. Electromagnetic Waves—Continuation of
3 units, Spr (Quate) MWF 2:15

181. Introduction to Computer Systems and Assembly Language Programming—(Enroll in Computer Science 110.)

182. Computer Organization—Basic computer organization. Computer components: memory systems, computer arithmetic, processors, controllers, input/output, buses, DMA. Data formats, addressing models, instruction sets, and microcode. Study of the design of a small computer. Prerequisites: 121 or equivalent, and Computer Science 110.
3 units, Aut (Ungar) MWF 11
Win (Lam)

183. Advanced Logic Laboratory—Experiments in digital logic design using TTL integrated circuits, MSI and LSI registers and ALU’s, Programmable Gate Arrays, and PLA’s. Choice of projects including: various sequential machines, D/A converters and CRT displays, integrators, arithmetic processors, stored-program processors, game-playing machines. Class size limited. Prerequisite: 121 or equivalents.
3 units, Aut, Win (Staff) MWF 8
Spr (Flynn) MWF 8
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 Satisfactory/No Credit basis.
by arrangement

191. Special Studies and Reports in Electrical Engineering—Independent work under the direction of a faculty member. A letter grade is given on the basis of the required written report or examination. If a letter grade based on written work is not appropriate, student should enroll in 190.
by arrangement

192. Special Seminars—Each year special seminars and experimental courses are given on topics of current interest. These are usually announced one or two quarters prior to their presentation and are given by specialists in the field. See Time Schedule and bulletins in the department office.
by arrangement

UNDERGRADUATE AND GRADUATE

201A, B. Seminar—Weekly discussions of special topics of current interest in electrical engineering. Autumn Quarter: orientation to Stanford and to the E.E. department. Winter Quarter: prepares for life after the M.S. degree, in industry or as Ph.D. students. Speakers from faculty, students, and outside. Satisfactory/No Credit only. Students with a conflict may arrange to view seminar via videotape in the library.
201A. 1 unit, Aut (Reis) M 4:15
201B. 1 unit, Win (Pantell) M 4:15

202. Medical Electronics—Primarily biological in nature. Introduces electrical engineers to the physiological and anatomic aspects of medical monitoring and imaging. Biological content, transducers, electronic systems, the socio-eco-
nomic impact, and the constraints unique to medicine. Presumes no biological background, but some familiarity with circuits and electrical instrumentation techniques (e.g., 113) makes it more meaningful.

3 units, Aut (Thompson) MW 12:50-2:05

205. The Entrepreneurial Engineer—A seminar to further the knowledge base of prospective entrepreneurs with an engineering background. Major content includes contributions made to the business world by engineering graduates. Speakers include Stanford (and other) engineering and MBA graduates who have founded large and small companies in nearby communities. Also, contributions from E.E. faculty members and other departments, law, business, and industrial engineering.

1 unit, Win (Melen) T 11

206. Control System Design and Simulation—(Enroll in Engineering 206.)

207A. Digital Control Design—(Enroll in Engineering 207A.)

207B. State-Space Digital Control Design—(Enroll in Engineering 207B.)

207C. Optimal Control and Estimation—(Enroll in Engineering 207C.)

209. Nonlinear Control—(Enroll in Engineering 209.)

212. 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. Designed to be taken Autumn Quarter by students who will be using the laboratory facilities for doctoral research. Prerequisite for 410. Those taking it as part of their breadth sequence may take it either Autumn or Spring Quarter. Prerequisite: 112 or equivalent.

3 units, Aut (Wong) MWF 2:15

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 semi-conductor 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 (Plummer) MWF 2:15

Win (Pease) MWF 11

217. Electron and Ion Beams for Semiconductor Processing—Focused and flood beams of electrons and ions are employed for processing semiconductor devices. Part I: the generation of such beams including thermionic emission, field-induced emission, first-order focusing and glow discharge processes. Part II: the interactions of such beams with the target including scattering in solids, the distribution of energy, heating, sputtering, beam-induced etching (including reactive-ion etching) and beam-induced deposition. Introduction to computer modeling of etching and deposition. Prerequisite: 212 or equivalent.

3 units, alternate years, given 1991-92

218. Semi-Custom VLSI Systems—Introduction to the design, architectures, and design automation of semi-custom integrated circuits. "Hands-on" experience in designing and prototyping a board level system using semi-custom VLSI. Topics: semi-custom design methodology; macro library, design entry and synthesis, simulation, automated placement and routing, and testing; performance optimization for macro library-based design; packaging; architectures of: sea of gates, programmable logic arrays, and programmable gate arrays. Prerequisites: basic knowledge of digital systems, logic design at the level of 182 and CMOS circuits at the level of 112, or consent of instructor.

3 units, Win (El Gamal) MWF 1:15

lab by arrangement

221. Linear Active Circuits—Analysis and design of discrete and integrated circuits. Properties of common building blocks at low and high frequencies. Circuits, such as active filters, using operational amplifiers. Filter functions for high, low, and bandpass filters. Introduction to noise limitations in amplifiers. Prerequisites: 102, 113.

3 units, Aut (McWhorter) MWF 11

228. Basic Physics for Solid State Electronics—Intended as a prerequisite for graduate level courses in physics of solid state devices. Topics: a review of classical kinetic theory, introduction to statistical mechanics, and introduction to the band theory of solids. Prerequisite: Physics 57 or equivalent.

3 units, Aut (J. Harris) TTh 9:30-10:45

229A. Photovoltaic Materials and Devices—(Enroll in Materials Science and Engineering 215.)

229B. Thin Films and Interface Microanalysis—(Enroll in Materials Science and Engineering 255.)
239C. Photoelectronic Properties of Solids—
(Enroll in Materials Science and Engineering 235.)

231. Laser I—Introduction to lasers and how they work, including quantum transitions in atoms, stimulated emission and amplification, rate equations, saturation, feedback, coherent optical oscillation, laser resonators, and optical beams. Limited primarily to steady-state behavior; uses classical models for atomic transitions with little quantum mechanics background required. Prerequisites: electromagnetic theory to a level of at least 142, preferably 241, and some knowledge of atomic or modern physics such as Physics 57, 130-131.

3 units, Aut (Staff) MWF 11

232. Lasers II—Continuation of 231 emphasizing dynamic and transient effects, including spiking, Q-switching, mode locking, frequency modulation, frequency and spatial mode competition, linear and nonlinear pulse propagation, short pulse expansion and compression. Prerequisite: 231.

3 units, Win (Staff) MWF 9

238. Electrical and Magnetic Properties of Solids—Electrical 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 systematized using the twin concepts of extended wave functions (transport, band theory, etc.) and more localized wave functions. Prerequisites: 111 and Physics 57, or graduate standing.

3 units, Win (Spicer) TTh 1:15-2:30

239A. Solid State Theory: Survey—(Enroll in Applied Physics 272.)

239B. Solid State Theory: Continuation—(Enroll in Applied Physics 273.)

241. Waves I—Introduction to 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. Geometric and structural complexities are minimized 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, Aut (Eshleman) MWF 11-12:15

242. Waves II—Continuation of 241 emphasizing fundamental topics 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 magnetoelectric plasma, and ferrite applications. Nonlinear effects. Mode coupling, resonators, and gaussian wave packets. Prerequisite: 241.

3 units, Win (Eshleman) MWF 11


3 units, Win (Pantell) MWF 11

244. Communication Engineering Transmission Systems—Design of transmission systems for television, telephone and data-using satellites, microwave repeaters, mobile radio, and broadcast transmitters. Performance of FM, AM, SSB common digital schemes and spread-spectrum modulation, time frequency, and code multiplexing. Emphasis on link performance, capacity, total system design, and cost optimization. Introduces current industry design problems and research results. Prerequisite: senior or graduate standing in Electrical Engineering, or permission of instructor.

3 units, Win (Lusignan) MWF 8

245. Waves Measurement Techniques—Lecture/laboratory on experimental techniques used for measurement of waves, employing techniques common to several fields. Experiments selected from research at Stanford: measurement of waveguide parameters, measurement of striplines, and time domain reflectometry with the network analyzer, fiber-optic waveguide measurements, optical diffraction, laser beam measurements, acousto-optic diffraction, measurements of the scanning optical microscope and measurements of capillary waves in water with the scanning optical microscope. Prerequisites: 142 or equivalent, and consent of instructor. Enrollment limited to 15.

3 units, Spr (Kino) TTh 10
246. Microwave Circuit Theory—A coherent development of the concepts and applications of distributed circuits. Emphasis on MIC structures (microstrip, coplanar waveguide, slotline, finline, and imageline) capable of transmitting millimeter wave analogue signals and picosecond pulses. Modal properties (TEM, quasi-TEM, TE, TM) of general guidelines. Higher order mode excitation effects at discontinuities (steps, bends, etc.) and junctions are modeled by lumped equivalent circuits, using Z-Y- S-matrix representations. Dispersion, attenuation, and distributed source excitation in distributed circuits. Analysis of circuit components (impedance transformers, directional couplers, hybrids, circulators, filters, solid state amplifiers). Illustrations given of IC circuit structures. Computer-aided design principles. Recommended: 142 or equivalent.

3 units, Win (Auld) MWF 2:15

249. Introduction to Space, Telecommunication, and Radioscience—Experimentation in the near-earth environment using radio waves and other probes. The STAR environment: earth, ionosphere, magnetosphere, interplanetary space, planetary environments. Tools including transmitters, antennas, receivers, sensors, radars, displays. Telecommunications. Electromagnetic waves, acoustic waves, gravity plasmas. Applications to current experimental programs. Planning and execution of experiments. Prerequisites: familiarity with electromagnetics at the level of Physics 53 and senior or graduate standing.

3 units, Aut (Bracewell) MWF 1:15 alternate years, not given 1991-92

250. Communications Design Seminar—Seminars on recent developments in telecommunications research, including fiber-optic networks, high-speed switching, voice and data processing, packet radio, and satellite applications. Speakers are from Stanford laboratories and telecommunications industry.

1 unit, Aut, Spr (Lusignan) T 4:15
Win (Staff)


3 units, Spr (Bracewell) MWF 1:15

254. Principles of Radar Systems—Analysis and design, emphasizing synthetic aperture radar. Radar equation and systems parameters, components of radar systems, radar cross-section and target characteristics, signal detection in noise, ambiguity function (with applications to measurement precision, resolution, clutter rejection and waveform design): pulse compression waveforms, synthetic aperture radar, tracking and scanning radars, HF (OTH) radar, radar remote sensing, radar astronomy. Prerequisite: senior undergraduate or graduate standing.

3 units, alternate years, given 1991-92

261. The Fourier Transform and Its Applications—The Fourier transform as a tool for solving physical problems. Fourier transform of discrete and continuous time signals, generalized transforms and Fourier series. Convolutions and correlations, the Dirac delta function, Fourier transform theorems, measures of time duration and bandwidth, the uncertainty relation, and the central limit theorem. Also, analysis of linear systems, sampling theorems, the discrete Fourier transform, and two-dimensional Fourier analysis. Prerequisite: previous exposure to Fourier series at the level of 102.

3 units, Aut (Inan) MWF 10
Win (Nishimura) TTh 2:45-4
Spr (Gray) TTh 2:45-4

262. Two Dimensional Imaging—2D autocorrelation, 2D Fourier, 2D Hartley, Hankel, Abel, and Radon transforms; projection-slice theorem. 2D delta functions, 2D impulse response, sampling theorems, image aliasing. Presentation of 2D images, contours, grey levels, matrices, contrast adjustment, perspective projection. 2D noise, speckle, thermal imaging with microwaves, noise images. Restoration, principal solution, restoration in the presence of noise. Reconstruction from projections (tomography). Indirect imaging (interferometry). Applications to various fields. Prerequisite: 261 or equivalent.

3 units, Win (Bracewell) MWF 3:15


3 units, Spr (Staff) MWF 8

264. Digital Filtering—Introduction to modern digital filtering techniques, filter approximation theory, s-plane to z-plane mappings, optimal de-

3 units, Aut (Widrow) TTh 9:30-10:45
Win (Widrow) TTh 9:30-10:45

268. Introduction to Modern Optics—(Enroll in Engineering 270A.)

270. Computer-Aided Analysis of Circuits and Systems—Introduction to simulation techniques used in circuit and system design. Topics: formulation of circuit equations; modified nodal analysis; Gaussian elimination and LU decomposition; sparse matrix techniques; DC analysis of nonlinear circuits (Newton-Raphson method and its modifications); transient analysis of nonlinear circuits; linear multistep integration; relaxation-based methods (Gauss-Seidel-Newton methods and waveform relaxation); timing verification and Penfield-Rubinstein technique; switch level simulation; event-scheduling and selective trace; functional level simulation; mixed-mode and heterogeneous simulation; distributed event-driven simulation and hardware simulation accelerators. Prerequisites: 101, Math 103.

3 units, Aut (Meng) TTh 2:45-4

271. Introduction to VLSI Systems—Large scale MOS design. Topics: MOS transistors, static and dynamic MOS gates, stick diagrams, programmable logic array and gate matrix design, MOS circuit fabrication, design rules, resistance and capacitance extraction, power and delay estimates, scaling, MOS combinational and sequential logic design, registers and clocking schemes, memory, data-path and control unit design. Elements of computer-aided circuit analysis and layout techniques. Intended for E.E., Computer Science and Computer Science Engineering students with background in computers, processors, or circuits. Background in IC fabrication or physics not required. Prerequisites: familiarity with the basic concepts of circuits, logic, and digital systems; 112.

3 units, Aut (Demichel) TTh 11-12:15
Spr (Meng) MW 11-12:15

272A. Design Projects in VLSI Systems—Experience in designing large-scale MOS ICs. Working in teams of two, students must complete modest-sized CMOS projects through layout, simulation, and design-rule checking. Topics: design tools and techniques—instruction on the use of computer 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 taking 272A are expected to take 272B for at least 1 unit. Prerequisites: 271, experience with timesharing facilities.

4 units, Win (Horowitz) TTh 1:15-2:30
lab by arrangement

272B. Testing and Simulation of VLSI Systems—Continuation of 272A, principally for simulating, testing, and elaborating projects designed in 272A. Students must functionally simulate and test their projects and report the results. By arrangement, students may undertake more extensive work for additional credit. Lectures include simulation and testing techniques used in the laboratory. Prerequisite: completing the 272A design project.

1 unit, Spr (Horowitz) TTh 9:30-10:45
lab by arrangement

278. Introduction to Statistical Signal Processing—Random variables, vectors, and processes; time averages, expectations, and laws of large numbers; stationarity, autocorrelation and spectral analysis; linear filtering of random processes; independent increment, Gaussian, and Poisson random processes. Prerequisites: 102 or 261, Statistics 116.

3 units, Aut (Gray) TTh 1:15-2:30
Win (Gray) TTh 2:45-4

279. Introduction to Communication Systems—Analysis and design of communication systems; analog and digital modulation and demodulation, frequency conversion, multiplexing, noise and quantization; spectral and signal-to-noise ratio analysis. Prerequisite: 278 and 102 or 261.

3 units, Win (Macovski) TTh 2:45-4

281. Microcomputer-Based System Design—Lectures on the architecture and design of microprocessor-based systems. Laboratory experiments use student-designed Motorola 68000 systems and utilize the latest Hewlett-Packard microprocessor system development tools. Final design project required. Based on the 68000 or alternatively on single chip microcomputers such as the Motorola 68HC11 or the Intel 8051. Prerequisites: 121, 181.

3 units, Aut (Gill) TTh 2:45-4
Win (Peterson) TTh 9:30-10:45
lab by arrangement

282. Computer Architecture and Organization—Structure of systems using processors, memories, input/output (I/O) devices, and I/O interfaces as building blocks. Computer system instruction set design and implementation, including memory hierarchies and pipelining. Issues and tradeoffs involved in the design of
computer system architectures with respect to
the design of instruction sets. Prerequisite: 182.
3 units, Aut (Hennessy) TTh 1:15-2:30
Win (Staff) TTh 11-12:15
Spr (Gupta) TTh 4:15-5:30

283. Compilers—(Enroll in Computer Science
143.)

284. Basic Tools in Computer Systems Mod-
eling—Basic tools for the analysis and perform-
ance evaluation of computer systems. Topics:
review of probability theory; Poisson distri-
bution; exponential distribution; transforms;
Poisson process; discrete-parameter Markov
chains; birth-death processes; queuing theory;
network of markovian queues. Examples from
the computer systems area. Prerequisite: Sta-
tistics 116.
3 units, Win (Tobagi) TTh 9:30-10:45

285. Programming Languages—(Enroll in Com-
puter Science 242.)

286A,B. Operating Systems—(Enroll in Com-
puter Science 240A,B.)

287. Programming Paradigms—(Enroll in Com-
puter Science 107.)

288. Software Project Laboratory—(Enroll in
Computer Science 194.)

289. Concurrent Programming—(Enroll in Com-
puter Science 140.)

290. Master's Thesis and Thesis Research—For
students who wish to do independent work un-
der the direction of an E.E. faculty member as
part of their master's degree program. A written
thesis is required for a final letter grade. The
continuing grade "N" is given in quarters
prior to the thesis submission. (See 390 if a letter
grade is not appropriate.)
by arrangement

GRADUATE

310. Integrated Circuits Technology and Design
Seminar—In-depth treatment of device struc-
tures, fabrication technologies and circuit design
issues in integrated circuits. Introduces current
research topics in these areas.
1 unit, Aut (Plummer) T 4:15
Win (Dutton) T 4:15
Spr (Saraswat) T 4:15

311. Characterization and Computer Modeling
of Semiconductor Devices—Computer simula-
tion techniques for IC process and device mod-
eling. Use of SUPREM for process modeling
and SEDAN for device analysis to characterize
effects such as bipolar current gain and MOS
threshold voltage. Model parameter extraction
for SPICE. Prerequisite: 216.
3 units, Win (Dutton) TTh 2:45-4

312. Digital MOS Integrated Circuits—Analysis
and design of digital MOS integrated circuits.
Device and circuit modeling considerations.
Circuit performance evaluation by means of
simple approximations and computer-aided cir-
cuit analysis. Transistor-level design techniques
for implementing specific digital circuit func-
tions. Logic and memory subsystem consider-
ations. Adjunct to courses in VLSI architecture
and layout. Prerequisite: 112 or equivalent.
3 units, Win (Dutton) TTh 3:15

313. Bipolar Integrated Circuits—Analysis and
design of analog bipolar integrated circuits,
emphasizing quantitative measures of perform-
ances, figures of merit, and circuit limitations.
Evaluation of circuit performance by means of
hand calculations and computer-aided circuit
simulation. Design of broadband amplifiers,
operational amplifiers, biasing circuits, voltage
references, and comparators. Frequency response,
feedback concepts, and noise in integrated cir-
cuits. Introduction to D/A and A/D converters.
Prerequisite: 113 or equivalent.
3 units, Aut (Wooley) MWF 10

314. Analog MOS Integrated Circuits—Fundamentals
of analog MOS integrated circuit design.
Small-signal device and circuit models. Design
of amplifiers, analog switches, sample and hold
circuits, comparators and voltage references.
Analog subsystems, including A/D and D/A con-
verters and switched capacitor filters. Prerequisite: 113 or equivalent.

3 units, Spr (Wooley) TTh 11-12:15

316. VLSI Devices and Technology—In modern VLSI technologies, MOS and Bipolar device electrical characteristics are very sensitive to structural details and hence to fabrication techniques. How are VLSI devices and circuits fabricated and what future changes are likely? What are the implications for device electrical performance caused by fabrication techniques? 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: 212, 216, or equivalent.

3 units, Win (Plummer) TTh 11-12:15

317. Microlithography—Fundamentals of exposure and development of resist patterns down to sub-micron dimensions. The interaction of the exposing radiation with resists and the generation of high quality images using light, x-rays, electrons, and ions. Some "hands-on" computer simulation of the exposure and development of patterns in resist. Prerequisites: 212 and basic competence in computing.

3 units, Win, Spr (Pease) MWF 8 alternate years, not given 1991-92

318. Computer-Aided Design of VLSI Systems—Presentation of techniques for computer-aided synthesis of VLSI circuits. Topics: layout compaction, procedural design and module generation; partitioning, placement and routing; PLA and gate matrix compaction; logic, structural and behavioral synthesis and optimization. Provides a theoretical framework for understanding the CAD problems. Analysis of heuristic, deterministic, and probabilistic algorithms applied to VLSI design problems. Prerequisite: 215 or 271 or consent of instructor. Recommended: familiarity with algorithm development and programming.

3 units, Win (De Micheli) Th 4:15-5:30

319. Integrated Systems Laboratory—Students do a CAD project (e.g., a synthesis program for a particular VLSI design style), or a system level design project (e.g., a board level design involving semi-custom ICs). Lectures present topics related to the project area, e.g., design representation and capture; simulation and verification techniques; synthesis systems; design management methods for large scale systems. Prerequisites: 218 and 318, or consent of instructor.

3 units, Spr (De Micheli, El Gamal) MW 11-12:15

320. Condensed Matter Seminar—(Same as Applied Physics 470.) Discussion by guest specialists, faculty, and students of research topics and current literature in solid state physics.

1 unit, Aut, Win, Spr (Spicer, Kapitulnik) Th 4

322A. Basic Quantum Mechanics—Two quarter sequence provides a firm foundation in quantum mechanics in condensed matter physics and solid-state electronics. 322A: postulates are developed emphasizing their physical interpretation. Topics: wave mechanics, probability amplitudes, matrix mechanics, the Dirac formalism, free particles, the harmonic oscillator, angular momentum, and the hydrogen atom. Prerequisites: Physics 57 or equivalent, differential equations. Recommended: linear algebra.

3 units, Aut (White) MWF 1:15

322B. Basic Quantum Mechanics—Applications of quantum mechanics to selected problems. Approximation schemes developed are variational methods, perturbation, and time-dependent perturbation. Complications arising from identical particles. Example applications: the helium atom, covalent bonding, electrons in solids, tunneling, quantum well devices, and the laser. Prerequisite: 322A.

3 units, Win (White) MWF 1:15

324. Applications of Quantum Theory—A unified approach involving the density matrix to lasers, field quantization, and multiple quanta effects. Emphasis on the techniques for obtaining the appropriate equations of motion, rather than detailed investigation of specific devices. Topics: rate equations, spontaneous emission, laser action, infrared absorption, multiple photon absorption, relativistic quantum effects, and free-electron lasers. Prerequisite: 322B or Physics 231.

3 units (Pantell) alternate years, given 1991-92

325A,B. Physics of Semiconductor Devices—Physical principles that govern operation of semiconductor devices and their applications in advanced semiconductor devices. Two quarter sequence; 328A emphasizes semiconductor physics such as quantum mechanics, energy band theory, semiconductor statistics, semiclassical transport theory, scatterings, and quantum mechanical transport theory; 328B emphasizes the applications of semiconductor physics in advanced semiconductor devices, such as heterojunction (HJ) p-n diodes, HJ-bipolar transistors, HJ-FET's electron transfer devices, and photonic devices. Many examples are related to the up-to-date research carried out in
334. Superconducting Electronics—Introduction to superconducting electronics and applications. A brief introduction to the phenomena of superconductivity through a discussion of Josephson junctions and superconducting quantum devices and an analysis of promising applications in computer logic and memory, magnetometry, and low noise electromagnetic detectors and mixers in the millimeter and sub-millimeter wave region. Recommended: an exposure to quantum mechanics and a good grounding in electromagnetic theory.

3 units, Win (Beasley) TTh 1:15-2:30

337. Solid-State Characterization Laboratory—Laboratory involving experimental techniques used to characterize the electronics and optical properties of solids and solid-state devices. Present experiments: Hall Effect, Deep Level Transient Spectroscopy (DLTS), Electron Beam Induced Conductivity (EBIC), photoluminescence and optical absorption. Prerequisite: 238 or Material Science and Engineering 188.

3 units, Aut, Win, Spr (Bates) by arrangement

346. 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.

3 units, Spr (S. Harris) MW 2:15

347. Optical Methods in Engineering Science—(Enroll in Aeronautics and Astronautics 220.)
352. Electromagnetic Waves in the Ionosphere and Magnetosphere—Magnetotonic theory in multi-component media; signal dispersion; group ray velocity; wave polarization; refractive index surfaces; ray tracing; absorption; boundary effects; interpretation of natural phenomena (whistlers, VLF emissions); remote sensing in plasmas; communication; theory of wave-particle interactions in the magnetosphere. Prerequisite: 142 or equivalent.

3 units, Spr (Helliwell) TTh 11-12:15 alternate years, not given 1991-92

354. Introduction to Radio Wave Scattering—Integral and differential equations of radio waves 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, alternate years, given 1991-92

357. Microstructures Fabrication Laboratory—Laboratory projects on the application of microfabrication technologies to exploratory devices. Planar fabrication techniques including contact lithography, vacuum deposition, and chemical etching emphasized. Use of analytical instruments including the scanning electron microscope, surface profilometer, and wafer probe station. Enrollment preference to students pursuing doctoral research programs requiring the use of the Ginzton microfabrication facility. Registration by consent of instructor. Prerequisite: 212 or 333.

3 units, Sum (Bloom, Khuri-Yakub) by arrangement

358A. Lasers Laboratory—(Enroll in Applied Physics 304.)

358B. Nonlinear Optics Laboratory—(Enroll in Applied Physics 305.)

363. Linear System Theory—Accelerated version of 263 with additional material on linear quadratic regulators, transfer function methods, and time-variant systems. Prerequisite: Math. 103 or Math. 113.

3 units, Aut (Kailath) MWF 1:15


3 units, Win (Boyd) MWF 1:15


3 units, alternate years, given 1991-92


3 units, Win (Hesselink) TTh 11-12:15

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 (Goodman) MWF 10 alternate years, not given 1991-92

368. Digital Image Processing—(Enroll in Aeronautics and Astronautics 268.)

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, magnetic resonance, 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. Prerequisite: Fourier transforms. Recommended 366.

3 units, Spr (Nishimura) TTh 11-12:15

370. Information Systems Seminar—Lectures and discussion of topics and research areas in information systems. Topics: communication and
information theory, signal processing, systems and control, and optical information processing.

1 unit, Aut (Gray) Th 4:15
Win (Franklin) Th 4:15
Spr (Kailath) Th 4:15

371. Advanced VLSI Circuit Design—Analysis and design of high performance digital integrated systems. Focus is on developing and using simple models to quickly evaluate the trade-offs involved in obtaining high performance systems. Bipolar, CMOS, and BiCMOS circuits. Common subsystems (e.g., memory arrays, register files, ALUs) are used to evaluate technologies and circuit designs. Final project involves the design of subsystems for a high speed computer. Prerequisites: 271, 313, or consent of instructor.

3 units, Spr (Horowitz) MWF 10

372. Quantization and Data Compression—Theory and design of codes for quantization and signal compression systems (source coding systems), systems which convert analog of high bit-rate digital signals while optimizing fidelity subject to available communication and storage capacity. The focus is the theoretical and practical tradeoffs among bit rate, fidelity, and complexity in codes for quantization and compression. Topics: scalar quantization (PCM), transform and predictive codes, lossless (entropy) codes, vector quantizers designed using clustering and decision tree design algorithms, Shannon distortion-rate theory, high rate (asymptotic) quantization theory, and quantization noise theory. Prerequisites: 261 and 278.

3 units, Aut (Gray) MW 11-12:15


3 units, Win (Widrow) TTh 1:15-2:30


3 units, Spr (Widrow) Th 1:15-2:30

374. Digital Transmission Systems in Telecommunications—Introduction to and comparison of analog and digital telecommunications; voice digitization—PCM, DPCM, and DMT techniques; low bit rate coding of speech; segment of companding laws in PCM; time division multiplexing-framing, synchronization and pulse stuffing; transmission of digital signals-baseband and carrier techniques. Prerequisites: 261 or equivalent, and 278 or equivalent.

3 units, Win (Narasimha) MWF 9


3 units, Spr (Boyd) TTh 9:30-10:45 alternate years, not given 1991-92


3 units, Aut (Cover) TTh 11-12:15


3 units, Win (Cover) TTh 11-12:15


3 units, Win (Kailath) TTh 1:15-2:30

entropy spectral analysis. Displacement structure: adaptive lattice and transversal filters. High-resolution methods (MUSIC, ESPRIT) for sensor array processing. Applications in communications, sonar and radar, etc. Prerequisite: 378A or permission of instructor.

3 units, alternate years, given 1991-92

379A. Digital Communication I—Maximum-likelihood data detection, signaling methods and bandwidth requirements, bandpass systems and analysis, intersymbol interference and equalization methods, continuous phase modulation, Viterbi Detection, phase-locking and synchronization. Prerequisites: 104, 278.

3 units, Win (Cioffi) TTh 9:30-10:45

379B. Digital Communication II—Capacity calculation, cut-off rates, convolutional codes, trellis and lattice codes, shaping codes, encoder/decoder complexity, spread-spectrum methods. Prerequisites: 278, 379A.

3 units, Spr (Cioffi) TTh 2:45-4

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, Win, Spr (Staff) W 4:15-5:30

381. Logic Design—Principles and techniques of logic design. Topics: combinational circuit analysis—hazard, detection; combinational circuit design—PLA, VLSI, and MSI techniques and testing techniques; IC logic families, flipflop properties, sequential circuit analysis and synthesis for fundamental and pulse mode circuits, design for testability techniques. Prerequisite: 182 or equivalent.

3 units, Aut (McCluskey) TTh 2:45-4

382. Processor Design—Computer arithmetic, high-speed algorithms. Pipelined machines, timing templates, design issues, and cache design. Memory system design for high-speed processors. Prerequisite: 282 or equivalent.

3 units, Win (Flynn) MWF 11

383. Advanced Compiling Techniques—(Enroll in Computer Science 243.)

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); data link protocols (character-oriented protocols, bit-oriented protocols, error checking, window flow control, and multi-access protocols); network control (datagrams, virtual circuits, routing, and congestion control); transport and session protocols (end-to-end communication, interconnection of networks); presentation layer protocols are cited for point-to-point, satellite, packet radio, and local area networks.

3 units, Aut (enroll in Computer Science 244.) Spr (Tobagi) TTh 2:45-4

385. Special Seminars in Computer Systems—Seminars on current research topics in computer systems are given occasionally and are usually announced one or two quarters in advance. See the Time Schedule and bulletins in the department office.

385A. Digital Systems Reliability Seminar—Student-faculty discussions of research problems in the design of reliable digital systems. Specific areas include Fault-Tolerant systems, design for testability and system reliability. Emphasis on student presentations and Ph.D. thesis research.

1-4 units, Aut (McCluskey) M 4:15

Win, Spr (Staff) M 4:15

386A. Parallel Computer Architecture and Programming—(Enroll in Computer Science 315A.)

386B. Parallel Programming Project—(Enroll in Computer Science 315B.)

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 (Staff) MWF 2:15

388. Programming Language Design—(Enroll in Computer Science 342.)

389. Topics in Programming Systems—(Enroll in Computer Science 349.)

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 Satisfactory/No Credit.

by arrangement

391. Special Studies and Reports in Electrical Engineering—Independent work under 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. If a letter grade based on written work is not appropriate, student should enroll in 390.

by arrangement

392. Special Seminars—Each year special seminars and experimental courses are given on topics of current interest. These 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.

392F. Digital Switching in Telecommunications—Switching fundamentals, space and time division switching; design of economical switching networks; analog and digital terminations; signaling methods and control systems; software design; network control and synchronizations; traffic analysis; circuit and packet switching; integrated voice and data networking. Prerequisites: 244A or 244B or 374.

3 units, Spr (Narasimha) WF 3:15-4:30

392L. Business Management for Electrical Engineers—The processes, tools, and logical basis for business planning and decision making. Topics: strategic planning and the management of new product development, finance, marketing, and manufacturing. Provides students an understanding of typical corporate and functional issues, and appreciation of the major focus on each of the functional areas of modern high technology enterprise, an acquaintance with fundamental management principles, and ability to pursue areas of further interest independently. Case method of instruction drawing, where appropriate, on cases from high technology companies. Enrollment limited to 60.

3 units, Spr (Maxfield) WF 8-9:45

395. Electrical Engineering Instruction: Practice Teaching—Open to a limited number of advanced graduate students in Electrical Engineering who plan to make teaching their career. Qualified students conduct a small section of an established course taught in parallel by an experienced instructor.

(McWhorter) by arrangement

400. Thesis and Thesis Research—Limited to students who have established candidacy for the degree of Engineer or Ph.D. A grade of "S" indicates satisfactory work; no letter grade is assigned.

by arrangement

410. Integrated Circuit Fabrication Laboratory—Laboratory fabrication of silicon gate NMOS or CMOS integrated circuits. Emphasis on practical aspects of IC fabrication, including silicon wafer cleaning, phototengraving, chemical etching, oxidation, diffusion, ion implantation, chemical vapor deposition and physical sputtering. Enrollment preference given to students pursuing doctoral research programs in which the facilities of the IC lab are used. Registration by consent of instructor. Prerequisite: 212.

3 units, Win (Wong) by arrangement

412. Advanced Integrated Circuit Laboratory—Experimental projects and seminars on integrated circuit fabrication using epitaxial deposition, oxidation, diffusion, ion implantation and photolithographic processes emphasizing techniques for achieving advanced device performance. May be repeated for additional credit. Prerequisites: 212, 410, and consent of instructor.

3 units, Spr (Saraswat) T 1:15-2:30 lab by arrangement

428A,B. Physics of Advanced Electronic Devices—Two-quarter course for second and third year graduate students specializing in solid state electronics and integrated circuits. Emphasis on the use and advantages of GaAs and related materials for high speed and optoelectronic integrated circuits. The use of heterojunctions, quantum wells and structures of ultra-small dimensions. The fundamentals for creating new devices based upon quantum size effects, tunneling, and ballistic electron transport. Prerequisites: 238A and B, and Physics 230 or equivalent.

3 units, Win, Spr (J. Harris) MWF 10

430. Solid State Laboratory Seminar—Research subjects of interest to the Solid State Laboratory. Topics: surfaces and interfaces, molecular beam epitaxy, novel manmade electronic structures, fine line lithography, solar energy conversion, rapid thermal annealing, high temperature superconductors, advanced semiconductor processing, and Schottky barriers. Faculty, advanced graduate students, and invited speakers from outside the University present material for discussion.

1 unit, Aut, Win, Spr (Spicer, Pease, J. Harris) W 4:15-5:15


453. Geomagnetically Trapped Radiation—Charged particle trapping in planetary magnetic fields, and its importance in near-earth-space phenomena. Motion of charged particles in inhomogeneous magnetic and electric fields, adiabatic invariants, distribution functions and diffusion equation methods. Useful theorems for interpreting experimental data. Source and loss processes and the physical mechanisms responsible for producing trapped radiation at the earth and other planets. Prerequisite: 142.

3 units, alternate years, given 1991-92
470A, B. Topics in Information Systems—Problems selected from recent research of the faculty in areas of information systems that have reached a level of development suitable for course presentation. Topics for 1990–91 are:

470A. Magnetic Resonance Imaging.
1 unit, Win (Nishimura) MW 4:15

3 units, Spr (Kailath) MW 3:15–4:30

479. Advanced Digital Communication—Topics: coding for channels with intersymbol interference, combined equalization and coding, coding for channels with input constraints (continuous phase of M-ary signaling constraints), encoder/decoder design, line coding design and analysis, multidimensional equalization, and multi-user code design.
3 units, alternate years, given 1991–92

482. Advanced Computer Organization—Topics in high performance and concurrent systems; single and multiple instruction stream systems; memory structures and control; high performance networks; algorithms; concurrency detection; applications considerations; system design and analysis. Prerequisites: 282, 382.
3 units, Spr (Hennessy) TTh 4:15–5:30

483. Topics in Compilers—(Enroll in Computer Science 343.)

484. Computer Networks: Modeling and Analysis—Network functions, architectures and protocols; computer traffic characterization; resource sharing, packet-switched-store-and-forward networks—ARPAnet; delay analysis, network design and optimization including capacities assignment, routing and topological design; multi-access/broadcast protocols (used in packet-switched satellite, ground radio, and local networks); fixed assignment, adaptive strategies, stability considerations and dynamic control. Prerequisite: 284. Recommended: knowledge of 384.
3 units, Spr (Tobagi) TTh 9:30–10:45

3 units, alternate years, given 1991–92

3 units, Spr (Peterson) MWF 10

3 units, Spr (Staff) TTh 2:45–4 alternate years, not given 1991–92

3 units, alternate years, given 1991–92

492. Special Seminars—Each year special seminars and experimental courses are given on topics of current interest. Usually announced one or two quarters prior to presentation and given by specialists in the field. See the Time Schedule and bulletins in the department office.
ENGINEERING-ECONOMIC SYSTEMS

Emeritus (Professor): Willis W. Harman
Chairman: David G. Luenberger
Professors: Donald A. Dunn, Ronald A. Howard, Donald G. Luenberger, William J. Perry, James L. Sweeney
Associate Professors: Samuel S. Chiu, Edison T. S. Tse
Assistant Professors: Ross D. Shachter, Ennio Stacchetti
Professor (Research): John P. Weyant
Associate Professor (Research): Michael R. Fehling
Lecturer: Gerd D. Wallenstein
Consulting Professors: James E. Matheson, Robert R. Maxfield, Peter A. Morris, D. Warner-North
Consulting Assistant Professor: Samuel Holtzman

GENERAL INFORMATION

GOALS

The Department of Engineering-Economic Systems (E.E.S) prepares individuals for careers in analyzing, managing, and creating activities of a business, financial, technical, or social nature ranging from individual projects to entire enterprises. The department emphasizes logical analysis using mathematical representations and advanced computational procedures, but complements this analysis with careful attention to framing of issues, formulation of problems and implementation of results.

CAREERS IN ENGINEERING-ECONOMIC SYSTEMS

Students are prepared for a variety of professional careers in business, industry, universities, and government. Graduates have pursued careers in project management, product development, consulting, strategic planning, financial analysis, government policy analysis, and university teaching and research. Some E.E.S. graduates have started companies specializing in management and systems consulting, high technology products, software, or financial services. Other graduates have helped establish new analysis capability in existing firms of government agencies and still others have established courses similar to those of E.E.S. in other universities.

APPROACH

The formal coursework is organized around a set of problem solving concepts drawn from the fields of dynamics, uncertainty, optimization, economics, and decision analysis. These "portable concepts" are transferable to problems in a variety of specific areas. The concepts are presented in a set of core courses that provide a foundation for direct application and prepare students for advanced courses that explore the frontiers of research.

Students benefit most from the program by acquiring first-hand experience in the capabilities of present methodology. Project courses, on-campus applied projects, and internships are available to provide this experience.

BACKGROUND REQUIRED

Students admitted for graduate study in Engineering-Economic Systems must have a background of undergraduate work that indicates a level of mathematical problem-solving maturity customarily found in an undergraduate engineering or physical science program. A full year's college-level calculus course and several courses applying calculus would constitute minimum preparation. A course in linear algebra is strongly recommended, as is some familiarity with formal proofs. Students who are not adequately prepared should take suitable mathematics courses prior to taking the core courses. Those needing a review of linear algebra or calculus are advised to attend the two-week intensive workshop offered by the department just prior to Autumn Quarter. Undergraduate coursework in economics is not required but will prove helpful.

GRADUATE PROGRAMS

Three primary programs of study lead to the degrees of Master of Science, Engineer, and Doctor of Philosophy in Engineering-Economic Systems. In addition, the department offers a co-terminal B.S./M.S. program.

Study programs should be selected to give a broad coverage as well as work in depth in one or more specific areas. The course program should include a selection of foundation material from the offerings of other departments to provide breadth.

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 reviewed as a terminal degree program with a professional focus, or as an exploratory vehicle to formulate and select a more advanced graduate program. Course programs are approved individually by the Engineering-Economic Systems (E.E.S) faculty.

The M.S. degree requires a minimum of one academic year of study beyond the B.S. degree. University regulations governing the M.S. 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 coursework. This total must include at least 36 units of regular lecture courses, 27 units of which must be courses in E.E.S. with letter grades. These courses must include at least five of the department's core courses and at least 3 units of project work. (See "Courses" below for a list of courses that meet these requirements.) Finally, a letter grade indicator of 2.75 must be achieved on the course program.

Up to 18 units of the M.S. degree program may be taken outside the department. However, most M.S. programs include more E.E.S. units than the minimum requirement.

ENGINEER

Admission to the Engineer degree program must be obtained from the department. The decision of the department is based on its evaluation of the applicant's academic record, performance in independent work, and potential for advanced study. The ability of the faculty to support and supervise such study is also considered.

The degree of Engineer requires a minimum of two academic years of study beyond the B.S. degree (three full-time quarters beyond the M.S.). University regulations governing the Engineer degree are described in the "Degrees" section of this bulletin.

In addition to the University requirements, the student must complete successfully: (1) an approved M.S. program with a 3.0 letter grade indicator (LGI); (2) 45 units beyond the M.S. degree including completion of all E.E.S. core courses and a 3.0 or better LGI; (3) approval of a thesis proposal by the thesis supervisor; (4) satisfactory oral presentation of the thesis to the thesis supervisor and one other faculty member appointed by the department; and (5) completion and approval of the Engineer thesis by the thesis supervisor.

DOCTOR OF PHILOSOPHY

The degree requires a minimum of three academic years of study beyond the B.S. degree. University regulations governing the Ph.D. are described in the "Degrees" section of this bulletin. The requirements are administered by the University Committee on Graduate Studies.

Admission to a graduate degree program does not imply that the student is a candidate for the Ph.D. degree. Only after the application for doctoral candidacy has received official departmental and University approval does the student become a candidate.

All students who have not already earned a master's degree must receive the M.S. in Engineering-Economic Systems as a prerequisite to candidacy for the Ph.D. Not later than the first Autumn Quarter after receiving the M.S. degree, the student should submit an application to participate in the department qualifying procedure.

In addition to University requirements, the student must complete successfully (1) the department qualifying procedure, (2) an approved program of courses, (3) a 3.5 letter grade indicator on the core courses (see "Courses" below), (4) an oral examination near the completion of the doctoral program, and (5) a dissertation, based on research, which must be a contribution to knowledge. The department does not have a foreign language requirement.

Ph.D. MINOR

Doctoral students throughout the University may complete a minor in Engineering-Economic Systems by taking 21 units of E.E.S. courses which include four core courses. The selection must be approved by the department advisor and by the E.E.S. academic affairs chairman.

FINANCIAL ASSISTANCE AND ADMISSION

Most students in the E.E.S. doctoral 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 internships, all of which contribute directly to their educational programs as well as provide financial support. For most students, the critical period financially is the first year and one half of graduate work, when a financial commitment of about $25,000 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 $825 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.

The application forms for all types of assistance may be obtained 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 a complete application for admission. (Applications not requiring financial aid are accepted until August 1.) Research assistantships, however, are awarded by the individual faculty research supervisors, not by the department, and have no such deadline.

Except in unusual circumstances, admission to the department of graduate students is limited to the Autumn Quarter because courses are arranged sequentially with basic courses and prerequisites offered early in the academic year.

INTERNSHIPS

Since most complex system problems cannot be realistically duplicated within a university, some internships are available to help the student develop the ability to solve system problems by working on real problems.

Internships may be found in large industrial firms; in companies and research groups concerned with the design, operation and planning of complex projects and systems; and in government agencies.

The duration of an internship ranges from six to twelve months depending on the time required to complete the project successfully. Internships for international students must conform to visa restrictions. Internships are not required, but many students elect to participate.

RESEARCH AND SYSTEM 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 an internship, 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 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 program research 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, (4) the use of decision analysis in medicine, and (5) the mutual exploration of the fields of decision analysis and artificial intelligence.

INTELLIGENT SYSTEMS
(Chiu, Fehling, Holtzman, 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 is conducted through the Intelligent Systems Laboratory directed by Professor Fehling. 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) integrated manufacturing enterprise management systems, (2) competitive analysis consulting system, (3) intelligent critical care decision system, (4) marketing support system, (5) product development decision support system, (6) cooperative problem solving, and (7) structural editing for situation assessments.
ECONOMIC ANALYSIS
(Chiu, Dunn, Luenberger, Stacchetti, Sweeney, Tse)

This program includes modeling and analysis of economic entities and their interactions. Several specific areas, described below, have commanded particular attention.

Natural Resource Economics—Examines the particular problems associated with depletable or renewable natural resources, including energy, biological, mineral, and environmental resources.

Organizational Economics—Studies incentives and information in organizations and inter-organizational systems. Incentives include those created by rules governing activities such as information sharing, cost allocation, and transfer pricing within an organization.

Systems Economics—A response to the growing magnitude and complexity of economic decision problems, it combines economic theory in finance, general equilibrium theory, and decision theory with the problem solving viewpoint and techniques of systems analysis.

ENERGY MODELING AND ANALYSIS
(Huntington, Sweeney, Weyant)

The energy modeling and analysis activity centers around the Energy Modeling Forum (EMF) and the Energy, Natural Resources, and the Environment Program (ENREP) of the Stanford Center for Economic Policy Research (CEPR). The EMF involves the application of formal analysis in the study of energy policy issues. Sponsored by the Electric Power Research Institute, the Department of Energy, and about 15 industrial affiliates, the EMF is based at Stanford with Professor Weyant as Director.

Current EMF studies focus upon key world oil market uncertainties, energy and the environment, and energy policy in Japan.

Research sponsored by CEPR includes modeling and analysis of world oil markets, of oil storage policies, and of long-term contracts in markets for coal. Additional research 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.

MATHEMATICAL SYSTEM ANALYSIS
(Chiu, Luenberger, Stacchetti, 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 diversity, both with respect to the types of mathematics employed and in the areas of application. The Stanford program emphasizes the interaction of theory and application. Faculty and students have developed methods in (1) modern control theory, including observers, dynamic programming, optimal control techniques, adaptive methods, and descriptor-variable theory; (2) optimization, including functional analysis methods, convergence theory for mathematical programming methods, decentralization methods, and new algorithms; and (3) economics including fixed-point methods, representation of dynamic phenomena, and investment theory.

SCIENCE AND TECHNOLOGY POLICY
(Dunn, Howard, Perry, Shachter, Sweeney, Weyant)

The science and technology policy program is concerned with the analysis of national and international policies that relate to goods and services based on new and evolving science-based technologies. It has close relationships with other activities on campus with similar objectives, as explained below.

Telecommunications and Information Policy—Analyzes policies concerned with the creation, distribution, and utilization of information and communication products. Current projects include studies of: (1) the adoption of new technologies in the telephone industry, (2) the economics of electronic publishing, and (3) optimal pricing and product selection in the telecommunications industry. Close ties with the Center for Economic Policy Research (CEPR) exist.

National Security Policy—Analyzes the existing international security system and alternative systems that may be established through the adoption of arms control and related international agreements. Projects are carried out in cooperation with the Center for International Security and Arms Control of the International Strategic Institute at Stanford. Current work includes a study of system alternatives that would be made possible by increased information exchange and improved verification of compliance with treaties.


Energy and Environment Policy—Analyses policies at the state and national levels concerned with the management of depletable and renewable natural resources and the environment. Current research projects focus on the regulation of public utilities providing natural gas and electric power. Close ties with CEPR exist.

Medical Policy—Analyses medical decision-making and the implications of the application of modern decision theory to medical practice for medical policy. Close ties with the School of Medicine exist and E.E.S. students are working on projects with both E.E.S. and medical school faculty members.

COURSES

Core Courses:

Project Courses:

Lecture Courses:

Other Courses:
290, 291, 292, 293, 294, 400 series.

Course descriptions, organized by general subject area, are listed below.

SYSTEMS

201A. Dynamic Systems—Introduction, with equal emphasis given to development of general dynamic system theory and to exploration of classical models from social, physical, and life systems. Goal: to recognize and analyze dynamic phenomena in diverse situations. Concepts include: formulation and analysis of difference and differential equations; state-space formulation; linear systems, fundamental solution sets, equilibria, dynamic diagrams; and eigenvector analysis of linear systems, the concept of stability. Systems with positive variables: Frobenius-Perron theory, stability, existence of positive equilibrium, comparative statics. Markov Chains; finite and infinite Markov Chains, limiting distributions, transient state analysis, state statistics. Applications include: cohort population models, social structures, migration models, national economics, price cycles, cultural media dynamics, Peter Principle of organizational hierarchies, Richardson's theory of arm races, Homans-Simon model of group interaction, population growth. Prerequisite: Math. 113 or equivalent.

4 units, Win (Chiu, Stacchetti)


3 units, Spr (Stacchetti) TTh 3:15-4:30 alternate years, not given 1991-92

ECONOMICS

155. Economics of Natural Resources—(Same as 255; graduate students register for 255.)

212A. Economic Analysis—Presents basic principles for analysis of economic problems arising in industry, individual or institutional decision making, and government. Topics: production (production functions, cost functions, duality); the behavior of the firm (perfect competition, monopoly, oligopoly, pricing policy); individual preferences and demands; consumer theory;
212B. Economic Analysis—Continuation of 212A.
Topics: equilibrium theory (existence of competitive equilibria, methods for computation, special models); game-theoretic models (strategic behavior of firms, bargaining, market games); public goods, externalities, truthful revelation of preferences. Emphasis on building a framework to formulate and solve important economic problems or as a basis for additional study.
3 units, Win (Sweeney) TTh 9:30-10:45

212C. Economic Analysis—Continuation of 212B.
Theoretical topics: welfare (criteria for evaluation of public projects, impossibility theorems); economics of uncertainty; and economics and information.
3 units, Aut (Luenberger) TTh 1:15-2:30 alternate years, not given 1991-92

214. Public Policy Analysis—Law and economics as a conceptual framework for policy formulation and evaluation. Examples of policies expressed in the form of property rights, contract law, tort law, criminal law, antitrust law, and public utility regulation. Analysis of the economic effects of laws and regulations. Recommended: Economics 51 or concurrent registration in 212A.
3 units, Win (Dunn) MW 11-12:15

215. Public Policy Design—Project course in which policies designed to achieve an integrated set of economic and social objectives are studied. Students prepare an analysis of some particular law, regulation, or institution that contributes to the policy design being developed. Previous studies: telecommunications deregulation and sustainable national economies. Recommended: Economics 51 or concurrent registration in 212A.
3 units, Spr (Dunn) MW 11-12:15

218. Economic Analysis Practice—Project course focusing on applications of economic analysis. Students in teams model/analyze an economic issue and present findings to the class. Lectures suggest project areas and methods useful for addressing problems. Potential projects for illustration: develop a forecasting model for semiconductor demand; model impacts of proposed trade restrictions; develop a competitive analysis for an anti-trust litigation; analyze investment options by a regulated industry.
4 units, Spr (Sweeney) TTh 11-12:15

255. Economics of Natural Resources—(Same as 155; undergraduate students register for 155.)
Economic analysis of natural resource use and preservation, including clear air and water, pollution, depletable mineral resources, energy, and biological resources. Stock-flow relationships; wealth maximizing choices over time; short-run and long-run equilibrium conditions; depletion/extinction conditions; market failure mechanisms (common-property, public goods, discount rate distortions, rule-of-capture); policy options. Prerequisites: Economics 51 or 51Q. Recommended: Math. 43.
5 units, Aut (Sweeney) MW 12:30-2:05

PROBABILITY

221. Probabilistic Analysis—A self-contained development of probability theory that is theoretically sound and suited to application. Appropriate as a terminal course or as a foundation for further graduate work in applied areas. Theory is presented axiomatically emphasizing outcome space representation for discrete and continuous random variables. Basic concepts, description of random variables, changes of variable, transform techniques, named distributions, and computer simulation. Most students have previous probability courses, but learn to apply probability concepts to problems of uncertainty. Objective: provide students with the same understanding and competence in analysis of probabilistic problems they possess in dealing with deterministic problems. Prerequisite: working knowledge of calculus.
5 units, Aut (Chiu) MW 11-12:15

3 units, Win (Schachter) TTh 12:30-1:45
DECISION ANALYSIS

31. Introduction to Decision Analysis—Decisions, and how people make them. Psychological research shows that in simple situations people make decisions that upon close examination they regard as wrong. Decision analysis is a rationale that allows one to convert the opaque decision situations that confuse into a clear basis for action by using transparent, logical steps in personal or professional life, and in areas that run from health to investment. Topics: decision trees, influence diagrams, Bayesian updating, value of information, valuing intangibles, probability assignment, risk preference, and analysis of large-scale decisions; examples are from every major field of application and provide the philosophical concepts and practical techniques necessary to achieve mastery in decision-making in a complex, dynamic, and uncertain world. (DR:8)

3 units, Aut (Howard) TTh 11-12:15

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. Examples from business, engineering, law, and medicine. Applications 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. Topics: 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 varies with current research interests. Prerequisite: 231.

3 units, Spr (Howard) Th 2:45-5:15

234. Intelligent Decision Systems—Use of artificial intelligence for delivering automated decision analysis assistance. Topics: design and analysis of classes of decisions, representing the decision analysis process, automating of probability and risk attitude assessments, automating sensitivity analysis, and representing deterministic decision models. Discussions tailored around a substantial term project. Student teams design and implement a narrow-scope intelligent decision system, or write a paper addressing a major research topic in intelligent decision systems. Prerequisites: 231 and either 285 or Computer Science 221.

4 units, Aut (Holtzman) MWF 3:15-4:30

235. Medical Decision Analysis—(Same as Medical Information Sciences 235, Computer Science 371.) Use of decision analysis in medical practice. Student teams analyze specific clinical decision problems as a term project. Topics: the decision making role of patients and physicians, medical preference models, assessing decision models in a clinical context, medical ethics, and designing and using automated medical decision tools. A formal medical background is helpful but not required. Prerequisite: 31 or 231.

4 units, Spr (Holtzman, Matheson) MWF 3:15-4:30

236. Decision Analysis Practice—An opportunity for students trained in decision analysis theory to apply that knowledge in practice, and to extend the domain of rational analysis. Teams analyze a current decision problem faced by an actual decision maker, and 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 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 (Holtzman, Matheson) MWF 3:15-4:30

238. The Ethical Analyst—The professional analyst who uses technical knowledge in support of any individual, organization, or government is ethically responsible for the consequences. Sensitizes the individual to ethical issues, providing the means to form ethical judgments, questions desirability of physical coercion and deception as a means to reach any end. An exploration of human action and relation in society is conducted in the light of previous thought, and is used to provoke additional research on the desired form of social interactions. Attitudes toward ethical dilemmas are explored.
by creating an explicit personal code. Selected issues from the full range of human affairs test the student’s framework for ethical judgment.

1-3 units, Spr (Howard) T 2:45-5:15

OPTIMIZATION


4 units, Aut (Schachter) TTh 9:25-10:50


4 units, Spr (Schachter) MW 9:30-10:45

246. Investment Science—Investment science is built on principles from systems theory, economics, and optimization. Investment opportunities and strategies are examined from this viewpoint, especially the interplay between the dynamic, uncertain, and structural composition of investments. traditional theories of present value, portfolio optimization, capital asset pricing, arbitrage, options pricing, yield curve analysis, and bond portfolio immunization; recent topics and methods. Prerequisite: 241.

3 units, Win (Luenberger) MW 11-12:15

253. Optimal Dynamic Systems—Development of optimal control theory and its applications to social, economic, and life systems. Pontryagin maximum principle developed from geometric point of view. Problems with inequality constraints; transversality condition; singular control; linear systems with quadratic cost; discounting cost; infinite horizon problem. Sufficient conditions for optimality. Applications 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) MW 1:15-2:30 alternate years, not given 1991-92

263. Principles of Optimization—A large segment of the field of optimization is 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. Prerequisites: 201B or Math. 113, Math. 115.

3 units (Tse, Stacchetti) alternate years, given 1991-92

APPLICATIONS AND RESEARCH

170. The Role of Technology in National Security—(Same as Political Science 134P.) Examines critical decisions made by the U.S. including development of the A-bomb and H-bomb, the crash development of the ICBM and SLBM after Sputnik, the decisions made in the wake of the energy crisis in the 70s, the space program, and current issues, e.g., high-density TV, the human genome project, and the SDI program. Also, briefly, how decisions to develop the A- and H-bombs were made in the U.S.S.R. and China, and comparison of the role of the U.S. and Soviet governments in their respective space programs. Focus: the process by which technical issues are synthesized into the decision process, and how they are explicated for the policymaker with no background in technology; the role of technical agencies, governmental committees, and science advisory boards and the way these groups interact to bring a broad spectrum of informed advice to the senior policymaker. Guest specialists from business, technological, and government areas provide key lectures.

3 units, Aut (Perry) MW 4:15-5:30 alternate years, not given 1991-92

206. Decision System Project Course—Class studies a recurring decision problem and constructs a prototype decision system to assist in its solution. Emphasis is on developing methodology to provide insight to decision makers, using techniques from the core courses. Design and implementation focus on representation of problem structure, and interactions among different subsystems created by class. Possible generalization of tools for use in future years. Prerequisites: four E.E.S. core courses or permission of instructor.

4 units, Sum (Schachter) TTh 9-10:50
281. **Product Planning**—Product planning as a synthesis of technology, cost, demand, user preferences, and legal rules. Students create product plans for new products that use existing technology and take existing laws as given.

3 units, Aut (Dunn) T 3:15-5

283. **Strategy and Planning Models**—Design and application of formal models in the study of strategic public and private sector planning problems. Problems involving issues of individual choice, social welfare, technology tradeoffs, resource management, and uncertainty in a national or international setting. Emphasis on integrated utilization of modeling tools drawn from diverse methodologies and the requirements for successful application in a policy-making or strategy development context. The links between art, theory, and practice are emphasized. Prerequisites: 212A, 231, and 241, or equivalent.

3 or 4 units, Spr (Weyant) MW 1:15-2:30

285. **Problem-Solving and Intelligent Systems**—Interplay of levels and forms of reasoning in the process of solving complex problems. Interdisciplinary approach to surveying important problem-solving concepts and techniques from Artificial Intelligence (AI), and integrating these AI concepts with analytical problem-solving methods from operations research, decision analysis, and statistical estimation and control. Topics: techniques for knowledge representation and modeling, basic inference methods and heuristic search strategies, and controlled reasoning paradigm in complex problem solving processes. Use of concepts and methods in AI systems to solve concrete engineering and management problems. Students with no knowledge of LISP programming must enroll in the 1-credit programming laboratory which introduces basic concepts of LISP programming and presents useful AI programming methods. Prerequisites: 221, 241.

3-4 units, Win (Tse, Fehling) MW 2:15-3:45

286. **Intelligent Problem Solving Systems**—Advanced topics in expert systems, AI planning and control, and management of uncertainties. Applications to manufacturing enterprise management systems. Student project on the design and implementation of an intelligent problem solving system. Prerequisite: 285.

3 units, Spr (Tse, Fehling) W 2:15-3:30

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 people pursue ends on a voluntary basis. Topics: efficacy and ethics; use rights for property; contracts and torts; spontaneous order and the free market; crime and punishment; guardian-ward theory for incompetency; the state and interventionism, the hypothesis of reverse results; applications to various topics—help for the needy, victimless crimes, and environmental protection; transition strategies to a voluntary society.

1-3 units, Win (Howard) TTh 2:30-4

**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

291. **Seminar in Engineering-Economic Systems**—Lectures on research applications and recent results by E.E.S. graduates and visiting scholars.

1 unit, Win (Tse) T 4:15

292. **Directed Reading and Research in Engineering-Economic Systems**—Directed study and research on a subject of mutual interest to the student and staff member.

1 or more units, any quarter (Staff) by arrangement

293. **Seminar in Engineering-Economic Systems**—Lectures on the relationship between business and technology by guest specialists from the business and the technological communities.

1 unit, Spr (Tse) 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. **System Research Seminar**—Group study of an area of current system research. Topics may include areas of theory and applications, announced on a quarterly basis.

1 or more units, Aut, Win, Spr (Staff) by arrangement

401. **Research on Intelligent Systems**—Students and faculty discuss current research on concepts and methods for building intelligent, computer-based problem-solving systems, e.g., techniques for automated planning and reasoning about action, use of qualitative and quantitative models in diagnosis and other assessment tasks, and computational methods for use in intelligent control- and decision-systems.

1-2 units, Aut, Win, Spr (Fehling) by arrangement

455. **Economic Analysis Seminar**—Economic theory, analysis, and application research in
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, or 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" section of this bulletin. 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 a group project represents 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 (I.E.E.M.), 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. The department also offers a master's degree in Manufacturing Systems Engineering in cooperation with the Mechanical Engineering Department.

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. The deadline for application is February 15.

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. 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 a step toward a second advanced degree.

The detailed requirements for the Master of Science degree are available from the I.E. M. office.

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 17 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.). 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 Management area (designed to provide core managerial skills and focused on technology management) 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 I.E. M. office.

This program should be of particular interest to Honors Cooperative students. While the program has a strong practitioner orientation, the department is also committed to furthering research in this area. The terminal degree for students interested in a research/academic career in engineering management would be the Doctor of Philosophy in Industrial Engineering with the appropriate concentration.

ENGINEERING: MANUFACTURING SYSTEMS ENGINEERING

The Master of Science in Engineering with a concentration in Manufacturing Systems Engineering addresses the need for engineers who combine management and design skills focused on manufacturing. There is a critical need for individuals who can deal directly with product design for manufacturability; design of integrated manufacturing systems; financial, organizational, and strategic management issues; and elements of automation technology such as computer-aided design, computer-aided manufacturing, robotics, and microprocessor control.

Manufacturing Systems Engineering is a joint effort of the Departments of Mechanical Engineering and Industrial Engineering and Engineering Management. The program seeks highly qualified students with strong educational backgrounds in engineering and provides a demanding curriculum strong in both hardware and engineering management.

The hardware and engineering-design aspects of the program include:
- Computer-Aided Design
- Engineering Design
- Introduction to Robotics and Manipulation
- Manufacturing Engineering
- Microprocessor Applications
- Visual Thinking

The engineering management subjects include:
- Engineering Economics
- Industrial Accounting
- Inventory Control and Production Systems
- Manufacturing Strategy
- Organizational Behavior and Management
- Quality Assurance and Control

The hardware and engineering-design courses provide hands-on background of these functions and the trade-offs that must be made in selecting alternative systems configurations.

The engineering management subjects provide a suitable perspective so that alternative system choices can be appropriately evaluated for their financial, organizational, and production impact, as well as their impact on the firm's manufacturing policy. A key integrating experience in the program is a year-long project.
Beyond the required core, the curriculum allows for elective courses chosen from a broad set of relevant electives providing additional training in both the engineering management perspective, engineering-design hardware, and aspects of computer science. Here a student may follow individual interests and tailor the program to meet individual needs.

The detailed requirements for the M.S. in Manufacturing Systems Engineering are available from the I.E.E.M. office.

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 includes the courses required for the M.S. plus approximately 36 units of additional courses of a more advanced level and 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 Ph.D. degree is a research degree and is intended for students who desire careers in teaching and research. The program requires a minimum of three years (nine quarters) of full-time graduate study, at least two years of which must be at Stanford. However, the typical student will take four years after entering the doctoral program to complete all Ph.D. requirements. The Ph.D. degree must include a minimum of 90 quarter units of approved coursework beyond the bachelor's degree, not including units for dissertation research. Frequently, a Ph.D. applicant has already completed a master's degree and would therefore be required to complete a minimum of 45 additional units. The detailed requirements for the Ph.D. program are available from the I.E.E.M. office.

ASSISTANTSHIPS AND SCHOLARSHIPS

A limited number of fellowships and assistantships are awarded each year. Application forms and detailed information may be obtained by writing the Department of Industrial Engineering and Engineering Management or the Graduate Admissions office. Applications for fellowships, assistantships, and scholarships should be made by February 15 preceding the start of the academic year for which the award is to be made.

COURSES

UNDERGRADUATE

60. Engineering Economics—(Enroll in Engineering 60.)

100. Organizations: Theory and Management—A survey of classical and modern organization theory, covering the behavior of the individual, the work group, and the organization. Enrollment limited to undergraduates with preference given to I.E.E.M. majors.

4 units, Aut (Eisenhardt) sec. 1 TTh 10-11:50 sec. 2 TTh 1:15-3:05

107. Work, Technology, and Society—(Enroll in VTSS 170.) Problems of work in contemporary society as influenced by rapid technological innovation. Causes and consequences of the current revolution in work. Public and private policies for grappling with resultant problems. Focus on the U.S., with attention to the corresponding situations in Italy, Mexico, and Japan. Topics: new technology at the workplace and its bearing on occupational, structural, and organizational changes, unions and industrial relations, the global factory and office, employment and unemployment, worker health, safety, and well-being, economic competitiveness, public education, women, and workplace ethics. Recent innovations in work policy in Silicon Valley. (DR:5)

4 units, Spr (McGinn) TTh 2:15-4:05


4 units, Win (Lee) MW 8:30-9:45

133. Industrial Accounting—Introduction to basic accounting concepts and operating character-
istics of accounting systems. Principles of financial and cost accounting, design of accounting systems, techniques of analysis, and cost control. Designed for the user of accounting information and not as introduction to professional accounting career. Interpretation and use of accounting information for decision making is stressed. Students who have taken or are taking elementary accounting should not enroll. Videotapes.

3 units, Aut (Bhimjee) TTh 1:15-2:30
Sum (Bhimjee) MTWTh 8
1 hour by arrangement

180. Senior Project: Organizations—Students participate in a major project as a group of four. Attention to problem identification and definition emphasizing synthesizing feasible solutions to real problems. Restricted to I.E. majors in their senior year not enrolled in 183 or 186. Prerequisites: 100, 121, 125, 133, 235, 260, Engineering 40, Operations Research 152, 153.
4 units, Win (Eisenhardt, Jucker, Sutton) TTh 11-12:15

183. Senior Project: Economic and Financial Analysis—A major project, in groups of four, with attention to problem identification and definition; emphasis on search for feasible solutions to real problems and appropriate treatment of uncertainties when relevant. Restricted to I.E. majors in their senior year not enrolled in either 180 or 186. Prerequisites: 100, 121, 125, 133, 235, 260, Engineering 40, Operations Research 152, 153.
4 units, Win (Keeley, Pate-Cornell) TTh 11-12:15

186. Senior Project: Production—A major project in groups of four, emphasizing problem identification and definition. Students apply analytic methodology obtained from previous coursework, when appropriate; emphasis on developing feasible solutions to real problems. Restricted to I.E. majors in their senior year not enrolled in either 180 or 183. Prerequisites: 100, 121, 125, 133, 235, 260, Engineering 40, Operations Research 152, 153.
4 units, Win (Brandeau, Carlson, Lee) TTh 11-12:15

191. Directed Study—Directed study on a subject of mutual interest to student and faculty member. Student must find a faculty sponsor and submit a one-page description of plan.
1 or more units (Staff) by arrangement

PRIMARILY FOR GRADUATE STUDENTS

201. Creative Problem Solving—(Same as Engineering 190; VTSS 181.) Problem solving emphasizing problem definition, creativity, and interpersonal and organizational factors that influence thinking. Common blocks to problem solving and methods of dealing with them. The advantages of integrating various problem solving strategies is stressed through reading, abstracted problem situations, and projects. Open to all undergraduates and graduates.
3 units (Adams) given 1991-92

203. Organizational Behavior and Management—Organization theory; concepts and functions of management; behavior of the individual, the work group, and the organization. Emphasis on case and related discussion. Enrollment limited to 50 graduate students per section; priority given to I.E.E.M. majors.
3 units, Aut (Sutton) sec. 1 MW 10-11:15 sec. 2 MW 1:15-2:30

225. Work Design—(Undergraduates see 125.) The concepts and techniques of designing and improving performance and productivity in systems composed of and influenced by people, organizational factors, environmental factors, and technology. Emphasis on the design of high-performance manufacturing systems. Multidisciplinary approach.
4 units, Win (Jucker) MW 2:15-4

4 units, Aut (Staff) MWF 9 Win (Keeley) MWF 10

237. International Investment and Financing—Evaluating international corporate investments including the implications of exposure to exchange rate movements, trade barriers, and international taxation. Capital structure and hedging decisions are examined in relation to taxation, exchange rate, and political risk issues. Implications for accounting, financial, and production practices. Prerequisite: 235. Recommended: Economics 165. Enrollment limited and at discretion of instructor (preference given to students with Economics 165).
3 units (Hodder) given 1991-92

240. Engineering Risk Analysis—Techniques of analysis of engineering systems involving a trade-off between risks (technical, human, environmental, etc.) and benefits. 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 (safety of nuclear power plants, liquefied natural gas terminals, and dams) are of interest to engineering students of various backgrounds. Emphasis on the questions of human safety for decisions of public and private sector. Prerequisites: Statistics 116 and Engineering 60, or equivalent.

3 units, Win (Pate-Cornell) MWF 1:15-2:05

260. Analysis of Production and Operating Systems—Introduction to the design, operation, and control of production systems using mathematical, computer, and modern analytical techniques. Topics: determination of optimal facility location, determination of production lot sizes, optimal timing and sizing of production capacity expansion, and introduction to inventory control. Graduate students should take 261. Prerequisites: Operations Research 152, Statistics 116.

4 units, Aut (Brandau) TTh 9:30-10:45

261. Inventory Control and Production Systems—Demand forecasting, inventory control, production scheduling, aggregate production and workforce planning, materials requirements planning and integrated systems. Prerequisite: Statistics 116 or equivalent.

3 units, Win (Hausman) TTh 10-11:15


3 units, Spr (Carlson) MW 8:15-9:45

269. Industrial Management—Introduction to marketing and management policy for industrial products. Focuses on real life industrial settings. Topics: technology selection, product design, pricing, channels of distribution, sales organization, promotion, communication, and response to competitive actions. The interaction of functional policies and overall corporate strategy is stressed. Extensive case studies. Enrollment limited to I.E.E.M. graduate students.

4 units, Win (Staff) TTh 8-9:30

270. Managing Technology for Competitive Advantage—(Same as Business 359.) Key issues of technology management focusing on the business unit level. Part I: the management of product or process development projects. Part II: the management of development manufacturing engineering functions. Part III: the integration of projects and engineering functional strategy into a business unit's technology and business strategy. Case based. Open to graduate engineers and second-year MBAs. Enrollment limited and at discretion of instructor. Prerequisite: 235 and 269 or first-year MBA core.

4 units, Spr (Adler) MF 10-11:45

271. New Enterprise Management—(Same as Business 353.) For students interested in starting a new business or participating in the management of a venture during its formative stages. Emphasis on the development and evaluation of business plans to launch new enterprises. Legal, financial, and operating problems that are peculiar to new ventures. Cases used extensively. Students, alone or in small groups, are required to develop a detailed business plan for a specific, new venture. Enrollment limited and at discretion of instructor.

4 units, Spr (Keeley) TTh 10-11:45

272. Automation and Work—(Same as VTSS 172.) A combination of theoretical reflection on and pragmatic analysis of the implementation of new technologies. Topics: human resource management in technology-intensive environments, skill and organizational impacts of advanced technologies (e.g., numerical control, word processing, CAD), technology and industrial relations, Taylorism, and new job design approaches. Emphasis on current issues; some historical background. Enrollment limited and at discretion of instructor. Open to seniors and graduate students only.

4 units, (Adler) given 1991-92

273. Entrepreneurship in High Technology—For graduate students interested in starting their own high technology business or who may become involved with smaller firms intent upon rapid growth. Also for those interested in consulting, venture capital, or in management of high technology ventures for large companies. One session each week is a case study discussion and analysis of a high technology venture. One session following is with an entrepreneur focusing on that issue. Student teams develop a new product and a business plan; recommendations for products are available. All functional areas of new ventures are studied. Enrollment limited to 55 graduate students, at the discretion
of the instructor, based upon previous management training and the new venture proposed.
4 units, Aut (Banfe) TTh 1:20-3:05

290. Risk Analysis Seminar Series—Five seminars (every other week) covering a range of aspects of risk analysis techniques and applications; assessment problems and valuation questions; technical, political, economic, and psychological aspects of risk-benefit decision making presented by speakers from universities and industry. No letter grades. Attendance required. Recommended: previous exposure to probabilistic methods.
1 unit, Spr (Pate-Cornell) Th 4:15-5:30

291. Directed Study—Directed study on subject of mutual interest to student and faculty member. Student must find a faculty sponsor.
1 or more units (Staff) by arrangement

Aut, Win, Spr (Staff) by arrangement

Aut, Win, Spr (Staff) by arrangement

320. Doctoral Research Seminar in Organizations—Topics from current published literature and working papers. Content varies. Enrollment limited to Ph.D. students; consent of instructor.
3 units, Win (Adler) TTh 2:45-5

325. Psychology and Organizational Behavior—How basic psychological processes influence individual behavior in organizations, behavior of work groups, and organizations. How theory about cognition, emotion, and personality is used to enhance and obscure knowledge about organizations, and how such knowledge guides future research. Introduction to a variety of methods for studying organizations, and learning of some of the nuances of writing-up organizational research for publication. Enrollment limited to Ph.D. students and permission of instructor.
3 units, Aut (Sutton) T 1:15-3:45

330. Doctoral Seminar in Financial Decisions—Topics from current published literature and working papers. Content varies with faculty and student research interests. Open to doctoral students with research interest in the application of financial and economic theory to industrial engineering problems. Prerequisite: Business 620.
3 units, Spr (Keeley) Th 2:15-5

340. Environmental Health Risk Assessment—Doctoral study including reading/review of the literature and exploration of new methods in the field of environmental health risk assessment. Emphasis on probabilistic methods and decision analysis, public policy making, treatment of uncertainty and economics of risk regulation. Integration of dispersion, exposure, and dose-response models (particularly for carcinogens). Enrollment limited and at discretion of instructor. Prerequisites: advanced course in statistics and probability, and engineering risk analysis (240 or equivalent).
3 units, Spr (Pate-Cornell) by arrangement

362. Advanced Models in Production and Operations—Design and operation of production-inventory systems. Production scheduling, capacity planning, plant location, sequencing, assemble line balancing, multigoal optimization. The reading material is drawn primarily from journal articles. Prerequisite: 260.
3 units, Win (Carlson) TTh 11-12:30

3 units (Brandeau) alternate years, given 1991-92

364. Advanced Models in Production and Distribution—A theoretical treatment of the management and control problems of inventory systems in production and distribution. Models for both single and multi-location systems are studied. Emphasis on operating characteristics, performance measures, and optimal operating and control policies. Prerequisites: 260 and 261, or equivalent.
3 units (Lee) alternate years, given 1991-92

366. Optimization Models in Manufacturing—Optimization models for manufacturing system design and control, focusing primarily on deterministic models. Topics: resource allocation problems, scheduling and sequencing problems, models of manufacturing systems, and analysis of heuristics. Prerequisites: 260 or equivalent, Operations Research 152 or equivalent.
3 units, Win (Brandeau) TTh 2:45-4 alternate years, not given 1991-92

3 units, Aut (Eisenhardt) W 1:15-3:30
I.E.E.M. Doctoral Research Seminar—
Presentations of current research papers by speakers from inside and outside the department. Ph.D. students must attend during every quarter in residence. No letter grades or units given.

Aut, Win, Spr (Staff) T 4:15-5:45

MATERIALS SCIENCE AND ENGINEERING

Emeriti: (Professors) Theodore H. Geballe, O. Cutler Shepard, Oleg D. Sherby, John C. Shyne, Robert L. White
Chairman: Stig B. Hagstrom
Associate Chairman: Richard H. Bube
Assistant Professors: John C. Bravman, Bruce M. Clemens
Professor (Research): Robert S. Feigelson
Consulting Professors: Paul A. Flinn, Timur Halicioglu, David Redfield, Arden Sher, John Stringer, Jeffrey Wadsworth, Henry Wise

The Department of 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, described under the School of Engineering, provides training for the physical metallurgist or materials engineer and also prepares for graduate work in materials science. Students are encouraged to take at least one year of graduate study to extend their coursework and to obtain training in research. Categorical 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

The department occupies 30,000 square feet in the Thomas F. Peterson Engineering Laboratory building, which has 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 other engineering departments and the Departments of Applied Physics, Chemistry, and Physics, participates in an interdisciplinary Center for Materials Research. The center provides equipment, service facilities, and funds for faculty and student research. It also 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 Laboratory (SSRL) at the Stanford Linear Accelerator Center. SSRL utilizes the intense X-ray and ultraviolet synchrotron radiation produced in an electron-positron storage ring for a large variety of studies of solids, liquids, and gases. For more information, see the "Stanford Synchrotron Radiation Laboratory" section 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. Undergraduates specialize in this field by following the curriculum outlined earlier under the School of Engineering. For the University's basic requirements for the bachelor's degree, see the "Degrees" section in this bulletin. Electives permit the combination of 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

For the University's basic requirements for the Master of Science degree, see the "Degrees" section in this bulletin. General departmental requirements are:

The Department of Materials Science and Engineering (M.S.E.) requires a minimum of 45 units for a master's degree. Up to 9 units of
work done as a graduate student at another institution may sometimes be transferred to give unit credit toward a Stanford degree. Substitution of courses taken for specific Stanford courses is approved on the Master's Program Proposal.

Degree requirements (for students entering after September 1, 1988) are:

1. A minimum of 30 units of M.S.E. coursework, including a maximum of 9 units of crosslisted work and a minimum of 12 units beyond the 180/202 series of courses. Thesis units (M.S.E. 200) cannot be used to fulfill this requirement.

2. Electives to bring the total to 45 units. (Master's Research Report optional, see below.)

3. A minimum letter grade indicator average of 2.75 for coursework at Stanford.

No more than 3 units of attendance-only seminar units may be used in fulfilling the requirements for the Master of Science degree. Further, if the student elects to complete a Master's Research Report, the sum of attendance-only seminar units and research units (see below) may not exceed 12 in fulfilling the requirements for the M.S. degree.

**MASTER'S RESEARCH REPORT**

Students wishing to take this option must submit a program of study, including not more than 12 units of Material Science and Engineering 200, to the department for approval at least one quarter before the degree is granted.

If a Master's Research Report is not to be submitted, units of M.S.E. 200 cannot be applied to the department's requirement of 45 units for the M.S. degree.

The report must be approved by two faculty members. Four copies of the report, in final form and signed by two faculty members, must be in the hands of the department administrator one week before the beginning of the final examination period of the final quarter of the program. The report is not an "official" University thesis but rather is intended to demonstrate to the faculty of the department an ability to conduct and report directed research.

**ENGINEER**

The University's basic requirements for the degree of Engineer are outlined in the "Degrees" section of this bulletin.

Departmental requirements are:

1. A student wishing to enter the Engineer program must have completed all requirements of the Master's Degree in Materials Science and Engineering, and must file with the department a petition requesting admission to the program. A student who fails the Ph.D. oral qualifying examination for a second time should file either a program proposal for a master's degree or a petition for the Engineer degree.

The "Application for Candidacy" must be filed by the end of the second quarter in the Engineer program. A coherent program should include 15 units of graduate courses beyond requirements for the M.S. degree, and additional research units to meet the 36-unit University minimum requirement. A letter grade indicator average of 3.0 must be maintained for all Stanford coursework.

Completion of an acceptable thesis is required. The Engineer thesis must be approved by two members of the department's faculty and submitted in quadruplet.

**DOCTOR OF PHILOSOPHY**

The University's basic requirements for the Ph.D. degree are outlined in the "Degrees" section in this bulletin.

Departmental requirements are:

1. Complete the substantial equivalent of the requirements for the Master of Science Degree in Materials Science and Engineering (M.S.E.).

2. Pass a departmental oral qualifying examination one year after admission. Students who pass are qualified to complete the "Application for Candidacy" for the Ph.D. degree.

3. Submit a program consisting of at least 72 units which contains at least 60 technical course units beyond the B.S. degree, exclusive of research units, seminars, colloquia, Participation in Teaching (M.S.E. 310), etc. The program should include:
   a) All courses in the 180 series or their equivalent, for a letter grade.
   b) Completion of 6 units of Materials Science and Engineering 202A, B, C (Materials Science Laboratory), except for students who have had equivalent experience.
   c) A minimum of 36 units of advanced coursework that, taken as a whole, comprises a coherent and well-designed program leading to proficiency in a certain area of M.S.E. Attendance-only seminars, M.S.E. 200, 300, and 310 are excluded from this category.
   d) Overall, a total of 36 units of non-crosslisted M.S.E. coursework taken at Stanford; units accumulated in the 180 and 202 series may be used in partial fulfillment of this requirement.

4. Maintain a letter grade indicator of 3.0 for all Stanford coursework as a graduate student.

5. A candidate must present the dissertation results at a departmental seminar prior to the University Oral Examination.
COURSES

5. The Microscopic World of Technology—(Enroll in Engineering 5.)
   3 units (Sinclair) not given 1990-91

50. Introductory Science of Materials—(Enroll in Engineering 50.) (DR:8)
   3 units, Win (Brauman) MWF 11
   Spr (Sinclair) MWF 11

51. Materials Technology for Structural Applications—(Enroll in Engineering 51.)
   3 units, Win (Staff) MWF 2:15

52. Electronic Materials Science—(Enroll in Engineering 52.)
   3 units, Spr (Hagstrom) TTh 9-10:15

100. Undergraduate Special Problems—Independent study in materials science under supervision of a faculty member.
   1-3 units, any quarter (Staff)
   by arrangement

150. Atomic Arrangements in Solids—(For undergraduates; see 180 for description.)
   5 units, Aut (Brauman) MTWTh 10
   and M 2:15-3:30

151. Thermodynamics and Phase Equilibria—
    (For undergraduates; see 181 for description.)
   5 units, Aut (Stevenson) MTWThF 9

152. Rate Process in Materials—(For undergraduates, see 182 for description.)
   4 units, Spr (Clemens) MWF 9
   and by arrangement

155. Mechanical Behavior of Solids—(For undergraduates; see 185 for description.)
   4 units, Win (Nix) MWF 9 TTh 4:15

158. Introduction to Electrical, Optical, and Magnetic Properties of Materials—(For undergraduates; see 188 for description.)
   4 units, Win (Bube) MWF 1:15
   and by arrangement

160, 161, 162. Experimental Methods in Materials Science—(For undergraduates; see 202A, B, C for description.) 160-162 are equivalent to 202A-202C respectively.
   2 units, Aut (Staff) W 2:15-3:45
   161. 2 units, Win (Brauman) W 3:15-5
   162. 2 units, Spr (Bates, Staff) M 3:15

170. Undergraduate Research—Participation in a research project.
   3-6 units, any quarter (Staff)
   by arrangement

178. Foundations of Electricity, Magnetism, and Optics—A compact logical exposition of the fundamental laws (Maxwell's equations) of the electric and magnetic field, and elementary applications of these laws to circuits, to a study of the electrical and magnetic properties of matter, and to the field of optics.
   3 units, Aut (Bates) TTh 2:15-3:30

180. Atomic Arrangements in Solids—(Undergraduates enroll in 150.) Description and determination of atomic arrangements in perfect and imperfect crystals, including treatment of formal crystallography, crystalline defects, and diffraction phenomena.
   4 units, Aut (Brauman) MTWTh 10

181. Thermodynamics and Phase Equilibria—
    (Undergraduates enroll in 151.) Application of thermodynamics to the control of the properties of materials. Heterogeneous equilibria emphasizing solids. Prerequisite: elementary thermodynamics.
   4 units, Aut (Stevenson) MTWTh 9

182. Rate Processes in Materials—(Undergraduates enroll in 152.) Diffusion in solids, structural transitions including recrystallization and liquid-solid and solid-solid phase transformations, property control by microstructural control. Prerequisites: 180, 181.
   3 units, Spr (Clemens) MWF 9

185. Mechanical Behavior of Solids—(Undergraduates enroll in 155.) Introduction to the mechanical behavior of solids, emphasizing relationships between microstructure and mechanical properties; description of elastic, anelastic, and plastic properties of materials; study of the relations between stress, strain, strain rate, and temperature for plastically deformable solids; application of dislocation theory to the study of strengthening mechanisms in crystalline solids; description of the phenomena of creep, fracture and fatigue and discussion of their controlling mechanisms.
   3 units, Win (Nix) MWF 9

188. Introduction to Electrical, Optical, and Magnetic Properties of Materials—(Undergraduates enroll in 158.) Survey of electrical, optical, and magnetic properties of metals, semiconductors, and insulators. A pre-quantum mechanical treatment designed for students with minimum background in condensed matter physics and electromagnetic theory. Emphasizes new concepts and opportunities to get acquainted with them. Satisfies core requirements; students majoring in electronic properties should take 198.
   3 units, Win (Bube) MWF 1:15

198. Electronic Properties of Solid Materials—
    Survey of the electronic properties of metals, semiconductors, and insulators, emphasizing free electron models. Origin and properties of energy bands in crystalline solids, and applications to electronic transport in the presence...

MATERIALS SCIENCE AND ENGINEERING 189
of electric or magnetic fields or thermal gradients, and to optical properties. For students with some background in condensed matter physics and quantum mechanics. Emphasizes the basis and models for these concepts. Satisfies core requirements. Prerequisite: 188 or equivalent.

3 units (Bube) given 1991-92

200. Graduate Special Problems.
1-15 units, any quarter (Staff)
by arrangement

201A. The Science of Crystallization: Microscopic Interfacial Phenomena—Emphasis on qualitative and semi-quantitative understanding, with a broad look at phenomena involved in the growth and perfection of crystalline solids from melt, solution, vapor, and electrodeposition. Topics: thermodynamic coupling equations, interface energetics, molecular attachment kinetics, dynamic interface shape effects in bulk crystals, solute partitioning process, and thin film formation via CVD and MBE.

3 units, Aut (Tiller) TTh 11-12:15

201B. The Science of Crystallization: Macroscopic Phenomena and Defect Generation—Topics: convection and heat transport, steady state solute partitioning, transient solute redistribution, morphological stability of interfaces, dynamic interface morphologies and physical defect generation. Emphasis on the applications of these principles to the tailor-making of new films, bulk crystals, castings, ingots, etc. Prerequisite: 201A.

3 units, Win (Tiller) TTh 11-12:15

202A,B,C. Experimental Methods in Materials Science—(Undergraduates enroll in 160, 161, 162 respectively.) Laboratory on experimental techniques in different areas of materials science. Typical experiments—202A: structural characterization by optical microscopy; experiments on thermodynamics and kinetics of materials. 202B: X-ray diffraction and transmission electron microscopy. 202C: experiments on the mechanical, electrical, optical, and magnetic properties of solids. Prerequisites: previous or concurrent registration in the Materials Science and Engineering 180 series or equivalent.

202A. 2 units, Aut (Staff) W 2:15-3:45
202B. 2 units, Win (Brazman) W 3:15-5
202C. 2 units, Spr (Bates, Staff) M 3:15


3 units, Spr (Barnett) MWF 10

204. Energy Storage—Technical principles and phenomena in approaches to energy storage in both small devices and large systems, e.g., utility and solar system load leveling, and vehicular applications. Electrochemical, chemical and thermal, mechanical, and magnetic energy storage systems. Current status and problem areas, fundamental limits, economics aspects, and potential prospects. Prerequisite: Engineering 50.

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

205. Strength and Microstructure—Mechanical properties of solids as viewed by the materials scientist or metallurgist. Basic aspects of dislocation theory and the role of dislocations and other defects on mechanical behavior of solids. Elastic, anelastic, and plastic properties of solids, stressing the relation between internal structure of solids and 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 to materials useful in technology. Directed primarily toward non-materials science majors. Prerequisite: upper division or graduate standing in engineering or science.

3 units, Aut (Staff) MWF 8

206. Imperfections in Crystalline Solids—Relation of lattice defects to physical properties of crystals. Introduction to point imperfections and their relation to transport properties in metallic, covalent, and ionic crystals, and to the geometric and energetic aspects of dislocation theory. Relation between dislocation mechanics and the mechanical properties of crystals. Structure and properties of interfaces. Prerequisites: 180, 185.

3 units, Aut (Nix) TTh 8, F 9

207A. Stress Analysis of Thin Films and Layered Composite Media—Introduction to methods of stress analysis of layered dissimilar media, including thin films deposited on substrates, composite laminates, and stratified anisotropic elastic materials based upon the technique pioneered by Stroh. Stress states generated by thermal and elastic mismatch and local stress concentrations at interfacial cracks or corners are studied with applications to integrated circuit devices, aircraft materials, and geophysical media. Prerequisites: any introductory course in strength of materials or the theory of elasticity, and some familiarity with matrix algebra.

3 units, Win (Barnett) MWF 11
first-year graduate level understanding of solid-state electronics.
3 units (Staff) given 1991-92

218. Basic Physics for Solid State Electronics—
(Enroll in Electrical Engineering 228.)
3 units, Aut (Harris) TTh 9:30-10:45

224. Amorphous Semiconductors—Atomic bonds, electronic states, and structures; es-
pecially the covalent bond and tetrahedral co-
ordination. Disordered potentials, electronic states, and energy-band tails in heavily doped
crystals and amorphous materials; localized and
extended states. Electron transport, mobility
dges and gap. Optoelectronic properties, de-
ects, instabilities and applications. Amorphous
silicon as a prototype. Prerequisites: 188 and
knowledge of semiconductor physics.
3 units, Aut (Redfield) MWF 1:15
(Alternate year course)

226. Electrochemistry and Corrosion—Devel-
opment of electrochemical principles with ap-
lication to corrosion, electrolytic processes, and
galvanic cells. Prerequisite: elementary
thermodynamics.
3 units, Spr (Stevenson) TTh 9:30-10:45

228A,B. Physics of Semiconductor Devices—
(Enroll in Electrical Engineering 328A,B.)
3 units, Win, Spr (Sigmon) MWF 3:15

229. New Methods in Thin Film Synthesis—
Techniques to control the growth of thin films
on an atomic scale provide the materials base
for new classes of devices. Fundamentals of vac-
uum growth techniques, molecular beam epitaxy
(MBE), chemical vapor deposition (CVD), elec-
tron and ion beam assisted deposition, and
plasma deposition. Relationships between dep-
osition parameters and film properties. Indus-
trial applications of thin film synthesis and
research proposal writing.
3 units, Win (Hagstrom, Smith) MWF 10

230. Materials Science Colloquium.
1 unit, Aut, Win, Spr (Hagstrom) F 3:30

231. Electrical and Magnetic Properties of Sol-
ids—(Enroll in Electrical Engineering 238.)
3 units, Win (Spicer) TTh 1:15-2:30

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. Pr-
requisites: 161 and Engineering 50, or
equivalent.
3 units, Aut (Huggins) TTh 1:15-2:30

3 units, Aut (Bube) MWF 2:15


3 units, Win (Sinclair) TTh 2:30-3:45

238. Introduction to Fracture Mechanics—(Enroll in Mechanical Engineering 240A.)

3 units, Win (Gao) TTh 10:45-12

239. Fundamentals of Optoelectronic Devices: Photodetection and Photodetectors—Fundamentals of detection of radiation in the optical region of the electromagnetic spectrum, i.e., from 0.01 μm to 1000 μm, in terms of behavior of the radiation field, material properties of the detector and statistical behavior of the detector output signal. Thermal and photon detectors are described and include bolometer (including superconducting bolometer), thermopile, Golay cell and pyroelectric thermal detectors, and photocathode, p-n junction, Schottky barrier, vacuum diode and photomultiplier photodetectors. Image intensifiers, charge transfer devices and pyroelectric vidicon are also used as applications of these detectors. The properties and use of materials used in these detector schemes are emphasized, e.g., Hg1-x Cd_xTe for detection in the 3 μm to 5 μm and 8 μm to 12 μm atmosphere windows and GaAs and Si for detection of visible radiation. Prerequisites: 188, or Electrical Engineering 216.

3 units, Spr (Bates) TTh 11-12:15

243. Transmission Electron Microscopy—Image formation and interpretation. The contrast phenomena associated with perfect and imperfect crystals from a physical point of view and from a formal treatment of electron diffraction theory. The importance of electron diffraction to systematic analysis and recent imaging developments. Prerequisite: 180.

3 units, Spr (Bates) TTh 11-12:15

244. Failure Analysis—Techniques and methods used in analysis of failures in materials science and engineering. Laboratory includes optical and electron fractography, localized chemical analysis, individual failure analyses, and a mock product liability trial. Lectures include failure in structural and electronic materials by ductile and brittle fracture, fatigue, corrosion, stress-corrosion cracking, surface, damage. Selected case studies.

3 units (Staff) given 1991-92

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.

3 units, Spr (Nix) MWF 11

(Alternate year course)

253. Transmission Electron Microscopy Laboratory—Experimental application of electron microscopy to typical problems in materials science, including specimen preparation, microscope operation and alignment, recording and analysis of bright and dark field images and diffraction patterns, dislocation and stacking fault characterization, precipitate identification.

2-3 units, Spr (Marshall) by arrangement

255. Thin Film and Interface Microanalysis—The science and technology of microanalytical techniques, including Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), secondary ion mass spectroscopy (SIMS), ion scattering spectroscopy (ISS), and x-ray photoelectron spectroscopy (XPS or ESCA). Also, generic processes such as sputtering and high-vacuum generation. Prerequisite: 188 or equivalent.

3 units, Spr (Braun) TTh 2:45-4

257. Structural Fatigue—(Enroll in Mechanical Engineering 245.)

3 units, Win (Nelson) MW 2:15-3:30

259A,B. Basic Quantum Mechanics—(Enroll in Electrical Engineering 322A,B.)

3 units, Aut, Win (White) MWF 1:15

268. The Electronic Structure of Surfaces and Interfaces—(Enroll in Electrical Engineering 329.)

3 units, Aut (Lindau) TTh 8-9:15

278. The Science of Semiconductor Interfaces—(Enroll in Electrical Engineering 331.)

3 units, given 1991-92


3 units, Win (Stevenson) TTh 9-10:15
MECHANICAL ENGINEERING

300. Research.  
1-15 units, any quarter (Staff) 
by arrangement

302. Solid-State Characterization Laboratory—  
(Enroll in Electrical Engineering 337.)  
3 units, Aut, Win, Spr (Bates) 
by arrangement

310. Participation in Materials Science Teaching.  
1-3 units, Aut, Win, Spr (Staff) 
by arrangement

341. Seminar in Mechanical Properties of Solids.  
1 unit, Aut, Win, Spr (Nix) T 4

1 unit, Aut, Win, Spr (Huggins) Th 4:15

343. Photoelectronic Materials and Devices Seminar.  
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

347. Seminar in Thin Film Science and Technology.  
1 unit, Aut (Hagstrom) W 4
Win (Clemens) W 4
Spr (Bravman) W 4

MECHANICAL ENGINEERING

Chairman: William C. Reynolds  
Associate Chairman: John K. Eaton  
Laboratory Directors: David Beach (Program Director, Manufacturing Systems Engineering and M. E. Student Shops), Mark Cutkosky (Manufacturing Sciences Lab), Daniel B. DeBra (Guidance and Control), John K. Eaton (Heat Transfer and Turbulence Mechanics), Ronald K. Hanson (High Temperature Gasdynamics), Larry J. Leifer (Smart Product Design Laboratory; Center for Design Research Rehabilitation R&D Center), Parviz Moin (Center for Turbulence Research)  
Associate Professors: John K. Eaton, Rolf A. Faste, David McKelley, Drew V. Nelson, Juan Simo  
Assistant Professors: Mark Cappelli, Mark Cutkosky, Huaqian Gao, Sanjiva Lele, M. Godfrey Mungal, Stephen J. Niksa, Shiri D. Sheppard  
Professors (Research): Dean R. Chapman, Sidney A. Self, Felix E. Zajac  
Professor (Teaching): David W. Beach  
Courtes Professors: George S. Springer, Robert L. Street  
Courtes Associate Professors: Leslie J. Dorfman, Vincent R. Hentz  
Courtes Assistant Professors: John J. Csongradi, Peter M. Pinsky  
Consulting Professors: Richard E. Balzhiser, Floyd L. Culler, Jong H. Kim, John Kim, Ernest Newman, Alvin H. Sacks, Chauncey Starr  
Consulting Associate Professor: Harry T. Whitehouse  
Teaching Specialist: Francis E. Rinehart  

The programs in the Department of Mechanical Engineering (M.E.) are designed to provide background for a wide variety of careers. The discipline 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 have traditionally entered into energy industries, product manufacturing industries, government laboratories and agencies dealing with these problems, and a variety of academic positions. Since mechanical engineering is a broad discipline, the undergraduate program can be a springboard for graduate study in medicine, law, political science, business, and other professions where a good understanding of technology is often very important. Both undergraduate and graduate programs provide excellent technical background for 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 development of systematic procedures for analysis, effective communication of one’s work and ideas, practical and aesthetic aspects in design, and 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 has three divisions: Applied Mechanics, Design, and Thermosciences. Each maintains its own laboratories, shops, and offices. Applied Mechanics Division covers dynamics, mechanics of deformable solids, fracture mechanics, fluid dynamics, and experimental and computational mechanics. Design Division emphasizes the design process and is specifically concerned with manufacturing technology, automatic control, robotics, kinematics, fatigue and fracture mechanics, experimental stress analysis, finite element analysis, optimization, design aesthetics, human factors, biomechanics, rehabilitation engineering, computer-aided design, microcomputers in design, and design research. Design Division also offers undergraduate and graduate programs in Product Design (jointly with the Art Department). Thermosciences Division offers courses and specialized work in applied thermodynamics, energy systems, combustion, fluid mechanics, heat transfer, plasma sciences, nuclear energy, and pollution control.

Many of the division faculty are involved in advanced mathematical analyses, and the department as a whole provides a number of basic and advanced courses in applied mathematics.

**FACILITIES**

The department divisions maintain modern laboratories which support undergraduate and graduate instruction and graduate research work.

In Applied Mechanics Division, qualified students can work as research project assistants, engaging in thesis research in working association with the faculty director and fellow students. Projects include original theoretical, computational, and experimental 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 Structures and Composites Laboratory, a joint activity with the Department of Aeronautics and Astronautics, studies structures made of fiber-reinforced composite materials. Equipment for fabricating structural elements include presses, autoclave, and filament winder. X-ray, ultrasound, and an electron microscope are available for nondestructive testing. The laboratory also has mechanical testers, environmental chambers, and a high speed impactor. Projects in the laboratory include design of composite structures, evaluation of environmental effects on composites, and development of novel manufacturing processes.

Applied Mechanics Division has a Computational Mechanics Laboratory. Its facilities include a CONVEX CI supermini computer (a vector machine with CRAY like architecture), SUN colorgraphics work stations, and a variety of terminals, laser printer, and hard copy devices.

Design Division has facilities for laboratory work in experimental mechanics and experimental stress analysis. Additional facilities, including MTS electohydraulic materials test systems, are available in the School of Engineering. Structures and Solid Mechanics Research Laboratory. Laboratories in bio- and rehabilitation-engineering are available through the School of Medicine and the Palo Alto Veterans Administration Medical Center.

The division also maintains student model shops which include machine tools, CAD/CAM, foundry, welding, wood, and plastics facilities. The shops offer tools and coaching to support prototype fabrication as an intrinsic part of the design process. Laboratory space is available for instruction, construction of projects, and graduate research work in disciplines of interest to the division faculty. The School of Engineering Structures Laboratory is used extensively for experimental work in structural mechanics and biomechanics. The M.E. 210 Design Project Laboratory has facilities for CAD, simple fabrication, assembly, and testing of original designs by master’s students in the engineering design program. A Smart Product Design Laboratory supports microprocessor application projects. The Center for Design Research (CDR), has an excellent facility for concurrent engineering research, development, and education. Resources include a network of over a dozen high-performance CAD workstations from IBM, DEC, SUN, Silicon Graphics, and Symbolics. In addition, CDR has several industrial robots for student projects and research. These and several NC machines are part of the CDR Manufacturing Sciences Lab. Design Division also has a unique “Product Design Loft,” in which students in the Product Design program develop graduate design projects.

Research and design/development opportunities in Rehabilitation Engineering and Biomechanics are available at the Veterans Administration Medical Center in cooperation with the School of Medicine. The program includes graduate assistantships and is led by members of Design Division faculty. Facilities include
ethernet-connected DEC, SUN, and Silicon Graphics workstations; Apple (MAC) and IBM personal computers; a Symbolics Lisp machine; and a motion analysis system for collecting biomechanical and kinesiological data. Neuromuscular Biomechanics and Electrophysiology Laboratories complement campus facilities.

Thermosciences Division has two major laboratories and a Center for Turbulence Research (CTR). 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. The High Temperature Gasdynamics Laboratory (HTGL) is engaged in research activities in plasma sciences, magnetohydrodynamics (MHD) for energy conversion, laser chemistry and processing, electrostatic precipitation, combustion, chemistry of pollutant formation, and development of laser-based diagnostics for high temperature gases. The experimental capability of the HTGL includes a variety of plasma facilities for plasma disposition and processors, normal and superconducting magnets, three shock tubes, several advanced laser systems, diagnostic devices for combustion gases and plasmas, dedicated minicomputers, a central laboratory computer (VAX-750), and laboratory combustors, including a coal combustion facility and supersonic combustion facilities. A wide variety of instrumentation, extensive shop facilities, utilities, and research space are all available within, and shared by, the laboratories. (CTR) has direct access to the major computing facilities of NASA-Ames Research Center. Together with others working in computational fluid mechanics, this group uses NASA's CRAY-XMP, CRAY-2, and CDC CYBER 205 computers.

Guidance and Control Laboratory, a joint activity with the Departments of Aeronautics and Astronautics, and Mechanical Engineering, specializes in construction of electromechanical systems and instrumentation, particularly where high precision is a factor. Work ranges from robotics for manufacturing to feedback control of fuel injection systems for automotive emission control. The faculty and staff work in close cooperation with both the Design and Thermosciences Divisions on device development projects of mutual interest.

Many computation facilities are available to department students. Three of the department's laboratories are equipped with superminicomputers. 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 IBM 3081 at the Stanford Data Center.

Library facilities at Stanford are outstanding. In addition to the general library, there are Engineering, Mathematics, Physics, and other departmental libraries of which engineering students make frequent use.

Graduate students participating in research are provided with office space in laboratory buildings, and can have substantial staff support from their research group.

UNDERGRADUATE PROGRAMS
BACHELOR OF SCIENCE

Specializing in mechanical engineering during the undergraduate period may be done 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 Product Design program is offered by 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 students who elect this program continue on through the master's degree in this field. Courses taken for the departmental major (math, science, VTSS, engineering fundamentals, and engineering depth) must be taken for a letter grade if the instructor offers the option.

Grade Requirements—To be recommended by the department for a Bachelor of Science Degree in Mechanical Engineering, a student must achieve the minimum letter grade indicator (LGI) set by the School of Engineering (2.0 in engineering fundamentals and engineering depth).

COTERMINAL B.S./M.S. PROGRAM

Stanford undergraduates who wish to continue their studies for the Master of Science degree in the coterminal program should apply for entrance after the beginning of the eighth quarter of undergraduate work and before the end of the 11th quarter. The application must provide evidence of potential for strong academic performance as a graduate student. The application will be evaluated and acted on by the graduate admissions committee of the department. Typically, an LGI of at least 3.25 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 is taken on the application. Coterminal information and forms can be obtained from the Mechanical Engineering Department office.

GRADUATE PROGRAMS
MASTER OF SCIENCE

The master’s program normally consists of three quarters of full-time coursework. 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 a B.S. degree in engineering, physics, or a comparable science program. The student’s undergraduate record and personal recommendations must demonstrate capability of handling graduate level work and 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 need 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; furthermore, students who have already fulfilled certain categories of the M.S. degree requirements as a result of 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. Discipline areas of interest to mechanical engineers include rigid and elastic body mechanics, materials, fluid mechanics, thermodynamics, heat transfer, nuclear reactor engineering, magnetohydrodynamics, biomechanics, and systems engineering, to name a few. No mechanical engineer is expected to have a mastery of the entire spectrum.

The master’s degree program requires 45 units of coursework taken as a graduate student. At least 36 of the units must be taken at Stanford; any units transferred from other universities (up to 9 are allowed) must be in graduate-level courses taken while registered as a graduate student, and may not be applied toward fulfillment of item (2). No thesis is required. However, students who desire some research experience during the master’s year may participate in research through M.E. 290, 291, and 292.

The departmental requirements which must be met for the M.S. 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 courses from the following:
   - M.E. 200-208
   - Math. 106, 113, 131, 132
   - Computer Science 237A, B
   (Requirement: 6 units)

   Students who completed comparable graduate-level courses as undergraduates and who can demonstrate their competence to instructors 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 M.E. 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 depth in specific areas as well as a significant component of applications of the material in the context of engineering synthesis. The currently approved depth packages involve three to four courses.
   b) Breadth in Mechanical Engineering: Additional graduate-level courses in mechanical engineering to bring the total number to at least 18 M.E. units courses numbered 210 and above, excluding 290-301 and mathematics courses. Of these additional courses, there must be at least one each in two independent subject areas that add breadth to the program, as approved by the advisor.

   Courses 200-208, 280, and 286-301 may not be counted in these categories.

3. Approved Electives: (To bring the total number of units to 39): all these units must have advisor approval. Graduate engineering, math, and science courses are normally approved, and upper-level undergraduate courses may be approved if consistent with the student’s objectives. Of the 39 units, no
more than 6 may come from M.E. 291 and 292, and no more than 3 may come from the other courses numbered 290-299 or other seminars. Students planning a Ph.D. degree should discuss with their advisor the desirability of taking 291 or 292 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 encouraged to use these units outside of engineering, mathematics, or the sciences. Students should consult their advisors 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. The course could be M.E. 210C, 218A, 226A, 248, 249, 254, 267, 268, 319. M.E. 292 satisfies the requirement if 3 units are involved in laboratory experiments. A student who has had a substantial laboratory experience in an industrial or government research institute may be exempted from the requirement by his advisor.

Candidates for the M.S. degree are expected to have the approval of the faculty, and a minimum letter grade indicator (LGI) of 2.75 in the 45 units presented in fulfillment of degree requirements. All courses used to fulfill requirements 1, 2, 3, and 5 must be graded (excluding seminars and courses for which a Satisfactory/No Credit grade is given to all students).

Students falling below an LGI 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 are disqualified from further registration. Courses used to fulfill deficiencies arising from inadequate undergraduate preparation for mechanical engineering graduate work may not be applied to the 60 units required for graduate registration.

**COMPUTATIONAL FLUID DYNAMICS**

Computational Fluid Dynamics (CFD) is an M.S. program operated jointly by the Departments of Aeronautics and Astronautics, and Mechanical Engineering. This program is an option within the general structure of either department’s master’s requirements. 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 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 (M.E. 269 and/or Aeronautics and Astronautics 214A,B,C) with an M.S. program strong in mathematics and numerical analysis (M.E. 200A,B,C or equivalents) and in advanced fluid mechanics (M.E. 251A,B, or 258, 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.

**ENGINEERING PRODUCT DESIGN**

The graduate program leading to M.S. in Engineering (Product Design) is unique in that it is jointly offered by the Departments of Mechanical Engineering and Art. Students with undergraduate engineering degrees other than Stanford’s B.S. in Product Design spend an additional year taking prerequisite undergraduate and product design courses. The degree requirements for this degree are:

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Art 360A,B,C. Master’s Project</em></td>
<td>6</td>
</tr>
<tr>
<td><em>M.E. 211A,B,C. Master’s Project</em></td>
<td>12</td>
</tr>
<tr>
<td>M.E. 221. Human Factors</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 313. Ambidextrous Thinking</td>
<td>3</td>
</tr>
<tr>
<td><strong>Approved Electives</strong></td>
<td>15</td>
</tr>
<tr>
<td>Free Electives</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
</tr>
</tbody>
</table>

* Taken jointly each quarter.
** Students are expected to create a plan of graduate studies suited to their personal needs. The courses listed below are recommended electives and may require enrollment approval by the instructor.

**GRADUATE DESIGN OPTIONS**

- **Biomedical Design**
  - M.E. 281A,B. Orthopedic Biomechanics
  - M.E. 282. Neuromuscular Biomechanics
  - M.E. 284. Dynamics of Viscous Fluids and Suspensions
  - M.E. 285. Biomechanical Fluid Mechanics

- **Computers in Design**
  - M.E. 212A,B. Geometric Modeling
  - M.E. 218A,B,C. Smart Product Design

- **Design Management**
  - Indust. Engr. 133. Industrial Accounting
  - Indust. Engr. 269. Industrial Marketing
  - Indust. Engr. 271. New Enterprise Management
  - Indust. Engr. 272. Managing Small Technical Companies

- **Design Philosophy**
  - M.E. 215. Designer in Society

- **Engineering Design**
  - M.E. 210A,B,C. Automation and Machine Design
  - M.E. 216. Principles of Optimal Design
  - M.E. 217A. Design for Competitive Manufacturability
  - M.E. 222. Kinematic Synthesis of Mechanisms
  - M.E. 223. Design and Analysis of Dynamic Systems
Visual Design
Art 261. Advanced Graphics Design
Art 268. Design Synthesis
Art 269. Advanced Creative Studies

Admission requirements and letter grade indicator graduation requirements are the same as for the Mechanical Engineering M.S. described above. Applicants must also submit a portfolio showing evidence of design ability (e.g., photos or slides of several art and design projects).

Students with non-engineering undergraduate degrees in design may apply to the Department of Art for a similar graduate design program administered by the Art Department and leading to an A.M. or M.F.A. in Design. Students with non-engineering degrees who wish to earn the M.S. degree should consult with the program advisor.


MANUFACTURING ENGINEERING SYSTEMS

The M.S. in Engineering (Manufacturing Systems Engineering) addresses the need for engineers who combine management and design skills focused on manufacturing. There is a critical need for individuals who can deal directly with product design for manufacturability; design of manufacturing tools; financial, organizational, and strategic management issues; and elements of automation technology such as computer-aided design, computer-aided manufacturing robotics, and microprocessor control.

Manufacturing Systems Engineering is offered jointly by two departments: Mechanical Engineering, and Industrial Engineering and Engineering Management. The program seeks high-quality students with strong educational backgrounds in engineering and provides a demanding curriculum strong in both hardware aspects and engineering management.

The hardware and engineering-design aspects of the program include:
M.E. 210A,B,C. Automation and Machine Design
M.E. 217A. Design for Manufacturability:
   Methodologies
M.E. 218A,B,C. Smart Product Design
M.E. 313. Ambidextrous Thinking
M.E. 319. Robotic and Vision Systems

The engineering management subjects include:
Indust. Engr. 121. Statistics and Quality Control
Indust. Engr. 133. Industrial Accounting
Indust. Engr. 203. Organization Behavior and Management
Indust. Engr. 261. Inventory Control and Production Systems
Indust. Engr. 268. Manufacturing Strategy

Hardware and engineering design courses provide hands-on knowledge of these functions and the trade-offs that must be made to take advantage of the relationships between design and manufacturing.

Engineering management subjects provide a suitable perspective, so that alternative system choices can be evaluated for financial, organizational, and production impact as well as impact on a firm’s manufacturing policy.

Beyond the required core, the curriculum allows for choice from a broad set of relevant electives to provide additional training in engineering management, engineering design hardware, and aspects of computer science. Here a student may tailor the program to meet individual interests and needs.

Students in the MSE program must have faculty approval and a minimum letter grade indicator (LGI) of 3.00 in the 45 units presented in fulfillment of the degree requirements.

ENGINEERING

As described in the "School of Engineering" section of this bulletin, each department in the school may sponsor students in a more general degree, the Master of Science in Engineering. Sponsorship by the Department of Mechanical Engineering (M.E.) requires (1) filing of a petition for admission to this program on the day before instruction begins, and (2) that the center of gravity of the proposed program lie in M.E.; no more than 18 units used for the proposed program can have been previously completed. The program must include at least 9 units of graduate-level work in the department other than M.E. 200-208 and 290-292. The petition must be accompanied by a statement explaining the program objectives, how it is coherent, contains depth, and fulfills a well-defined career objective. The grade requirements are the same as for the M.S. in Mechanical Engineering.

POST-MASTER'S DEGREE PROGRAMS

The department offers two post-master’s degrees: Engineer and Doctor of Philosophy. Students anticipating working for a post-master's degree should 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 generally require some 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.

In 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 of this bulletin.

This degree represents an additional year of study beyond the Master of Science degree and includes a research thesis. The program is designed for students who desire to do professional engineering work upon graduation and who want to engage in more specialized study than is afforded by the master's degree alone.

Admission standards are substantially the same as indicated under the master's degree. However, since thesis supervision is required and the availability of thesis supervisors is limited, admission is not granted until the student has personally arranged with a faculty member to supervise a research project. This frequently involves a paid research assistantship awarded by individual faculty members (usually from the funds of sponsored research projects under their direction) and not by the department. Thus, personal arrangement is necessary. Students studying for the M.S. degree at Stanford and desiring to continue to the Engineer degree ordinarily make such arrangements during the M.S. degree year. Students holding master's degrees from other universities are invited to apply and may be admitted providing they are sufficiently well qualified and have made thesis supervision and financial aid arrangements.

Departmental requirements for the degree include an acceptable thesis; up to 15 units of credit is allowed for thesis work. In addition to the thesis, 27 units of approved advanced coursework in mathematics, science, and engineering are expected beyond the requirements for the M.S. degree; the choice of courses is subject to approval of the advisor. Students who have not fulfilled the Stanford M.S. degree requirements are required to do so (with allowance for approximate equivalence of courses taken elsewhere).

Candidates for the degree must have faculty approval and have a minimum letter grade indicator 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 M.S. in Mechanical Engineering plus the M.S. 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 90-unit total can be completed in two academic years. Students deficient in prerequisite areas may take more time. Those who fulfill program requirements are awarded the M.S. in Engineering (Product Design) and the Degree of Engineer in Mechanical Engineering (Product Design) simultaneously.

Admission 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 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 allows a minor field, 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.

In special situations dictated by compelling academic reasons, Academic Council members who are not members of the departmental faculty may serve as the principal dissertation advisor when approved by the department. In such cases, a member of the department faculty must serve as program advisor and member of the reading committee, and agree to accept responsibility that departmental procedures are followed and standards maintained.

Admission involves much the same consideration described under the Engineer degree.
Since thesis supervision is required, admission is not granted until the student has personally arranged, at least tentatively, with a member of the faculty to supervise a research project. Once a student has obtained 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 research and before receiving a paid research assistantship. Note that research assistantships are awarded by faculty research supervisors and not by the department.

Prior to being formally admitted to candidacy for the Ph.D. degree, the student must demonstrate knowledge of engineering fundamentals by passing a qualifying oral examination. The academic level and subject matter of the examination correspond approximately to the M.S. program described above. The form and timing of the examination differs for the three divisions of the department. Information may be obtained from the divisional or departmental offices.

Normally the qualifying examination is taken during the first post-master's year. A student must have the written approval of a tentative dissertation supervisor (sponsor) in order to take the examination. (Sponsorship carries no implication of financial support.) To apply for the examination, a student must have a Stanford graduate letter grade indicator (LGI) equivalent of at least 3.25. Courses used in the LGI evaluation are the same as those that would be used to meet the M.S. LGI requirement. Students entering Stanford with an M.S. from another school must have a 3.25 LGI in that school's M.S. program to take the examination in their first quarter at Stanford. After the first quarter at Stanford, such a student must meet the LGI of 3.25 for courses taken at Stanford.

Students interested in the Ph.D. degree should consult the current "Outline of Requirements for the Ph.D. Degree," which contains current requirements and is available from the department office.

Ph.D. candidates must complete a minimum of 36 units of approved coursework (excluding research, directed study, and seminars) in advanced study beyond the M.S. degree. The courses should consist primarily of graduate courses in engineering and sciences, although the candidate's reading committee may approve a limited number of upper division undergraduate courses and courses outside of engineering and sciences, as long as such courses contribute to a strong and coherent program. In addition to this 36-unit requirement, all Ph.D. candidates must participate each quarter in one of the following (or equivalent) seminars: M.E. 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 (M.E. 301) to help fulfill University residence requirements, but there is no minimum limit on registered dissertation units. Candidates should note that University residence requirements (see the "Degrees" section of this bulletin) are expressed in terms of equivalent full-time registration and not in terms of units per se; questions on this should be addressed to the departmental administrative assistant.

The department has a breadth requirement for the Ph.D. degree. This may be satisfied either by a formal minor in another department or by coursework that is approved by the dissertation reading committee.

The final University oral examination is conducted by a committee consisting of a chairman, from another department, and four faculty members of the department or departments with related interests. Usually the committee includes the candidate's advisor and two faculty members chosen to read and sign the candidate's dissertation. The examination consists of two parts. The first 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 is conducted in private and covers subjects closely related to the dissertation topic.

A student wishing to complete the Ph.D. requirements in four years should ordinarily complete the M.S. by the Spring Quarter of the first year, pass the qualifying examination by the Autumn Quarter of the second year, and complete the coursework, demonstrate feasibility of research methods, and obtain approval of the dissertation proposal by the end of the third year.

Ph.D. MINOR

Students who wish a Ph.D. minor in M.E. should consult the department office for designation of a minor advisor. A minor in M.E. may be obtained by completing 20 units of approved graduate-level M.E. courses 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) for the Master of Science in Mechanical Engineering.
FINANCIAL ASSISTANCE

The department annually awards a number of fellowships, teaching assistantships, and research assistantships to graduate students. Fellowships are usually awarded to first-year graduate students. Research assistantships are used primarily for post-master's degree students. Preference for teaching assistantships is generally given to students who obtain the bachelor's or master's degrees at Stanford. Research assistantships are awarded by individual faculty research supervisors, not by the department.

Research assistants can, and normally do, carry out dissertation research work and write the dissertation as an integral part of the commitments of assistantships.

COURSES
PRIMARILY FOR UNDERGRADUATES

Note 1—the following are especially suitable for freshmen.

101. Visual Thinking
103. Manufacturing Technology

Note 2—Laboratory sections in experimental engineering are assigned in groups. If the laboratory schedule permits, students are allowed, with due regard to priority of application, to arrange their own sections and laboratory periods. Enrollment with the instructor concerned, on the day before instruction begins or the first day of University instruction, is essential in order that the laboratory schedule may be prepared. Enrollment later than the first week is not permitted.

30. Engineering Thermodynamics—(Enroll in Engineering 30.)

4 units, Win (Bradshaw) MWF 10
Spr (Johnston) MWF 11
lab MTWTh 1:15-3:05 or 3:15-5:05, or one 2-hour lab by arrangement

75. Introduction to Small Computer Hardware and Interfacing—Self-guided class teaching fundamentals and practical aspects of interfacing a small computer with the external environment. Basic computer architecture, analog and digital interfacing, serial interfacing, and simple control systems. No lectures. Material is covered in computer-based textbook and laboratory projects. Weekly demonstrations. Prerequisite: Engineering 40.

3 units, Win (Eaton) by arrangement

100. Differential Equations in Engineering—Origin of differential equations, linear first order differential equations, linear second order equations with constant coefficients, variation of parameters, finite difference methods for first order equations, higher order methods, methods for boundary value problems, series solution, singular points, eigenvalue problems, Strum-Liouville problem, stiffness and curing it. Prerequisites: Math. 43 and 44. Limited enrollment.

3 units, Aut (Ferziger) MWF 11


3 units, Aut (Staff) leclab MW 1:15-3:05
Win (Staff) lecflab TTh 3:15-5:05
Spr (Staff) lec/lab MW 3:15-5:05

102. Design Communication—Fundamentals of the four basic methods of engineering design communication: freehand sketching, technical drawing, verbal, and written presentations. Introduction to computer-aided tools in the design process. To encourage innovative and relevant use of engineering skills, class exercises and projects are based on instructor's professional experiences.

3 units, Spr (Della Bona, Scott) MWF 8-10

103. Manufacturing and Design—(Graduate students enroll in 303.) Emphasis on prototype development techniques as an intrinsic part of the design process. Fundamentals of machining, welding, and casting introduced in lecture and supported by laboratory experience. Manufacturing processes described through lecture, films, and field trips. Design aspects are developed in an individual term project chosen, designed, and fabricated by the students. 103D is normally taken concurrently unless student has prior drafting experience. Recommended: 101, Engineering 11.

4 units, Aut, Win (Beach) TTh 9-11
plus lab by arrangement

103D. Engineering Drawing—Fundamentals of engineering drawing including orthographic
projection, dimensioning, sectioning, exploded and auxiliary views, and assembly drawings. Designed to accompany 103. Homework drawings are of parts fabricated by the student in the shop. Major assignments in 103 are supported by material in 103D and assignment dates are sequenced on the assumption that the student is enrolled in both courses simultaneously. No prior knowledge of drafting required.

1 unit, Aut, Win (Milroy) one meeting per week by arrangement, Sec. 1 T 7:30-9:30 p.m., Sec. 2 W 3:30-5:30

104. Dynamic Response—(Enroll in Engineering 104.)

105A. Feedback Control Design—(Enroll in Engineering 105A.)

105B. State Space Control Design—(Enroll in Engineering 105B.)

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, and residual stresses. Contact stresses and surface failures (fretting, pitting, wear). Design margins (safety factors) and product liability. Homework assignments emphasize applications to mechanical design. Prerequisites: Engineering 10 and 11.

3 units, Aut (Nelson) MW 1:15-2:40

112. Mechanical Systems—Emphasizes quantiative aspects of the design process. Applications of basic principles and empirical relationships in the evolution from conceptual design to detailed specification of critical components. Individual term projects apply principles developed to the quantitative design on paper of a complete mechanical system to meet specified functional goals. Co-or prerequisites: 103, 111.

3 units, Win (Staff) TTh 1:15-2:40

113. Engineering Design—Application of information from various sources to create tangible objects and intangible system concepts to improve the quality of human life. Design is studied as a process, and experienced by students as they work on a team design project. Final project results are presented to a professional jury. Prerequisites: 101, 103, 111, and 112.

3 units, Spr (Cutkosky, Sheppard) MW 3:15-5:05

115A. Human Values in Design—Active encounters with human values in design. Lectures survey central philosophy of product design program, emphasizing the relation between technical and human values, the creative process, and design methodology. Laboratory exercises include development of simple product concepts visualized in rapidly executed three-dimensional mockups. Prerequisite: 101.

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

one evening lab by arrangement

115B. Expression of Function—Numerous tightly constrained projects requiring reconciliation of manufacturing, human factor, and aesthetic concerns; solutions presented in a variety of design media. Prerequisites: 103, 115A, Art 60.

3 units, Spr (Staff) MW 1:15-3:05

115C. Design Sketching—Freehand sketching, rendering, and design development. Work is guided by instructor. Concurrent assignments in 115 and 116 series provide subject matter, but the class is open to anyone wishing to improve freehand drawing skills.

1 unit, any quarter (Scott, Reeder, Gehrke) one evening per week

116A. Advanced Product Design—Small-scale projects carried to a high degree of refinement. Emphasis upon craftsmanship and aesthetics. Prerequisites: 115B, Art 160.

3 units, Aut (Moggridge, Kelley) TTh 9-12

116B. Advanced Product Design—Need identification by means of various strategies: technology push, market pull, design history, societal trends, self-awareness. The role of perception and personal values in problem definition and entrepreneurship. Students identify a project area to be pursued as a thesis in 116C.

3 units, Win (Staff) 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 (Burnett, Boyle) TTh 11-1:05

117. History and Philosophy of Design—(Enroll in VTSS 117.)

119. Precision Engineering—Lectures, laboratory experiences, field trips, individual design and fabrication projects, current topics of interest in manufacturing emphasizing precision engineering. How are microinch resolution and repeatability accomplished? What are the applications for ultra-precision machining and measuring systems? Students select projects from the lecture material and pursue them to hardware. Final project presentation should demonstrate the application of design skills to some problem in precision engineering.

3 units, Spr (DeBra, Beach) TTh 9 lab by arrangement

130. Internal Combustion Engines—Internal combustion engines including conventional and
turbocharged spark ignition engines, diesel, and gas turbine engines. Lectures: 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 30 or equivalent. Limited enrollment.

3 units, Aut (Rinehart) MW 9
lab by arrangement

131A. Heat Transfer—First of three-quarter sequence taken in consecutive quarters. Topics: fluid mechanics, heat transfer, and thermodynamics with emphasis on basic principles used in the energy sciences and their application in man-made systems. Laboratory sessions are devoted to demonstration and experiments in the specific lecture area and cover basic experimental procedure, including measurement techniques, experiment design, data collection, processing and evaluation. Prerequisites: 33 and Engineering 30. Recommended: intermediate calculus and ordinary differential equations.

5 units, Aut (Cappelli) MWF 10
lab one afternoon by arrangement

131B. Fluid Mechanics—Continuation of 131A.
3 units, Win (Mungal) MWF 10

131C. Thermosciences—Continuation of 131B.
3 units, Spr (Bowman) MWF 11

132. Thermosciences Laboratory—Demonstrates the utility of experimentation in thermosciences and introduces modern laboratory techniques, e.g., A/D converters for digital data acquisition. Two introductory experiments are selected from vehicle aerodynamics, compressible fluid flow, and turbomachinery. A major experiment involves an internal combustion engine. Communication of results in written and oral reports and the evaluation of data using formal methods of uncertainty analysis emphasized. Enrollment limited to 30 preregistered students. Prerequisites: 33, 131A, and Engineering 30.

3 units, Win, Spr (Staff) lecture T 9
labs 4 hours weekly by arrangement

138. Noise Pollution—(Enroll in Aeronautics and Astronautics 138.)
3 units, Aut (Staff) MW 9

161. Dynamic Systems—Linear modeling, analysis, and measurement of mechanical and electromechanical systems. Topics: resonance, damping, stability, harmonic analysis, and force transmission. Extensions to multiple degrees of freedom using computers. Several sessions devoted to demonstrations and practical examples. Assumes a background in dynamics and mathematics. Prerequisites: Engineering 12, Math. 43, or equivalent. Recommended: Math. 113 and Engineering 40, or equivalent (can be taken concurrently).

4 units, Aut (Cutkosky) TTh 1:15

191. Engineering Problems and Experimental Investigation—Directed study and research for the undergraduate on a subject of mutual interest to student and staff member. Student must find faculty sponsor and have approval of the advisor.

1-5 units, any quarter (Staff)
by arrangement

UNDERGRADUATE AND GRADUATE

The following are especially suitable for advanced undergraduates and graduates and may be used to satisfy the M.S. requirement, item 3, approved electives.

103. Manufacturing Design

105A. Feedback Control Design—(Enroll in Engineering 105A)

105B. State-Space Design—(Enroll in Engineering 105B)

113. Engineering Design

138. Noise Pollution—(Enroll in Aeronautics and Astronautics 138)

161. Dynamic Systems Design

165. Processing of Advanced Structural Materials

225. Gasdynamics

250. Introduction to Heat Transfer

PRIMARY FOR GRADUATES

ENGINEERING MATHEMATICS


3 units, Aut (Staff) MW 11-12:15

200B. Mathematical Methods in Mechanical Engineering—Geometric interpretation of partial differential equations (PDEs), characteristics, solution of first order equations, characteristics and classification of second order PDEs, separation of variables, special functions, eigen function expansions, Fourier integrals, and
transforms, Laplace transforms, method of characteristics, self-similarity.

3 units, Win (Staff) MWF 9


3 units, Spr (Staff) MW 11-12:15

201. Applications of Complex Variables—Theory of analytic functions, with applications to evaluation of definite integrals by contour integration, solution of physical problems by conformal mapping, and solution of partial differential equations by means of integral transforms. Knowledge of the algebra of complex numbers and the derivative of a complex function is assumed.

3 units, Aut (Van Dyke) MWF 11


203. Perturbation and Asymptotic Methods with Applications—(Enroll in Math. 270.)


3 units, Aut (Keller)

205B. Methods of Mathematical Physics—(Enroll in Math. 220B.) Continuation of 205A.

3 units, Win (Liu)

205C. Methods of Mathematical Physics—(Enroll in Math. 220C.) Continuation of 205B.

3 units, Spr (Lowengrub)

206. Similarity in Engineering Mechanics—Reduction of physical problems: similarity rules revealed by dimensional analysis; supplementary information; self-similar solutions by dimensional analysis and other groups of transformations; applications to fluid mechanics and other fields; local solutions and their uses; self-similar solutions with concealed exponent. Prerequisite: 200B or Math. 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. Prerequisite: 200B or Math. 131, or consent of instructor.

3 units, Spr (Van Dyke) MWF 10

208. Vector and Tensor Analysis—(Enroll in Aeronautics and Astronautics 192.)

DESIGN AND CONTROLS

209. Aesthetics of Machinery—Effects of design strategy selection, design media, construction and assembly strategies, human factors, and explicit or intuitive personal criteria on the appearance of machinery and designed objects. Students explore these issues and develop an awareness of their personal design style through design and construction of small-scale mechanical devices. Limited to 15 students, consent of instructor required.

1-3 units (Faste) alternate years, not given 1991-92

210A. Automation and Machine Design: Methodology—Project-centered, using industry-sponsored projects to develop the graduate engineer's knowledge of, and skill at applying, structure concurrent engineering design methodology. Corporate representatives deliver project specific technology while the industrial team focuses on methodology. Students do three short design exercises to sharpen methods awareness and develop team design skills in preparation for sponsored project bidding. Following project selection, the design team is challenged to: refine the problem statement; develop detailed function, feature, and constraint specifications; and identify design approach alternatives. Each team is supported by a "design coach," corporate liaison, and faculty advisors. Project content may include: mechanism design, automation design, manufacturing process design, consumer product and biomedical device design. Students wishing to integrate microcomputer technology, sensors, and automatic control theory should enroll in both 210...
and 218. Students may exit the 210 series only at the end of 210A.

4 units, Aut (Leifer, Staff) TTh 3:15-5:05

210B. Automation and Machine Design: Rapid Prototyping—Continuation of 210A. Design alternatives are subjected to rigorous examination by rapid prototyping and design trade-off analysis. Emphasis is on design for manufacturability, assembly, test, service, cost, and human factors. Incremental test/assessment development cycles are supported by the design lab's CAD, simulation, and physical prototyping facilities.

4 units, Win (Leifer, Staff) TTh 3:15-5:05

210C. Automation and Machine Design: Functional Assessment—Continuation of 210B. One or more leading design alternatives are developed into full-scale functional product prototypes. Emphasis on oral and written presentation skills prevails throughout 210C and climaxes at the Design Affiliates Symposium where projects are formally presented to an industrial audience.

4 units, Spr (Leifer, Staff) TTh 3:15-5:05

211A,B,C. Product Design Master's Project—Three-quarter graduate design project taught jointly with Art Department faculty. First quarter: rational and intuitive problem-finding procedures to identify design projects within an unexplored area of need. Second quarter: explore concepts, perform necessary experiments and research, and construct a working prototype. Third quarter: refine and finalize the design. A demonstration model is built and presented to a professional jury. For Product Design or Design (Art) majors only. Corequisite: concurrent Art 360.

211A. 4 units, Aut (Faste, Kelley) T 7-10 p.m.
211B. 4 units, Win (Faste, Kelley) T 7-10 p.m.
211C. 4 units, Spr (Faste, Kelley) T 7-10 p.m.


3 units (Wilde) alternate years, given 1991-92


3 units (Wilde) given 1992-93

213. Computer-Aided Prototyping—Prototype design and fabrication emphasizing the use of computer supported tools in the design process. Students choose, design, and build individual projects. The tool set includes Hewlett Packard and Apple CAD, CNC part programming software, and CNC milling machines. Lectures alternate between student and instructor presentations of work in progress. Enrollment limited to 12; priority based on student project proposals made at the first class meeting. Coaching in project development is available from instructors during Autumn and Winter Quarters. Prerequisites: vector analysis, matrix algebra. Required: programming ability in Pascal (or other high level language), 101, 103.

3 units, Spr (Larkin, Beach) MW 10 lab by arrangement
loss function, robust design, methodology, and manufacturing/design interface. Four units, by arrangement, for extended term paper. Prerequisites: 113 or equivalent, some familiarity with statistical fundamentals.

3-4 units, Aut (Barkan) TTh 8-9:15

217B. Design for Manufacturability: Projects—The application of simultaneous engineering of product and process, and implementation of contemporary design and management methodologies employed in competitive industries, building on principles developed in 217A. Small student teams, preferably interdisciplinary, apply concepts to a term project, either an original problem of direct interest to team members or a study and re-design of some existing product or sub-system for a competitive market. Strategic planning and the primary customer-defined values; the design process, emphasizing competitive benchmarking, the close relationship between the design and economic manufacture; assembly, maintenance; and addressing design for near net shape, standardization and minimization of number of parts, robust project and process design, critical tolerances, etc. Also, organizational issues. Class presentations by teams and discussions at key milestones. Prerequisites: 217A.

4 units, Win (Barkan) TTh 8-9:15

218A. Smart Product Design Fundamentals—Topics: basic digital and analog circuits, boolean algebra, logic, clocked circuits, encoders/decoders, microprocessor architecture, serial input/output, FORTH high level language programming, and "C" high level language production programming. Enrollment in 218B, C is contingent on completing 218A or passing a Smart Product Design Fundamentals proficiency examination given at the beginning of Autumn Quarter.

4 units, Aut (Carryer) TTh 1:15-3:15

218B. Smart Product Design Applications—Laboratory design problem lecture series deals with programmable electromechanical systems design methodology. Fundamentals and advanced topics are introduced in the context of laboratory assignments and projects. Topics: advanced digital and analog circuits, signal conditioning and analysis, software requirements for embedded systems, sensors, actuators, and real-time operating systems. Prerequisite: passing of the Smart Product Design Fundamentals proficiency examination.

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

218C. Smart Product Design Practice—Project-driven lecture and case study deals with advanced design and the development of real smart-product prototypes. Student teams carry design from concept through to functional prototypes. Also, a continuing review of advanced technology issues. Smart Product Design Management topics: product specification, development environment selection, design team management, scheduling, and documentation design.

4 units, Spr (Carryer) TTh 1:15-3:15


3 units, Win (Khatib) MWF 2:15

219B. Introduction to Computer Vision—(Enroll in Computer Science 327B.)

219C. Advanced Robotic Manipulation—(Enroll in Computer Science 327C.)

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. Introduction to available techniques for sensing displacement, force, pressure, acceleration, velocity, temperature, optical and nuclear radiation, and other physical parameters. Elementary electronic interface circuits are presented in a manner which assumes no prior knowledge of electronic circuits. Case histories of several sensing systems designed and patented by the instructor.

2 units, Win (Adler) M 3:15-5:05

221. Human Factors—Design of man-machine systems and analysis emphasizing 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 (Verplank) MW 4:15-6:05

222. Kinematic Synthesis of Mechanisms—The rational design of linkages. The problem of determining linkage proportions to fulfill various design requirements is treated analytically. Topics: 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 (Roth) given 1991-92

223. Design and Analysis of Dynamic Systems—Modeling, analysis, and synthesis of practical devices, operating open loop 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 or permission of instructor.

3 units, Spr (Barkan) MWF 9

224. Advanced Manufacturing Automation—For students who have some familiarity with controls and manufacturing, are interested in manufacturing research, and are familiar with solid mechanics. Discussion of the underlying physics of manufacturing processes. Sensor-driven flexible manufacturing. Basic issues and the unit process level; the acquisition and interpretation of sensory data, adaptive control, machine learning, in-process inspection, spatial reasoning, and integration with CAD. Prerequisites: 219A or experience with automated equipment, and a basic understanding of control systems, solid mechanics, and manufacturing methods. Limited to 15 students.

3 units, Win (Cutkosky) TTh by arrangement

225A. Control System Design and Simulation—(Enroll in Engineering 206.)

225B. Nonlinear Control—(Enroll in Engineering 209.)

226A. Digital Control Design—(Enroll in Engineering 207A.)

226B. State-Space Digital Control Design—(Enroll in Engineering 207B.)

226C. Optimal Control and Estimation—(Enroll in Engineering 207C.)

227A. Optimal Control of Dynamic Systems—(Enroll in Aeronautics and Astronautics 278A.)

227C. Differential Games—(Enroll in Aeronautics and Astronautics 278C.)

228. Advanced Robotic Manipulation—(Enroll in Computer Science 327C.)


3 units, Spr (DeBra) by arrangement

MECHANICS OF SOLIDS

230. Advanced Kinematics—Kinematics from mathematical and engineering viewpoints. Introduction to algebraic geometry. Application of matrix, tensor, and dual-quaternions methods to kinematic analysis and synthesis. Students are required to prepare reports on problems in kinematics.

3 units (Roth) alternate years, given 1991-92


3 units, Aut (Kane) TTh 9:30-10:45

231B. Dynamics—Generalized active forces. Contributing and noncontributing interaction forces. Generalized inertia forces. Relationship between generalized active forces and potential energy; generalized inertia forces and kinetic energy. Prerequisite: 231A.

3 units, Win (Kane) TTh 9:30-10:45


3 units, Spr (Kane) TTh 9:30-10:45

232A. Spacecraft Attitude Dynamics I—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 (Kane) alternate years, given 1991-92


3 units (Kane) alternate years, given 1991-92

233. Nonlinear Oscillations—Derivation and classification of nonlinear differential equations governing various phenomena of mechanics. Phase plane trajectories and integrals of the equations of motion of autonomous systems. Response curves and stability criteria for forced oscillations of systems with nonlinear characteristics. Systems with several degrees of free-
dom. Large nonlinearities, chaotic behavior.

3 units, Win (Breakwell) MWF 2:15

3 units (Hughes) alternate years, given 1991-92

234B. Finite Element Methods in Fluid Mechanics—Continuation of 234A.
3 units (Hughes) alternate years, given 1991-92

234C. Finite Element Methods in Fluid Mechanics—Continuation of 234B.
3 units (Hughes) alternate years, given 1991-92

3 units (Simo) alternate years, given 1991-92

3 units (Simo) alternate years, given 1991-92

3 units (Hughes) alternate years, given 1991-92

3 units (Herrmann) given 1991-92

236B. Wave Propagation—(Same as Math. 274.) Concepts 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. Applications are made to electromagnetic, acoustic, elastic, and other types of waves.
3 units (Keller) not given 1990-91

237. Free and Forced Motion of Structures—(Enroll in Aeronautics and Astronautics 244A.)

3 units, Aut (Herrmann) MWF 10

238B. Theory of Elasticity—Continuation of 238A. Analysis of plane stress and plane strain.
238C. Theory of Elasticity—Continuation of 238B. Three-dimensional problems in terms of displacement potentials such as Boussinesq-Papkovich-Neuber functions and the Galerkin vector. Fundamental solutions to the Kelvin, the Boussinesq, and the Mindlin problem and their extensions. Strain energy and material conservation laws in linear elasticity. Their relation to path-independent integrals of fracture mechanics: J, L, M. Introduction to nonlinear elasticity. Applications to defect and fracture mechanics.

3 units, Spr (Gao) MWF 11


3 units, Win (Simo) TTh 2:45-4


Recommended: familiarity with a high-level computer language.

3 units, Spr (Staff) TTh 2:45-4


3 units, given 1991-92

240A. Introduction to Fracture Mechanics—Linear and non-linear analysis on crack-tip stress fields; energy concepts and crack growth criteria; conservation integrals; fracture behaviors under small scale or large scale plastic yielding; aspects of fatigue, dynamic fracture, and micromechanisms of fracture. Prerequisite: 238A or equivalent.

3 units, Win (Gao) TTh 10:45-12

240B. Advanced Fracture Mechanics—Continuation of 240A. Muskhelishvilli’s complex variable approach to elastic crack analysis; weight function theory in three-dimensional crack analysis; interfacial cracks; viscoelastic crack analysis; numerical methods in fracture mechanics; crack interactions with other material defects such as dislocations and inclusions. Prerequisite: 240A.

3 units (Gao) given 1991-92

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 stress. Application to design of domes, pressure vessels, expansion joints and pressure sensing devices. Use of asymptotic solutions for “very large finite element computation.” Membrane theory for
general surfaces; hyperbolic paraboloids. Prerequisite: 111 or Civil Engineering 114.
3 units, Win (Steele) MWF 1:15

3 units (Steele) alternate years, given 1991-92

242A. Introduction to Nonlinear Continuum Mechanics—(Same as Math. 275.) Basic kinematics. Local description of a continuum. General notions of strain and rotation, rate of deformation, and vorticity. Discussion of spatial, material, and convected descriptions. Consistent linearization techniques. The Piola transformation and alternative notions of stress tensors. Basic thermodynamics and the role of the second law. Constitutive equations, basic principles, and invariance under superposed isometries. Material symmetries and symmetry group. Application to ideal and viscous fluids, and finite elasticity. Geometric methods and computational implications of the basic theory are emphasized.
3 units, Aut (Simo) TTh 8-9:15

3 units (Simo) alternate years, given 1991-92

3 units, Win (Springer)

3 units (Herrmann) alternate years, given 1991-92

3 units, Win (Nelson) MW 2:15-3:30

246. Atmospheric and Space Physics—(Same as Aeronautics and Astronautics 227.) Introduction to geophysics and astronomy emphasizing conditions in 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 Earth, photosphere, chromosphere, corona of the Sun, and 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. Principal features of the interaction of solar wind with Earth and other objects in the solar system.
3 units, Aut (Spreiter) TTh 2:45-4

247A. Strength and Microstructure—(Enroll in Materials Science and Engineering 205.)

248. Introduction to Experimental Mechanics—Theory and applications of photoelasticity, strain gages, and laser interferometric (holographic)
techniques. Comparison of test results with theoretical predictions of stress and strain. Other methods of stress and strain determination (acoustoelasticity, thermoelasticity, brittle coating, Moiré). Students do a special project on use of strain gages "in the field." Limited enrollment.

3 units, Spr (Nelson) M 2:15-5:05

lab by arrangement

249. Experimentation in Aeronautics and Astronautics—(Enroll in Aeronautics and Astronautics 131.)

HEAT TRANSFER, FLUID MECHANICS, AND HIGH TEMPERATURE GAS DYNAMICS


3 units, Aut (Moffat) MWF 3:15

251A. Fluid Mechanics—Exact and approximate analysis of fluid flow covering kinematics, global and differential equations of mass conservation, momentum, and energy. Forces and stresses in fluids. Euler’s equations and the Bernoulli Theorem are generated for, and applied to, inviscid flows. Flows of simple viscous fluids using the Navier-Stokes equations. Boundary layer (thin shear) layer approximation. Solutions for some flows obtained by analytical and numerical methods examined. Prerequisite: graduate standing.

3 units, Aut (Eaton) MWF 8

251B. Fluid Mechanics—Laminar and turbulent flow, emphasizing thin shear layers and introducing inviscid, irrotational flows. Topics: exact solutions for viscous flows, creeping flow, boundary layer separation, boundary layer stability, transition to turbulence, Reynolds averaged Navier-Stokes equations, introduction to bounded and free turbulent shear layers and some approximate methods of solution, conditions for irrotational flow, stream function and velocity potential in exact and approximate solutions, superposition of solutions, complex potential function, circulation and life. Examples from internal flows including ducts, nozzles, diffusers, and turbomachinery blading. Prerequisite: 251A.

3 units, Win (Johnston) MWF 11

252A. Convective Heat and Mass Transfer—Prediction of heat and mass transfer rates based on analytical or numerical solutions of the governing differential equations. Current theories compared with current experimental results. Fully developed and entrance region channel flow situations in laminar and turbulent flow. Superposition methods for dealing with non-uniform wall temperature or heat release. Laminar and turbulent boundary layer heat transfer using similarity methods, integral methods, and superposition. Heat exchanger optimization and design methods. Introduction to mass transfer analysis. Prerequisites: at least one survey course in heat transfer and one in viscous fluid mechanics, equivalent to 250 and 251A.

3 units, Win (Moffat) MWF 10


3 units, Spr (Moffat, Staff) MWF 10

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. Advanced course for students with strong interests in heat transfer, as applied in high-temperature energy conversion systems. Take 252A,B, to obtain depth in convective heat and mass transfer. Prerequisites: graduate standing and an undergraduate course in heat transfer. Recommended: some computer skills.

3 units, Aut (Niksa) MWF 9

254. Computers and Instrumentation in the Fluid Mechanics Laboratory—Use of laboratory computers including (1) interfacing of analog and digital instruments, (2) experimental control, (3) sampling strategies, and (4) data reduction techniques. Instrumentation including hot-wire, laser, and pulsed-wire anemometers. Prerequisite: previous experience with computer programming.

4 units, Spr (Eaton) MTWF 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; unsteady one-dimensional flow, two-dimensional
supersonic flow; oblique shock waves, Prandtl-Meyer expansions.

3 units, Aut (Staff) MWF 1:15

256. Fluid Dynamics of Turbomachinery—Operation, theory, and elements of 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 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 (Johnston) alternate years, given 1991-92


3 units, Win (Spreiter) TTh 2:45-4

259A. Numerical Methods in Fluid Mechanics—(Enroll in Aeronautics and Astronautics 214A.)

259B. Numerical Computation of Compressible Flow—(Enroll in Aeronautics and Astronautics 214B.)

259C. Numerical Computation of Viscous 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: 258 or equivalent.

3 units, Spr (Spreiter) MW 3:15-4:30


3 units, Aut (Bradshaw) MWF 3:15

261B. Analytical Methods for Turbulent Flows—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. Prerequisites: 261A, plus a graduate sequence in fluid mechanics.

3 units, Spr (Reynolds) MWF 3:15

261C. Theoretical Approaches to Turbulence—Possible subjects: Navier-Stokes equations in spectral space and its movements; eddy damped quasi-normal Markovian approximation; renormalization group approaches; direct interaction approximation in both Eulerian and Lagrangian coordinates. Connections with turbulence models; applications to passive scalars; influence of rotation and stratification; two-dimensional turbulence.

3 units, Aut (Staff) TTh 8-9:15

262A. Physical Gas Dynamics—Concepts and techniques for description of high-temperature and chemically reacting gases from a molecular point of view. Introductory kinetic theory, chemical thermodynamics, and statistical mechanics as applied to properties of gases and gas mixtures. Transport and thermodynamic properties, law 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. Non-equilibrium Processes in High-Temperature Gases—Introduction to chemical kinetics and energy transfer in high-temperature gases. Collision theory, transition state theory, and unimolecular reaction theory. Vibration-
translation energy transfer. Applications in shock waves and expansions.

3 units, Win (Hanson) MWF 1:15

263. Partially Ionized Plasmas and Gas Discharges—Introduction to partially ionized gases and the nature of gas discharges. Topics: fundamentals of plasma physics emphasizing collisional and radiative processes, equilibrium and non-equilibrium plasmas; plasma diagnostics, application to energy conversion devices, and materials processing.

3 units, Spr (Cappelli) MWF 3:15

264. Optical Diagnostics and Spectroscopy—Introduction to spectroscopy of gases and laser-based diagnostic techniques for measurements of species concentrations, temperature, density, velocity, and other flowfield properties. Topics: electronic, vibrational, and rotational transitions; spectral lineshapes and broadening mechanisms; absorption, fluorescence, Rayleigh and Raman scattering methods; collisional quenching. Prerequisite: 262A or equivalent.

3 units (Hanson) alternate years, given 1991-92


3 units, Spr (Hanson) MWF 10 one 3-hour lab by arrangement

268. Experimental Methods in the Thermosciences—Planning experimental programs, uncertainty analysis, and 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. Prerequisites: at least one graduate course each in heat transfer and fluid mechanics, or consent of instructor.

4 units, Spr (Bradshaw) MWF 10 one 4-hour lab by arrangement


3 units (Ferziger) alternate years, given 1991-92

THERMODYNAMICS AND ENERGY CONVERSION

270. Engineering Thermodynamics—Thermodynamic analysis of engineering systems emphasizing systematic methodology for application of basic principles. Introduction to availability analysis. Thermodynamics of gas mixtures and reacting systems. Use of modern computational equations of state. Thermodynamics of condensed phases. Prerequisites: undergraduate background in engineering thermodynamics and computer skills.

3 units, Aut (Bowman) 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 chain branching; conservation equations for multi-component reacting flows; explosions, fuel oxidation; propagation and structure of laminar premixed flames; detonations. Prerequisite: 262A or 270, or consent of instructor.

3 units, Win (Bowman) 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 diffusion in flames; combustion of fuel droplets and sprays; combustion of coal. Prerequisite: 271 or consent of instructor.

3 units, Spr (Niksa) MWF 11

274. Introductory Hypersonic Aerophysics—(Enroll in Aeronautics and Astronautics 212.)

BIOMECHANICS

280. Bioengineering Seminar—(Same as Engineering 280.) Invited speakers present research topics at interfaces of biology, medicine, physics, and engineering. Primarily for graduate and medical students.

1 unit, Aut, Win, Spr (Carter) T 4:15

281A. 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 orthopedic procedures and devices. Correlations between engineering predictions and clinical/biological results. Introductory anatomy and physiology. Prerequisite: engineering graduate standing or consent of instructor.

3 units, Aut (Carter) MW 3:15-4:30
281B. Orthopaedic Biomechanics—Interdisciplinary approaches are used in specific research and development projects associated with orthopaedic patient care. Example topics: fracture plate fixation, artificial joint replacement, spine fractures, and osteoarthritis. Prerequisite: 281A.
3 units, Win (Carter) M 3:15-4:30, W 7:30-9

282. Special Projects: Neuromuscular Biomechanics—Engineering mechanics applied to coordination of the human neuromuscular system including: mechanical properties and models of muscle and tendon; dynamics and models of limbs that consist of single- and multi-joint muscles originating and inserting on a multi-segmented skeleton; applications to sports and rehabilitation such as posture, walking, jumping, and cycling. Prerequisite: consent of instructor.
1-5 units, any quarter (Zajac) by arrangement

284. Dynamics of Viscous Fluids and Suspensions—(Enroll in Aeronautics and Astronautics 209.)

285. Biomedical Fluid Mechanics—(Enroll in Aeronautics and Astronautics 229.)

SPECIAL AREAS

289. The Nature of Technology in Modern Society—(Enroll in Engineering 221; VTSS 106.)

DIRECTED STUDY AND SEMINARS

290. Thermosciences Research Project Seminar—Review of work in a particular research program and presentations of other related work.
I unit, any quarter (Staff)
section I (HTTM), section II (HTGL)

291. Engineering Problems—Directed study for graduate engineering students on subjects of mutual interest to student and staff member. May be used to prepare for experimental research during a later quarter under 292. Students must find a faculty sponsor.
1-5 units, any quarter (Staff) by arrangement

292. Experimental Investigation of Engineering Problems—Graduate engineering students undertake experimental investigation under guidance of staff member. Previous work under 291 may be required to provide background for experimental program. Faculty sponsor required.
1-5 units, any quarter (Staff) by arrangement

293. Innovation—(Enroll in VTSS 166.) The nature, processes, and management of research and development in industrial societies. Sociotechnical systems as the physical bases of society. Creation of abundant societies and rise of R&D in final quarter of 19th century in the U.S. and Germany. Conventional linear model and improved chain-linked model. Comparison of scientific (reductionist) view with the consistent view needed in innovation; operational consequences. Modes of institutionalizing R&D. Barriers to innovation and countervailing forces. Revolutionary and evolutionary innovation in small and large companies. Effects of management style. Effects of industry and of product life cycle. Government role in innovation.
3 units, Win (Kline)

294A, B. Design Forum—Invited speakers address issues of interest to designers. Brief presentation followed by open discussion.
1 unit, Aut, Win (Staff) F 3:15

294C. Craftsmanship Forum—Guest craftsmen make presentations exploring the romance of technology and the relationship between craftsmanship and design. Diverse presentations have included musical instrument building, microsurgery, historical machinery, pipe organ construction and voicing, and blacksmithing.
1 unit, Spr (Freund) F 3:15

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 (Staff) Th 4:15-5:30

296. Manufacturing Systems Engineering Forum—Invited speakers address issues of interest to design and manufacturing engineers. Brief presentations are followed by open discussion. Sponsored by Stanford Engineering for Automation and Manufacturing.
1 unit, Aut, Win, Spr (Beach) F 2-3

297. Design Theory and Methodology Forum—A mixture of research reports, literature reviews, and guest speakers promotes vigorous examinations of the cognitive basis for designer behavior and design tool specification.
1 unit, Aut, Win, Spr (Leifer) W 4:15-5:30

298. Seminar in Fluid Mechanics—(Enroll in Engineering 298.)

2-15 units, any quarter (Staff) by arrangement

301. Thesis—Dissertation for the degree of Ph.D
2-15 units, any quarter (Staff) by arrangement

303. Manufacturing and Design—(Same as 103)

308. Spectral Methods in Computational Mechanics—Data analysis, spectra and correlations, sampling theorem, non-periodic data and win-

3 units (Moin) given 1991-92

309. Finite Element Analysis in Mechanical Design—Part I: Basic concepts of finite elements, with applications to problems confronted by mechanical designers. Linear static, modal, and thermal formulations emphasized: also nonlinear and dynamic formulations. Students implement simple element formulations in either Fortran or Pascal to obtain a deeper understanding of the essential elements of this numerical technique. Part II: Application of a commercial finite element code in analyzing design problems. Issues: solution methods, modeling techniques, basic problem definition. Individual projects focus on the interplay of analysis and testing in product design/development. Approval of instructor required. Prerequisites: ability to program in Fortran or Pascal, Math. 103, or equivalent. Recommended: 111, Civil Engineering 114, or equivalent in structural and/or solid mechanics; some exposure to principles of heat transfer.

3 units, Win (Sheppard) MW 2:15-4:05

313. Ambidextrous Thinking—Visual and kinesthetic thinking skills developed and exercised in the context of solving design problems. Quickly executed perspective, orthographic, diagrammatic, and three-dimensional sketches emphasized. Experiences to appreciate and develop the entire body’s role in creative thinking. Emphasis on fluent and flexible idea production.

3 units, Aut (Faste) lecture/lab MW 3:15-5:10

319. Robotic and Vision Systems—For graduate students with some familiarity in robotics who want project experience with robotic and vision systems. Current topics in robotics and machine vision with applications to flexible, automated manufacturing; emphasis on integrated problems and techniques for fine motion control, calibration, acquisition of sensory data, and programming. Cell level topics: architectures and strategies for cell control. Research issues: dextrous manipulation and languages for high-level task specification. Typical projects: robotic deburring, assembly using force feedback and/or vision, part inspection, and cell control. Short assignments provide practice with various equipment. Prerequisites: 219A or equivalent, and some familiarity with programming. Enrollment limited to 30.

3 units, Spr (Cutkosky) TTh 6:30-8:30 p.m.


3 units, Aut (Barnett, Gao) by arrangement

ADVANCED FLUID MECHANICS

351A. Advanced Fluid Mechanics—For advanced students specializing in fluid mechanics. Topics: kinematics (analysis of deformation, critical points and flow topology, Helmholtz decomposition); constitutive relations (viscous and visco-elastic flows, non-inertial frames); group theory approach to scaling; vortex dynamics; circulation theorems, vortex line stretching and rotation, vorticity generation mechanisms, vortex filaments and Bio-Savar formula, local induction approximation, impulse and kinetic energy of vortex systems, vorticity in rotating frame. Prerequisite: graduate level courses in compressible flow and viscous flow.

3 units, Aut (Lele) TTh 11

351B. Advanced Fluid Mechanics—(Same as Aeronautics and Astronautics 351B.) Waves in fluids: surface waves, internal waves, inertial waves and acoustic waves, dispersion and group velocity, wave trains, transport due to waves, propagation in slowly varying medium, wave steepening, solitons and solitary waves, shock waves. Stability of fluid motion: dynamical systems, bifurcations, Kelvin-Helmholtz instability, Rayleigh-Benard convection, energy method, global stability, linear stability of parallel flows, necessary and sufficient conditions for stability, viscosity as a destabilizing factor. Prerequisite:
graduate level courses in compressible flow and viscous flow.

3 units, Win (Lele) TTh 11

351C. Advanced Fluid Mechanics—(Same as Aeronautics and Astronautics 351C.) Special topics change for each offering. Compressibility effects in viscous flows, effects of rotation, stratification and buoyancy, modern concepts in nonlinear hydrodynamics stability theory, or free-shear flows. Focus is on compressible flows. Topics: measures of fluid compressibility, low Mach number variable density flow; small disturbances in subsonic and supersonic flow; limitations and extensions of Biot-Savart formula; baroclinic generation of vorticity; curved shock waves; Crocco's Theorem; substitution principle; acoustic, vorticity and entropy modes; boundary layers; structure of shock waves; interaction of disturbances with a shock wave. Prerequisite: graduate level courses in compressible flow and viscous flow.

3 units, Spr (Moin, Mungal) TTh 11

OPERATIONS RESEARCH

Emeritus: George B. Dantzig
Chairman: Donald L. Igleheart
Associate Chairman: Richard W. Cottle
Associate Professor: Peter W. Glynn
Professors (Research): Walter Murray, Michael A. Saunders
Affiliated Assistant Professor: Andrew Goldberg
Consulting Professors: Alan J. Hoffman, Austin J. Lemoine
Consulting Associate Professor: Sam L. Savage

Operations research is concerned with 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 and Computational Science. 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: applied probability; dynamic programming; inventory, queueing, reliability theory, and simulation methodology; linear, nonlinear, and integer programming; networks and combinatorial optimization; nonlinear equations; and energy and economic modeling.

The Systems Optimization Laboratory provides 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 remote-access computer terminals, microcomputers, and computer workstations.

INTRODUCTORY COURSES

The department offers introductory courses for both undergraduate and graduate students. They are given at several levels and in a variety of combinations to accommodate students' needs.

Operations Research (O.R.) 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 socioeconomic problems.

O.R. 152 is an introduction to linear, nonlinear, and dynamic programming for students familiar with calculus. O.R. 153 is an introduction to stochastic processes and models in operations research for students with a knowledge of calculus and undergraduate level probability theory. O.R. 154 is a condensation of 152 and 153 for students with similar backgrounds.

O.R. 241 is a first course in linear programming, having matrix algebra as a corequisite. O.R. 242 discusses shortest paths, dynamic programming, convexity, inventory, and production. O.R. 243 emphasizes the use of integer and nonlinear programming. O.R. 251 and 252 introduce probabilistic models in operations research. O.R. 241 and 242 are a more extensive and higher-level presentation of topics of 152. O.R. 251 and 252 bear 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 O.R. 340-349, 351, 355, 356, 358, and 359.

UNDERGRADUATE PROGRAM
BACHELOR OF SCIENCE IN MATHEMATICAL AND COMPUTATIONAL SCIENCE

Although the department does not have an undergraduate degree program, it participates with the Departments of Computer Science, Mathematics, and Statistics in a program leading to a Bachelor of Science in Mathematical and Computational Science. See the "Mathematical and Computational Science" section of this bulletin.

GRADUATE PROGRAMS
MASTER OF SCIENCE

The M.S. program in Operations Research (O.R.) prepares individuals for high-level professional work applying operations research. Thus, the emphasis is on providing a solid foundation for a life-long professional career involving the formulation, analysis, and use of operations research models of complex systems problems in business or government.

In addition to the University’s basic requirements for the master’s degree discussed in the "Degrees" section in this bulletin, a candidate must complete an approved course program of 45 units. This program normally can be completed in one academic year (three academic quarters) of full-time work. A number of operations research practitioners in local industry also attend part time under the Honors Cooperative Program, taking one or two daytime classes per quarter.

Each student normally fulfills the following requirements for the Master of Science degree:

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp. Sci. 106A or 105A, or 106X</td>
<td>3*</td>
</tr>
<tr>
<td>Computer Programming</td>
<td>3*</td>
</tr>
<tr>
<td>Math. 103. Matrix Theory and its Applications</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 241. Linear Programming</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 242. Network Programming</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 243. Integer and Nonlinear Programming</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 253. Simulation</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 251. Cases in Operations Research</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 252. Projects in Operations Research</td>
<td>3</td>
</tr>
<tr>
<td>Stat. 106. Theory of Probability</td>
<td>3*</td>
</tr>
<tr>
<td>Stat. 200. Introduction to Statistical Inference</td>
<td>3</td>
</tr>
<tr>
<td>Stat. 217. Introduction to Stochastic Processes</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives from the 200 or higher-level offerings of the department (with at most 2 units of O.R. 290 counted) or from authorized courses in other departments

Total 45

* The first three courses are prerequisites; at most, 6 of these 9 units may contribute to the 45 units.

For a more advanced master’s program, students may substitute, with advisor approval, appropriate 300-level courses in the department for required 200-level courses in the department. Electives may be selected for specialization in various areas, e.g., numerical analysis, decision analysis, manufacturing, and applied statistics.

No thesis is required. A minimum letter grade indicator of 2.75 is required.

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.

The degree nominally represents an additional academic year of full-time study beyond the Master of Science in Operations Research, and includes 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, 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 Ph.D. in Operations Research is for students 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, queueing 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.

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, simulation methodology, network and combinatorial theory, reliability, queueing theory, inventory theory, and game theory.

Candidates for the Ph.D. normally meet the course requirements shown below. Exceptional cases are considered upon petition to the department.

1. Prerequisites: Math. 113, 115; or 171; Statistics 116, 200, 203, 217; Computer Science 106A. Engineering-Economic Systems 212A or Economics 51Q or 202. Students lacking background in some of these areas can include appropriate courses in their program at Stanford.

2. Requirements in Operations Research: At least five of the courses in Group 1 (340, 341, 342, 343, 345, 347, 348); at least five in Group 2 (351, 355, 356, 357, 358, 359); and at least 14 total courses chosen from Groups 1, 2, and 3 (344, 346, 349, 363, 371, 373, 377, 381, 382).

A doctoral candidate must also 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 two written comprehensive examinations.

For the first examination, the students are examined on their selection of three of the following courses: 340, 341, 342 or 348, and 345. Similarly, for the second examination, students select three of the following courses: 351, 355, 356, 359.

A student performing satisfactorily in the Ph.D. program normally is eligible to receive a Master of Science in Operations Research, if desired, after completing 45 units of coursework.

Ph.D. MINOR

Doctoral students in other departments may obtain a minor in Operations Research by completing 20 units of 200 or higher-level courses in the department with an average letter grade indicator of 3.0 or higher. The courses normally include Operations Research 241, 243, 251, and 253 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 from University loans.

All applicants for financial assistance must take the General Test and the Subject 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 February 15.

COURSES

PRIMARILY FOR UNDERGRADUATES

50. Models and Applications of Operations Research in Society—(Graduate students register for 150.) Analysis of important socioeconomic problems by methods of operations research. Problem areas drawn from energy, environment, health, and urban planning. Intended for students in the social sciences or pre-engineering desiring a broad introduction to the potential role of operations research in modern society. Prerequisite: high school algebra. (DR:6) or (DR:8)

3 units, Spr (Staff) MW 4:15-5:30

150. Models and Applications of Operations Research in Society—Lectures same as 50, but a term paper is required. (DR:6) or (DR:8)

3 units, Spr (Staff) MW 4:15-5:30

152. Introduction to Operations Research I—(Enroll in Engineering 62.) 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: Math. 43 or consent of instructor. (DR: 8)

4 units, Aut (Hillier) MWF 1-2:05
Spr (Staff) MWF 1-2:05


4 units, Win (Liebermann) MTWTh 1:15

154. Operations Research—Introduction to the techniques and models of operations research for students who have not had the equivalent of 152 and 153. Topics are similar to those of 152 and 153. Prerequisites: calculus and Statistics 116.

4 units, Sum (Staff) TTh 3:15-5:30

150. Statistical Issues in Manufacturing—Introduction to the statistical ideas used in the design and control of modern manufacturing systems. Relationship to the strategic issues involved in global competitiveness. Topics: introduction to basic probability and statistics, Markov chains, queueing networks, simulation. Applications to: production and scheduling, just-in-time inventory management, quality control, materials requirement planning. Software packages are described and used. Prerequisite: Math. 43 or permission of instructor.

4 units, Sum (Staff) TTh 3:15-5:30

PRIMARILY FOR MASTER’S CANDIDATES

These courses are oriented toward applications. Operations Research (O.R.) 241, 242, 243, 251, 252, 253, 281, and 282 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.

241. Linear Programming—Linear programming emphasizing standard model formulation, fundamental theorems, variations of the simplex method, and parametric programming. GAMS/MINOS software is used. Corequisite: Math. 103.

3 units, Aut (Staff) TTh 1:15-2:30
Sum (Staff) TTh 1:15-3

242. Network Programming—Shortest paths, dynamic programming, present value of money, critical paths, convexity and extreme points, unimodularity, critical paths with cost benefit, minimum cost flows, inventory and production scheduling, minimum spanning trees, complexity, software (GAMS/MINOS). Corequisite: 241 or equivalent.

3 units, Aut (Eaves) TTh 2:45-4


3 units, Win (Veinott) MW 8:30-9:45

246. Mathematical Programming Computation—(Doctoral students register for 346.) Overview of major computational procedures used in solving mathematical programming problems, including large-scale systems. Introduction to computer implementation of algorithms for: linear programming, quadratic programming, unconstrained, linearly constrained, and nonlinearly constrained optimization. Practical experience with techniques that increase speed, stability, and accuracy of computation. Prerequisites: 243 or 341, and Computer Science 106A or equivalent, or consent of instructor.

3 units, Sum (Staff) MW 3:15-5

251. Probability Models in Operations Research—Formulation, solution, and analysis of models in operations research incorporating probabilistic elements. For students anticipating doing project work in government or industry. Topics: inventory, forecasting (including regression), decision analysis, and quality and reliability. Relevant software packages are utilized. Prerequisite: Statistics 116 or equivalent.

3 units, Win (Lieberman) TTh 9:30-10:45

252. Stochastic Models in Operations Research—Formulation and analysis of models in operations research involving stochastic processes. Topics: Markovian queues, queues with embedded Markov chains, general single server queue, queueing networks, diffusion approximations, and Markov decision chains. Software packages are used. Prerequisite: 251 and Statistics 217 or equivalent.

3 units, Spr (Iglehart) TTh 9:30-10:45
Sum (Staff) TTh 3:15-5

253. Simulation—(Doctoral students register for 353.) 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 FORTRAN, or PASCAL; Statistics 217 or the equivalent.

3 units, Spr (Shedler) TTh 11-12:15
Sum (Staff) MW 1:15-3

(Ph.D. students enroll in 381.) Integrates (and enhances) problem identification, case definition, case selection, case analysis, teamwork, project scheduling, task definition, task allocation, task amalgamation, group behavior, technical writing, public speaking, presentation skills, questioning skills, software usage, library usage, etc., as they relate to the effective use of operations research. Enrollment is limited. Prerequisites: 241 and 242 or equivalent and consent of instructor.

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

282. Projects in Operations Research—(Ph.D. students enroll in 382.) Student groups identify, develop, solve, and report on operations research projects in business, nonprofit institutions, and government. Emphasis on problem-solving; involves field interaction, formulation, analysis, data collection, discussion with clients, report writing, and presentation to clients. Enrollment limited. Prerequisites: 281 and consent of instructor.

3 units, Spr (Manne) MW 9-10:15

283. Operations Research with Spreadsheets and Databases—Reexamines O.R. techniques introduced in 240 and 250 sequences, e.g., linear and integer programming, network flow problems, inventory theory, and forecasting the simulation techniques in the environments of the spreadsheet and database. The emphasis is on extending the applicability of these techniques through integration with existing business data structures rather than exploring the underlying mathematical theory. Prerequisites: 241 and 242, or consent of instructor.

3 units, Win (Savage) by arrangement

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

PRIMARILY FOR DOCTORAL STUDENTS

These advanced courses are concerned with the development of the mathematical theory of operations research and sophisticated applications thereof.

340. Linear Programming—Basic theory plus laboratory for learning about the numerical, software, and applicational aspects of the field.


4 units, Aut (Dantzig) TTh 1:15-2:30
lab by arrangement


3 units, Win (Cottle) TTh 1:15-2:30

342. Equilibrium Programming—A development and application of the solution of equations through piecewise linear deformations and curve following. Topics: models of economies and conflict, subdivisions, piecewise linear maps, regularity, degree, fixed point theorems, general algorithms, and special case algorithms.

3 units, alternate years, given 1991-92


3 units, alternate years, given 1991-92

344. 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: 340 or consent of instructor.

1 unit, Aut (Hillier) F 9

open-pit mining, production, planning, transportation, distribution, capacity planning.
3 units, Win (Hoffman) TTh 11-12:15

346. Mathematical Programming Computation—
(Same as 246.)
3 units, Sum (Staff) MW 3:15-5

347. Sectoral and Economywide Modeling—
Formulation and solution of models for individual sectors and for the economy as a whole.
3 units, given 1991-92

348. Linear Complementarity—
Theory of the linear complementarity problem, its applications, and algorithms for its solution. Elements of quadratic programming theory. Pivotal algebra, Schur complements, and matrix classes. Analytic existence theorems. Lemke’s algorithm, the principal pivoting method and degeneracy resolution techniques. Indirect algorithms. Prerequisite: 341 or consent of instructor.
3 units, Spr (Cottle) TTh 1:15-2:30

349. Combinatorial Optimization—
(Same as Computer Science 363.) Algorithms for optimization of combinatorial structures. Topics: shortest paths, maximum flows, minimum-cost flows, bipartite matching and assignment problem, general matching, stable marriage, polynomial-time algorithms for linear programming, integer programming and unimodularity, and approximation algorithms for NP-hard problems. Prerequisite: Computer Science 161 or 264, or equivalent.
3 units, Win (Goldberg) TTh 1:15-2:30

350. Dynamic Programming and Stochastic Control—
3 units, Spr (Veinott) TTh 1:15-2:30

351. Reliability Theory—
3 units, Aut (Lieberman) TTh 9:30-10:45

352. Inventory Theory—
3 units, Aut (Veinott) TTh 11-12:15

353. Queueing Theory—
Advanced, but nonmeasure theoretic, course in the foundation of queueing theory. Topics: Markovian queues, embedded Markov chains, general single server queue and random walk theory, limit theorems for average values and extreme values of waiting times, queueing networks, multiple channel queues in heavy traffic, and diffusion approximations. Prerequisite: 359.
3 units, Spr (Lemoine) MW 2:15-3:30

354. Applied Probability—
3 units, Win (Glynn) TTh 9:30-10:45

355. Information and Organization—
(Same as Economics 282.) Information and decision. The value and cost of information. Demand for information and its economic implications. Differential information and communication in economic organizations.
5 units, Win (Arrow)

356. Interdisciplinary Seminar on Conflict Resolution—
(Same as Business 694, Economics 386, Law 325, Psychology 283.) Addresses problems of decision making, risk analysis, conflict resolution and negotiation from normative and descriptive perspectives.
1-2 units, Win, sometimes Spr (Arrow, Mnookin, Ross, A. Tversky, Wilson) T 4-5:30
367. Welfare Economics—(Same as Economics 280.) Social choice theory; optimal mechanism design; welfare measurement and identification using hedonic price methods. Analysis of constrained second best.

5 units, Win (Starrett)

369. Interdisciplinary Workshop in Risk Management—(Same as Economics 388.) Examines a number of current issues in risk management from an organizational perspective. Speakers from engineering, economics, law, medicine, and business; also risk management private consultants.

1 unit, Spr (Arrow, Lieberman) T 4-5:30

371. Topics in Mathematical Programming—Seminar with presentations by students and invited speakers. Introduction to techniques for solving structured linear programs. Sparse matrix methods, basis factorization, comparison of exterior and interior methods, generalized linear programming, decomposition principle, convex programming, integer programming, multicommodity problems, stochastic programming. Prerequisite: 340.

3 units, Win (Dantzig) by arrangement

372. Stochastic Programming—Seminar with presentations by students and invited speakers. Finding an "optimal" solution to mathematical programs with uncertain parameters (i.e., coefficients and constant terms). Recent advances, the role of parallel and vector processors, importance sampling, decomposition and other large-scale methods, applications, and software. Students participate in ongoing research. Prerequisite: 371 or equivalent.

3 units, Spr (Dantzig) by arrangement

381. Case Studies in Operations Research—(Same as 281.)

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

382. Projects in Operations Research—(Same as 282.)

3 units, Spr (Manne) MW 9-10:15


any quarter (Staff) by arrangement

---

SCIENTIFIC COMPUTING AND COMPUTATIONAL MATHEMATICS PROGRAM

Core Faculty: Gene Golub (Computer Science), Joseph B. Keller (Mathematics), Joseph Oliger (Computer Science)

Associate Faculty: Khalid Aziz (Petroleum Engineering), Robert Dutton (Electrical Engineering), Joel Feziger (Mechanical Engineering), George M. Homsy (Chemical Engineering), Thomas J. Hughes (Mechanical Engineering), Thomas Kailath (Electrical Engineering)

Affiliated Faculty: S. Boyd (Electrical Engineering), A. Bryson (Aeronautics and Astronautics), J. Cioffi (Electrical Engineering), R. Cottle (Operations Research), T. Cover (Electrical Engineering), G. Dantzig (Operations Research), S. Doniach (Applied Physics), C. Eaves (Operations Research), J. Friedman (Statistics), T. Kane (Mechanical Engineering), J. Koseff (Civil Engineering), R. MacCormack (Aeronautics and Astronautics), W. Murray (Operations Research), W. Reynolds (Mechanical Engineering), B. Roth (Mechanical Engineering), M. Saunders (Operations Research), J. Simo (Mechanical Engineering), R. Street (Civil Engineering), M. Van Dyke (Mechanical Engineering), D. Wilde (Mechanical Engineering)

The Scientific Computing and Computational Mathematics Program (SC/CM) is interdisciplinary and leads to the M.S. and Ph.D. degrees. It is designed for students interested in studying and developing computational tools in those aspects of applied mathematics that are central to modeling in the physical and engineering sciences. Graduates of this program are expected to be able to deal with a scientific problem from its formulation, moving through its mathematical analysis to algorithm development and implementation. The symbiosis of applied mathematics and numerical computing is stressed, but there is emphasis on areas such as symbolic computation and computer architecture.

The program prepares students for research in the rapidly expanding field of supercomputing.

GRADUATE PROGRAMS

MASTER OF SCIENCE

A candidate must complete a program of 45 units of courses numbered 100 or greater, of which at least 18 must be at the 200 level or above. At least 36 of these units must be graded
units, passed with a letter grade indicator of 3.0 ("B") or better. The core curriculum is common to all degrees offered by the program but is adapted according to the interests and prior education of the student. Deviations from the core curriculum must be justified in writing and approved by the student's advisor and the SC/CM Committee. Courses that are waived rather than taken may not be counted towards the master's degree. The student must fulfill credit requirements in each of the categories listed below.

**CORE CURRICULUM**

1. **Mathematics** (15-18 units)—Students are required to take Math. 220 A,B,C. Nine additional units in mathematics are required with at least 6 units at the 200 level. Suggested courses are: Math. 135, 173, 224, 230A,B,C, 256A,B,C, 270, 274. Other courses can be taken with consent of the advisor and SC/CM Committee. Students should take those courses most suitable to their areas of specialization.

2. **Numerical Analysis** (9-12 units)—Students are required to take Computer Science (C.S.) 237 A,B,C and 3 units of one of the advanced courses in numerical analysis: C.S. 335, 339; Mechanical Engineering (M.E.) 235A,B,C.

3. **Computer Science** (6-9 units)—Students can take a selection of courses from: C.S. 108 A, B, 212, 248, 260. This must include a course at the 200 level.

4. **Application Area** (9 units)—Students must take a focused program in an applications area such as fluid mechanics, operations research, or statistics. Courses must be at the 200 level or higher and the program of concentration must be approved by the advisor and committee. The following courses would be acceptable candidates: M.E. 251A,B, 269; Aeronautics and Astronautics (A.A.) 210A,B, 214A,B,C; Civil Engineering 210A,B; Electrical Engineering 363, 364, 365, 378A,B.

5. **Seminar** (1 unit)—Students are required to regularly attend the Scientific Computing/Computational Mathematics seminar for one quarter. The seminar is held weekly during the academic year.

**DOCTOR OF PHILOSOPHY**

The University's basic requirements for the Ph.D. (residence, dissertation, examination, etc.) are discussed in the "Degrees" section in this bulletin. The following are program requirements:

1. Plan and successfully complete a coherent program of study covering the basic areas of Scientific Computing and Computational Mathematics. It must at least satisfy the requirements for the M.S. degree in SC/CM. It is important that the student be able to exhibit depth in some area of applications. The student's advisor has the primary responsibility for the adequacy of the program, which must meet the approval of the SC/CM Committee.

2. To be admitted to candidacy for the Ph.D. degree, a student must have successfully completed 27 units of graduate courses (200 level and above) with at least a letter grade indicator of "B." In addition, a student must pass a qualifying examination. This examination covers basic courses in mathematics, numerical analysis, and computer science as described in the "Master of Science" degree program above. Students who have obtained the master's degree in another program must satisfy the candidacy requirement within one year of entering the program. Those entering the program with a B.S. are expected to satisfy the candidacy requirement by the end of the second year.

3. Beyond the requirements for candidacy, the student must complete a focused course of study of at least 48 units. The program should be designed to develop a deep, focused background in the research area to be pursued in the dissertation. Approval of the program must be obtained from the SC/CM Committee.

4. In addition, the student must have an adequate knowledge of a coherent area of application and must complete at least 12 units in that area.

5. The most important requirement for the Ph.D. is the dissertation. Within a reasonable period after passing the qualifying examination, the student must obtain the agreement of a faculty member to be the dissertation advisor. A reading committee must be selected before the student is admitted to Terminal Graduate Registration (TGR), and this committee should be frequently consulted by the student before the University oral examination. Upon completion of a substantial portion of the dissertation, the student must pass a University oral examination in defense of the dissertation.
SCHOOL OF HUMANITIES AND SCIENCES

Dean: Ewart A. C. Thomas
Senior Associate Dean: Walter P. Falcon
Associate Deans: Theodore M. Andersson, Alexander L. Fetter, Carolyn C. Lougee, Thomas A. Wasow
Associate Dean for Planning and Management (Acting): Nancy J. Padgett
Associate Dean for Development: John M. Cash


The School of Humanities and Sciences, with over 40 departments and interdepartmental degree programs, is the primary locus for the liberal arts education offered by Stanford University. Through exposure to the humanities, undergraduates study the ethical, aesthetic and intellectual dimensions of the human experience, past and present, and so are prepared to make thoughtful and imaginative contributions to the culture of the future. Through the study of social, political, and economic events, they acquire theories and techniques for the analysis of specific societal issues, as well as general cross-cultural perspectives on the human condition. And through exposure to the methods and discoveries of mathematics and the sciences, they will become better-informed participants and leaders in today’s increasingly technological societies.

Further, the exciting research environment within the school offers both undergraduates and graduate students the intellectual adventure of working on their own research projects, side by side with the school’s distinguished faculty. While a few of the school’s graduate programs offer professional degrees such as the Master of Fine Arts, most are academic and research programs leading to the Ph.D. Doctoral programs emphasize original scholarly work by the graduate students, often at the frontiers of knowledge, and normally require the students to participate in the supervised teaching of undergraduates. Indeed, in the school as in the University more broadly, graduate students are of central importance in the development of a community of scholars.

The fact that so many different disciplines lie within the same organization is one reason why the school has had great success in promoting interdisciplinary teaching and research programs. Whether it is through study of the ethical, policy, and technological issues related to kidney transplants or study of the relevance of contemporary social and philosophical theories to an interpretation of Dante’s writings, our undergraduates, graduate students, and faculty are engaged in the challenge of transcending the barriers among scholarly disciplines, those between research and teaching, and those between the academy and the rest of society.

ORGANIZATION

The School of Humanities and Sciences includes the Departments of Anthropology, Applied Physics, Art, Asian Languages, Biological Sciences, Chemistry, Classics, Communication, Comparative Literature, Drama, Economics, English, Food Research, French and Italian, German Studies, History, Linguistics, Mathematics, Music, Philosophy, Physics, Political Science, Psychology, Religious Studies, Slavic Languages and Literatures, Sociology, Spanish and Portuguese, and Statistics.


In addition, the school sponsors programs that do not currently grant degrees: Astronomy, Black Performing Arts, Center for Teaching and Learning, Ethics in Society, History of Science, Innovative Academic Courses, Jewish Studies, Medieval Studies, Overseas Studies, and Undergraduate Research Opportunities.

Faculty and academic staff of the School of Humanities and Sciences are listed under the respective departments or programs.

DEGREES OFFERED

Candidates for the degree of Bachelor of Arts, Bachelor of Science, Bachelor of Arts and Sciences, Master of Arts, Master of Fine Arts, Master of Science, Doctor of Musical Arts, or Doctor
of Philosophy should consult appropriate sections of the announcements following. They should consult also the department or program in which they intend to specialize. For regional or area studies and other special programs leading to the degree of Doctor of Philosophy, refer to the “Graduate Divisions Special Programs” section in this bulletin.

UNDERGRADUATE PROGRAM IN AFRICAN AND AFRO-AMERICAN STUDIES

Chairman: Horace Porter (English)
Steering Committee: David Abernethy (Political Science and African Studies), James Gibbs (Anthropology), Thomas Massey (Humanities and Sciences), Arthur Walker (Applied Physics), Sylvia Wynter (Spanish and Portuguese), student representative from the Black Student Union

Participating Faculty: Clay Bates (Engineering), Lucius Barker (Political Science), Clay Carson (History), Sandra Drake (English), John Gill (Engineering), William Gould (Law), Kennell Jackson (History), Halifu Osumare (Athletics), John Rickford (Linguistics), Arthur B. C. Walker (Applied Physics), Sylvia Wynter (Spanish and Portuguese)

UNDERGRADUATE MAJOR

The curriculum is based on the idea that the African and Afro-American Studies (AAAS) program should provide an interdisciplinary introduction to (I) the field of Afro-American history, culture, and society as a central component of the United States; (IIA) to the field of African history, culture, and society, and to (IIB) the emerging field of the history, culture, and society of the Black diaspora. The student major is expected to develop a specialized knowledge in all three fields but with special emphasis on the first.

All majors and double majors are expected to take a total of 63-65 units. Of these, 33-35 units must be selected from the core courses (I); AAAS 105 is mandatory. Fifteen units each are to be selected from the two other groups of courses (IIA and IIB). Each of these course groupings consolidates as well as broadens the work of the core and further develops the understanding the major has for issues in the AAAS field.

This selection constitutes option (A). In addition, students majoring in AAAS may take option (B) which consists of the core courses (I) and either (IIA) or (IIB) and a choice of a thematic concentration in part III. Part III also consists of 15 units.

AAAS majors have numerous opportunities to obtain academic advising. The chair directly advises all the majors, and their progress is closely followed by the program coordinator. When the time comes to choose between the two options for study, faculty with expertise in the different areas will be available. The program aims to provide the best possible advising for majors and to give the students a chance to discuss academic choices with the many faculty involved in the program.

REQUIREMENTS

I. CORE COURSES (33-35 units)

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>73. Black English</td>
<td>5</td>
</tr>
<tr>
<td>105. Introduction to Afro-American Studies</td>
<td>5</td>
</tr>
<tr>
<td>291. Race, Discourse, and the Origin of the Americas: A New World View of 1492</td>
<td>5</td>
</tr>
<tr>
<td>Anthropology 122. Film Images of African-American Culture</td>
<td>5</td>
</tr>
<tr>
<td>Drama 5. Introduction to Black American Drama</td>
<td>5</td>
</tr>
<tr>
<td>English 161A. Afro-American Writing, 1950-1970</td>
<td>5</td>
</tr>
<tr>
<td>English 161B. Afro-American Writing, 1970-Present</td>
<td>5</td>
</tr>
<tr>
<td>History 157. Afro-American History: The Modern Civil Rights Movement</td>
<td>5</td>
</tr>
<tr>
<td>History 164. Race and Ethnicity and the American Experience</td>
<td>5</td>
</tr>
</tbody>
</table>

IIA. AFRICAN HISTORY, CULTURE AND SOCIETY (15 units)

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>115. Africa and Philosophy, Philosophy and Africa</td>
<td>5</td>
</tr>
<tr>
<td>History 148. Introduction to African History</td>
<td>5</td>
</tr>
<tr>
<td>History 148C. Africa in the 20th Century</td>
<td>5</td>
</tr>
<tr>
<td>Political Science 118B. Southern Africa: Race, Class, and Political Change</td>
<td>5</td>
</tr>
</tbody>
</table>

IIB. HISTORY, CULTURE, AND SOCIETY OF THE BLACK DIASPORA (15 units)

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>114. Africa and the Black Diaspora</td>
<td>5</td>
</tr>
<tr>
<td>185. African-Caribbean Roots of American Jazz Dance</td>
<td>2</td>
</tr>
<tr>
<td>248. The Caribbean-Americas: An Introduction to their Literature and Thought</td>
<td>5</td>
</tr>
<tr>
<td>249. The Afro-Hispanic World: An Introduction</td>
<td>5</td>
</tr>
<tr>
<td>English 167F. Modern Literature of the Caribbean</td>
<td>5</td>
</tr>
</tbody>
</table>

III. THEMATIC CONCENTRATION

This area allows the student to focus 15 units of work on themes that either develop previous work in the major or explore new areas. There
are five possible themes. In choosing a theme, the student is advised by a faculty member with a specialization in the area or discipline as well as by the chair of the program. The themes are as follows:

African History and Society—History 148B, Afro-America and Africa; History 248S, The Colonial State and Society in Africa; Education 195, Introduction to Africa Through Film.

Expressive Culture of the Africa Diaspora—Afro-American Studies 162E, Introduction to Caribbean Poetry; Afro-American Studies 186, African-Caribbean Dance Technique; Drama 157, Contemporary Black Playwrights; English 161F, The Harlem Renaissance; English 167F, Modern Literature of the Caribbean; Dance 81 and 82, Jazz Dance I and II (the last two are suggested but units are not counted toward major).

African Development—Food Research 103, The World Food Economy; Food Research 121, Development and Population Interaction; Food Research 136, Population Perspectives in the Third World; Food Research 250, Nutritional Problems of Developing Nations; Food Research 251, Food and Nutrition Strategies in Development; Economics 118, Economics of Development; Economics 122, Theory of Capitalist Development; Political Science 123D, Political and Ethical Aspects of Foreign Aid; and History 249A, Africa since 1945.

Afro-American History and Society—History 146B, Afro-Americans and Africa; History 146A, The United States and Africa; Psychology 127, Afro-American Psychology; Afro-American Studies 126, Black Perspectives on Medicine; Afro-American Studies 127, Professional Development for Minority Engineers; and Sociology 144, Social Inequality and Social Stratification.

The Fifth Choice—Part III allows the major to devise a program around a special theme. In organizing this plan, the major works with a specialist on the chosen theme and with the chair of the program. The plan is approved by the steering committee. Honors work is possible as part of this option.

DOUBLE MAJORS

Many students in the program are double majors. Over the years, students have found that continuing a major in one field with a strong concentration in Afro-American Studies is an exciting intellectual choice. Almost any field complements the program offerings, even the sciences and engineering.

If a student decides to double major in Afro-American Studies, the core courses (33-35 units) should be taken. In addition, 30 units from various departmental offerings, e.g., English 161A, B, must be chosen. The total number of units required for a double major in this field is, therefore, 63-65 units. To determine the additional units, the prospective double major should consult with the chair of the program.

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 to produce a document or project demonstrating some measure of competence in the student’s specialty. 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.

UNDERGRADUATE SCHOLARS PROGRAM (USP)

Initiated in 1986, USP is an innovative project which brings together faculty and students for research on an intensive, individual basis. In 1990, 26 students were placed with 17 professors in a variety of fields.

Each student receives a research stipend and a certificate upon completion of the program. USP is listed as a specific course (3-5 units, Winter and Spring Quarters) on the transcript of the participants. A special, high-quality video that has been made to advertise the program is available at the Afro-American Studies office. A student can register in this program through Afro-American Studies 198A (3-5 units). Kennell Jackson, Jr., in the History Department, is the head of the USP.

COURSES

The core course (105) is a broad survey of the Afro-American experience. Team-taught by faculty from the humanities and social sciences, it introduces themes such as retained Africanisms, the Black family, Black studies, and Afro-American literature, history, and identity. Interaction with professors also helps students plan future courses of study.

AAAS PROGRAM OFFERINGS

59A, B, C. Dance Theater Production. 1-5 units, Aut, Win, Spr (Osumare)

105. Introduction to African and Afro-American Studies—(Same as Anthropology 105.) Lecture 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: African survivals in the New World; interpretations of slavery in the New World; contrasting interpretations of the Black family; the Afro-American as artist; and the Afro-American identity. Also, why particular ideas developed at particular times, and the relationship between African and Afro-American Studies and other academic disciplines. (DR:5*)

5 units, Win (Wynter) MWF 11

114. Africa and the Black Diaspora: An Introduction to its Literature, Thought, and Cultural Worlds—The parallelisms and differences in the literature, thought, and cultural worlds of contemporary Africa and of the African-descended communities in the New World, i.e., the U.S., Brazil, Spanish-speaking Latin America, and the Caribbean. (DR:5*)

5 units, Spr (Wynter)

115. Africa and Philosophy, Philosophy and Africa: Introduction to a Polemic—Introduces an ongoing dispute between African intellectuals. Which political “philosophy” (liberal humanism or Marxism-Leninism in its African variants, or a resurgent Islamic fundamentalism) best serves a viable contemporary Black African civilization? If not one of these, what then? (DR:3*)

5 units (Wynter) given 1991-92

122. Film Images of African-American Culture—(Same as Anthropology 130, Communication 138.) The nature of the images of African-Americans and African-American culture as portrayed on film. The sources of those images (including the sources in African-American culture itself); their variations; and how they have changed over time. These historical trends are related to changes in African-Americans' self-conceptions, in their status and power in American society, and in their overall American race relations and American popular culture, including the filmic media. (DR:5)

5 units, Spr (Gibbs) MF 10, T 7:30 p.m.

126. Black Perspectives in Medicine—Through readings, discussions, and contact with Black doctors and other health care professionals, 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. Professional Development for Minority Engineers—(Same as Engineering 7.) The role of, and opportunities available to, Blacks in engineering and other technical fields, emphasizing the relationship between technological development and opportunities for Black and Third World communities.

3 units, Spr (Bates)


5 units, Win (Porter)


5 units, Spr (Porter)

190A,B,C. Directed Reading.

3-5 units, Aut, Win, Spr (Staff)

195A,B,C. Independent Study.

3-5 units, Aut, Win, Spr (Staff)

195D,E,F. Independent Study: The King Papers.

3-5 units, Aut, Win, Spr (Carson)

198A. The Undergraduate Scholars Program.

3-5 units, Spr (Jackson)

199A,B,C. Honors Project.

3-5 units, Aut, Win, Spr (Staff)

200A,B,C. MESA Tutors Project.

1-4 units, Aut, Win, Spr (Staff)

248. The Caribbean-Americas: An Introduction to Their Literature, Thought, and Cultural Worlds—(Same as Spanish 248, English 262G.) The literature, thought, and popular culture of the Caribbean Basin area within the context of an overview of its multiple cultural and linguistic worlds.

3-5 units, Aut (Wynter)

249. Afro-Hispanic Cultural Worlds: An Introduction—(Same as Spanish 249.) The literature and thought of Black Latin American writers in the Spanish-speaking Americas and Brazil. Introduction to the popular syncretic cultures of these interesting but as yet little known worlds. Reading in Spanish/Portuguese, and in English translations.

3-5 units (Wynter)

291. Race, Discourse, and the Origin of the Americas: A New World View of 1492—Examines major texts related to the Event of 1492 and to the prelude voyage of the Portuguese around
Cape Bojador to West Africa, which constitutes the formation of a new legitimating basis for structures of New World societies. Analysis of juridico-theoretical, historical, and literary texts, from the perspective of the Americas; attempts to decipher the politics of representation in the orthodox interpretation of Columbus' discovery and to deconstruct the strategies whereby a symbolic construct of "race" (in a Natural Law variant) would take primary place in the New World instead of the "gender" construct of previous human societies. (Texts available in English.)

5 units, Spr (Wynter)

**OFFERINGS IN OTHER DEPARTMENTS**

See respective department listings for course descriptions and Distribution Requirement (DR) information.

**ANTHROPOLOGY**

15/116. Anthropological Perspectives on American Culture—(Same as Education 116X.)
3-5 units (G. and L. Spindler) given 1991-92

5 units, Aut (Gibbs)

122. Film Images of African-American Culture.
5 units, Spr (Gibbs)

**DANCE**

182. Jazz Dance II.
1 unit, Aut, Win, Spr (Osumare)

183. Jazz Dance III.
1 unit, Win (Osumare)

2 units, Aut (Osumare)

2 units, Spr (Osumare)

**DRAMA**

5. Introduction to Black American Drama.
4 units, Aut (Elam) MWF 11

29. Theater Performance: Acting.
1-3 units, any quarter (Staff)

39A,B,C. Theater Performance: Crew.
1-3 units, any quarter (Staff)

157N. Contemporary Black Playwrights.
4 units, Spr (Elam) MWF 11

**ECONOMICS**

118. The Economics of Development—Prerequisite: Economics 51.
5 units, Spr (Kochar)

**EDUCATION**

201. History of Education in the United States—(Same as History 158.)
3 units, Spr (Tiffany)

**ENGLISH**

161B. Afro-American Writing 1970 to the Present.
5 units (Drake) not given 1990-91

**FOOD RESEARCH INSTITUTE**

103. The World Food Economy—(Same as Economics 106.)
5 units, Win (Falcon) MW 9-10:50

121. Development and Population Interaction in the Third World—(Same as Economics 119.)
5 units, Win (Yotopoulos) MW 1:15-3:05

136. Population Perspectives in the Third World—(Same as Economics 133, Human Biology 136, Sociology 153.)
5 units, Spr (Arthur) MW 1:15-3:05

166. International Trade Policy—(Same as Economics 166.)
5 units, Spr (Pearson) MW 11:12-5:00

250. Nutritional Problems of Developing Nations—(Same as Anthropology 250, Human Biology 110.)
5 units, Spr (Martorell) TTh 1:15-3:05

**HISTORY**

21. The World Outside the West: Change and Tradition Before the Age of European Imperialism—(Same as Anthropology 21.)
6 units, Aut (Roberts, Duus, Chamberlain)

148C. Africa in the 20th Century.
5 units, Win (Roberts)

249A. Undergraduate Colloquium: Africa since 1945.
5 units, Spr (Jackson)

**LINGUISTICS**

73. Black English.
4 units, Aut (McNair-Knox)

150. Introduction to Sociolinguistics.
4 units, Win (Guy)

602A,B,C. Beginning Hausa.
4 units, Aut, Win, Spr (Bature)

603A,B,C. Beginning Bambara.
4 units, Aut, Win, Spr (Bature)

606A,B,C. Beginning Swahili.
4 units, Aut, Win, Spr (Masagara)

4 units, Aut, Win, Spr (Staff)
Courses in African Studies are offered by departments and programs throughout the University. A sampling of these is listed at the end of this section. Each year the committee sponsors a seminar to demonstrate to advanced undergraduate and graduate students how topics of current interest in African Studies are approached from different disciplinary perspectives. Each week's presentation is conducted by a different professor in African Studies; the first hour is a lecture, followed by a one-hour seminar discussion.

Course offerings in African languages are also coordinated by the Committee on African Studies. Along with regular courses in several levels of Swahili, Hausa, and Arabic, the committee arranges with the Special Language Program in the Department of Linguistics to offer specialized instruction in a wide variety of other African languages. In recent years, the Special Language program has offered courses in Shona, Zulu, Igbo, Yoruba, and Bambara.

The Committee on African Studies does not sponsor degree programs, but undergraduates and graduate students can specialize in African Studies under a number of arrangements listed below.

UNDERGRADUATE STUDY

Undergraduates may choose an African Studies focus among several alternatives:

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 in 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 should
check with the Overseas Studies Office to see what arrangements are currently available.

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 doctoral programs of the different academic departments. Students in the Departments of Anthropology, Political Science, History, and Sociology, and in the School of Education, may declare African Studies as the area of specialization for their master's and Ph.D. thesis work. Some other departments, programs, and institutes also permit students to specialize in African Studies. The A.M. program in International Policy Studies aims to prepare students for careers in policy-determining positions in an international setting in the private and public sectors. The Food Research Institute, which offers an A.M. and a Ph.D., has a long-standing interest in research and teaching related to problems of food, agriculture, and rural development in tropical Africa. The programs in International Development Education in the School of Education focus on issues of educational policy and planning in Africa, and in the Third World more generally. The Stanford International Development Education Committee (SIDEC) offers both an A.M. and a Ph.D., for which specialization in international education policy and administration is possible.

2. Through a Graduate Division Special Program administered by the Dean of Graduate Studies. 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

AFRICAN AND
AFRO-AMERICAN STUDIES

105. Introduction to African and Afro-American Studies—(Enroll in African and Afro-American Studies 105, Anthropology 105) Introduces 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: African survivals in the New World; interpretations of slavery in the New World; contrasting interpretations of the Black family; the Afro-American as artist; and the Afro-American identity. Also, why particular ideas developed at particular times and the relationship between African and Afro-American Studies and other academic disciplines. (DR:5*)

5 units, Win (Wynter) MWF 11

114. Africa and the Black Diaspora: An Introduction to Its Literature, Thought, and Cultural Worlds—(Enroll in African and Afro-American Studies 114) The parallelisms and differences in the literature, thought, and cultural worlds of contemporary Africa and of the African-descended communities in the New World, i.e., the U.S., Brazil, Spanish-speaking Latin America, and the Caribbean. (DR:5*)

5 units, Spr (Wynter)

115. Africa and Philosophy, Philosophy and Africa: Introduction to a Polemic—(Enroll in African and Afro-American Studies 115) Introduces an ongoing dispute between African intellectuals. Which political "philosophy" (liberal humanism or Marxism-Leninism in their African variants or a resurgent/Islamic fundamentalism) will best serve a viable contemporary Black African civilization? If not one of these, what then? (DR:3*)

5 units (Wynter) given 1991-92

ANTHROPOLOGY

21. The World Outside the West: Change and Tradition Before the Age of European Imperialism—(Enroll in Anthropology 21, History 21.) See History 21 in this section.

5 units, Aut (Chamberlain, Duus, Roberts)

22. The World Outside the West in the Age of European Imperialism—(Enroll in Anthropology 22, Political Science 22, History 22.) See History 22 in this section.

6 units, Win (Abernethy, Befu, Beinin) MTWThF 10


5 units, Win (Wynter)

108. African Societies in a Changing World—(Enroll in Anthropology 108.) Lectures, discussions, and films introduce the social institutions and cultural forms of Black Africa in the wider context of colonialism, political independence, and national strategies of development. Topics: shifts in patterns of marriage and family life, the emergence of new classes, and the impact of Islam and Christianity. (DR:5*)

5 units, Aut (Gibbs) MWF 10

155. Food Production, Poverty, and Famines—(Enroll in Anthropology 155, VTSS 161.) Widespread and long-lasting famine in Africa ha
shown that new technologies for the production of food and modern transportation have not by themselves eradicated hunger in the world. The distribution of food in its complex relationship with production, focusing on the paradox of pov-

ty amidst plenty, the long-term ecological con-
sequences of new agricultural technology and the factors that lead to famine. Materials are
drawn from different areas, with emphasis on Africa and South Asia.

5 units (Gupta) given 1991-92

157. Law in Radically Different Cultures—(En-
roll in Anthropology 157, Law 316. Graduate
students register for Anthropology 257.) Uses
American law as a benchmark to examine com-
parable issues in the People’s 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. Registration required for
both Winter and Spring Quarters for classes
starting January 29. (DR:5*)

2 units, Win, plus 3 units, Spr (Barton, Staff)
not given 1991-92

234. Seminar on African Law—(Enroll in An-
thropology 234.) African indigenous legal sys-
tems and their interaction with European law
imposed during the colonial period. The chang-
ing post-independence dynamics of that inter-
relationship. Focuses on law in Botswana and
Liberia.

5 units, Win (Gibbs) T 2:15-4:05

EDUCATION

206A. Introduction to the Study of International
Development Education—(Enroll in Education
206A.) Theoretical orientations and the research
agenda in international development education
and resources for study and research at Stanford.
Consent of instructor.

1 unit, Aut (Carnoy) M 12-1:05

306A. Education and Economic Development—
(Enroll in Education 306A.) Introductory analysis
of the role of education in economic growth and
development. Case material considers devel-
opment problems in the U.S. and abroad. Dis-
cussion sections on the economic aspects of
educational development.

5 units, Aut (Carnoy) TTh 2:15-4:05

and by arrangement

306B. Education and Political Change—(Enroll
in Education 306B, Political Science 221.) The
relations between education and politics from
a comparative perspective. Topics: the study of
education and politics, questions of legitimacy
in educational policy, international factors in
educational policy and 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

306C. Education and Sociocultural Change—
(Enroll in Education 306C, Anthropology 239.)
Models of cultural change are developed that
stress the impact of abrupt changes in the con-
ditions of life on the personal adaptations of
individuals and local communities brought about
by modernization and urbanization. Education
as an instrument of change and its intervention
in the process of indigenous cultural transmission
as an aspect of these processes. Case studies
document and help build appropriate models.
Students, in a seminar-like setting, apply the
models developed to the analysis of Third World
and other relevant situations.

3-5 units, Win (McDermott)

306D. Sociology of Development and Educa-
tion—(Enroll in Education 306D, Sociology 306.)
The analysis of the relations between educational
and societal developments from a comparative
perspective. Readings on varying theoretical
perspectives and empirical studies on the struc-
tural and cultural sources of educational expa-
nension and differentiation, and on the cultural
and structural consequences of educational insti-
tutionalization. Research topics: education and
nation-building; education, mobility, and equality;
education, international organizations, and
world culture. (IDE, SSE)

5 units, Spr (Ramirez) MW 1:15-3:05

408. Research Workshop in International De-
velopment Education—(Enroll in Education 408.)
Research workshop for the review of key issues
in the methodology and epistemology of social
research in education, and research proposals
and findings by students and faculty. Prereq-
quisite: 306A-D or equivalent. Limited
enrollment.

2-5 units, Win (Carnoy) MW 3:15-6:05

FOOD RESEARCH

149/249. Economic Development in Africa—
(Enroll in Food Research 149/249, Economics
125.) Economic development issues in Africa,
emphasizing the sub-Saharan region. Topics: so-
cioeconomic maps of Africa; recent economic
history, demography, and migrations; devel-
opment strategies; agricultural policies, external
debt, famines and drought; environmental
degradation.

5 units, Aut (Fafchamps) TTh 1:15-3:05
FRENCH AND ITALIAN

269D. Contemporary Francophone Literature: Africa, Caribbean—(Enroll in French and Italian 269D.) Major francophone authors from Africa and the Caribbean. Reading list includes Cé saire, Senghor, Mohamed Dib, Driss Chraibi, Simone Schwartz Bart, Maryse Conde, Sembene Ousmane, Camara Laye. (In French)
4 units, Aut (Apostolides)

HEALTH RESEARCH AND POLICY

270. International Health—(Enroll in Health Research and Policy 270.) Discussion of world distribution of selected diseases and health problems; international organizations and control programs; environmental, social and economic factors in relation to health, particularly in developing countries; and comparative health care systems in poor and wealthy countries. Also, preparation for work and experience abroad. Prerequisite: consent of instructor.
2-4 units, Spr (Basch) Th 1:15-3:05

HISTORY

21. The World Outside the West: Change and Tradition Before the Age of European Imperialism—(Enroll in History 21, Anthropology 21.) A comparison of the cultural heritages and dynamics of change in three non-Western societies before extensive contact with Western Europe. Physical environment, economy, social and political structures, and religious and ethical values in Japan, Nigeria, and Egypt. (DR:5*; also satisfies Area 3 when taken in sequence with 22.)
6 units, Aut (Chamberlain, Duus, Roberts)

22. The World Outside the West in the Age of European Imperialism—(Enroll in History 22, Anthropology 22, Political Science 22.) Confrontation and accommodation as non-European societies respond to Western Europeans, and to Western institutions and ideas, from the early 19th century to the present. Changes in production and trade, in social and political structures, and in religious and ethical values in Egypt, Japan, and Nigeria. Recommended: History 21. (DR:5*; satisfies Area 3 when taken in sequence with 22.)
6 units, Win (Befu, Beinin)

LINGUISTICS

287. Field Methods—(Enroll in Linguistics 287, Anthropology 71.) Analysis of the structure of a lesser known language, using data gathered from a native speaker. Groups work together to capture the basics of the phonology, morphology, and syntax of the language and to explore a few aspects of the language in depth.
4 units, Spr (Bresnan, Leben)

602A,B,C. Beginning Hausa—(Enroll in Linguistics 602A,B,C.) Successful completion of 602C may fulfill the foreign language requirement.
4 units (Staff)

603A,B,C. Intermediate Hausa—(Enroll in Linguistics 603A,B,C.)
4 units, Aut, Win, Spr (Bature)

606A,B,C. Beginning Swahili—(Enroll in Linguistics 606A,B,C.) Successful completion of 606C may fulfill the foreign language requirement.
4 units, Aut, Win, Spr (Masagara)
AFRICAN STUDIES 233

4 units, Aut, Win, Spr (Staff)

608A, B, C. Advanced Swahili—(Enroll in Linguistics 608A, B, C.)
4 units, Aut, Win, Spr (Staff)

619A, B, C. Beginning Zulu—(Enroll in Linguistics 619A, B, C.)
3 units, Aut, Win, Spr

620A, B, C. Beginning Arabic—(Enroll in Linguistics 620A, B, C.) Successful completion of 620C may fulfill the foreign language requirement.
4 units, Aut, Win, Spr (Barhoum)

621A, B, C. Intermediate Arabic—(Enroll in Linguistics 621A, B, C.)
4 units, Aut, Win, Spr (Barhoum)

622A, B, C. Advanced Arabic—(Enroll in Linguistics 622A, B, C.)
4 units, Aut, Win, Spr (Barhoum)

Other African Languages—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: Bambara, Setswana, Shilluk, Shona, Wolof, and Yoruba. Contact the Special Language Program office, (415) 723-3636.

POLITICAL SCIENCE

22. The World Outside the West in the Age of European Imperialism—(Enroll in Political Science 22, Anthropology 22, History 22.) See History 22 in this section.
6 units, Win (Abernethy, Befu, Beinin)

25. 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. (DR: 5*)
5 units (Abernethy) given 1991-92

118A. Political Change in Tropical Africa—(Enroll in Political Science 118A.) The colonial situation, the growth of nationalism, the achievement of political independence, ethnic patterns in new states, civilian and military leadership, the role of party and bureaucracy, problems in stimulating economic development, and cases of cooperation and conflict among African states. (DR: 5*)
5 units, Spr (Abernethy)

118B. Politics of Race and Class in Southern Africa—(Enroll in Political Science 118B.) The political history of the region's 10 countries emphasizing relations among racial and ethnic groups. Diplomatic, economic, and military interactions among these states, and the impact of movements, corporations, and international organizations based outside the region. Attention to domestic politics and foreign policy of South Africa. (DR: 5*)
5 units (Abernethy) given 1991-92

132D. Political and Ethical Aspects of Foreign Aid—(Enroll in Political Science 132D.) General and case study materials examine the characteristics of bilateral and multilateral "official development assistance"; trends in its volume and composition; the complex relationship between aid providers and recipients; ethical problems posed in the allocation, monitoring, and evaluation of development assistance; international disaster relief operations.
5 units, Spr (Abernethy)

140A, B, C. Ethics of Development in a Global Environment (EDGE)—(Enroll in Anthropology 133A, B, C; Engineering 297A, B, C; Political Science 140A, B, C.) Seminars with a series of speakers on current development issues emphasizing problems of the poorer nations. Autumn Quarter: world resources—energy, food, housing, population and environment. Winter Quarter: the role of institutions affecting the transfer of technology—political systems, World Bank, transnationals. Spring Quarter: the role and responsibilities of the individual who wants to affect development. One unit credit for speaker series (lecture); 3 additional units for optional workshops treating selected issues in more depth and writing a term paper. (Sequential registration not required.)
1 or 4 units, Aut, Win, Spr (Fagen, Lusignan) W 7:30-9:30 p.m., workshops by arrangement

SOCIOLOGY

5 units, Spr (Lipset) MWF 11
RELATED MATERIALS

Students who wish to increase their knowledge of Africa may consider the following courses, of which at least 25 percent of the content is devoted to Africa:

ANTHROPOLOGY
128. Ethnographic Film.
164. Ecological Anthropology.

DANCE

FOOD RESEARCH

The following courses have some Africa content and present conceptual substance that is helpful to understanding African societies and institutions.

ECONOMICS
118. The Economics of Development.

EDUCATION
206B. Project Workshop in International Development Education.

FOOD RESEARCH
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 10 to 15 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.

CORE LECTURES

AMERICAN STUDIES

150. 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 are supplemented with discussions of the intellectual, theological, and political history of the period. Required for the American Studies major. (Thought and Imagination)
5 units, Aut (Fliegelman) MTWTh 10

151. The Transformation of American Thought and Culture, 1865 to the Present—(Same as History 152.) See “Core Lectures.”
5 units, Win (Gillam) MTWTh 9

152. Introduction to Material Culture—(Same as History 152.) See “Core Lectures.”
5 units, Spr (J. Corn) TTh 1:15-3:05

ANTHROPOLOGY

130. Film Images of African-American Culture.
5 units, Spr (Gibbs)

132. Language, Culture, and Education in Native North America.
5 units, Win (Nelson-Barber) MW 11-12:30

150. American Indian Ways of Knowing: Culture, Philosophy, Ecology.
5 units, Spr (Nelson-Barber) MW 11-12:30

ART

4 units, Win (W. Corn)

130A. American Art and Culture in the Gilded Age.
4 units, Spr (W. Corn) TTh 1-2:15

4 units, Aut (W. Corn) Th 3:15-5:05

DRAMA

5. Introduction to Black American Drama.
4 units, Aut (Elam)
154N. American Drama 1920s-1960s. 4 units, Win (Elam) MWF 11

157N. Contemporary Black Playwrights. 4 units, Spr (Elam) MWF 11

165. Topics in American Musical Theater. 4 units, Aut (Eddleman)

ENGLISH

125. American Fiction 1917-1945. 5 units, Spr (T. Moser)

134C. American Fiction: Romance to Realism. 5 units, Win (Halliburton)

161B. Afro-American Writing, 1970 to the Present. 5 units, Aut (Drake)

161C. 20th-Century Afro-American Fiction. 5 units, Win (Porter)

161D. Afro-American Autobiography. 5 units, Spr (Porter)

163A. Presentations of American Women. 5 units, Spr (Wald)

169B. Readings in the Asian-American Novel—(Same as Comparative Literature 169B.) 5 units, Aut (Palumbo-Liu)

169D. Readings in Asian-American Short Fiction—(Same as Comparative Literature 169D.) 5 units, Spr (Palumbo-Liu)

178. Toni Morrison—(Same as Feminist Studies 164A.) 5 units, Win (Cliff)

187B. Seminar: William Carlos Williams. 5 units, Spr (Sorrentino)

187G. Seminar: American Jewish Literature. 5 units, Spr (J. Moser)

266B. Modern American Texts: The Making of Americans. 5 units, Aut (Wald)

269C. The Poet and the Painter in American Modernism. 5 units, Win (A. Gelpi)

MUSIC

5A. Music in America. 3 units, Aut (Cohen)

RELIGIOUS STUDIES

7. American Indian Religions. 4 units, Win (Good)

152. New Religions in America. 5 units, Aut (Nattier) MWF 10

163. Religion and Ethnicity. 5 units, Spr (Busto)

AMERICAN SOCIAL ORGANIZATION AND BEHAVIOR

AMERICAN STUDIES

151. The Transformation of American Thought and Culture, 1865 to the Present—See “Core Lectures.” 5 units, Win (Gillam) MTWTh 9

152. Introduction to Material Culture—(Same as History 152.) See “Core Lectures.” 5 units, Spr (J. Corn) TTh 1:15-3:05

179. Introduction to American Law—(Same as Law 106, Political Science 182F.) See “Core Lectures.” 5 units, Aut (Friedman) MTWTh 9

ANTHROPOLOGY

132. Language, Culture, and Education in Native North America. 5 units, Win (Nelson-Barber)

150. American Indian Ways of Knowing: Culture, Philosophy, Ecology. 5 units, Spr (Nelson-Barber)

ECONOMICS

116. American Economic History. 5 units, Win (McLean)

HISTORY

52S. Introductory Seminar: The Making of the Constitution. 5 units, Win (Rakove)

57S. Introductory Seminar: The American West. 5 units, Win (Camarillo)

64. Introduction to Chicano Life and Culture. 5 units, Win (Arroyo, Rosaldo)

67S. Introductory Seminar: Social Change in Industrializing America. 5 units, Win (Sawislak) Th 1:15-3:05

151. American Labor History. 5 units, Spr (Sawislak) MTWTh 10

155. U.S. and Mexican Organizations and Politics. 5 units, Spr (Arroyo)

157. Afro-American History: Black Freedom Struggle. 5 units, Spr (Carson)

158. History of Education in the United States—(Same as Education 201.) 3 units, Spr (Tyack)

164. Race and Ethnicity in American Experience. 5 units, Spr (Camarillo, Frederickson)
16A. 18th-Century America—(Required for the American Studies major.)
5 units, Aut (Longmore, Rakove) MTWTh 10

16B. 19th-Century America—(Required for the American Studies major.)
5 units, Win (Fredrickson) MTWTh 10

16C. 20th-Century America.
5 units, Spr (Bernstein, Camarillo)

17A. America Since 1945.
4-5 units, Win (Bernstein)

24A. Undergraduate Colloquium: End of Slavery in Africa and Americas.
5 units, Spr (R. Roberts)

5 units, Spr (Rakove)

25B. Undergraduate Colloquium: Poverty and Homelessness in America.
5 units, Win (Camarillo)

5 units, Spr (Kleiman)

25D. Undergraduate Colloquium: Topics in the History of the American West.
5 units, Win (Sawislak) W 3:15-5:05

275. The Emergence of the Modern American City.
5 units, Aut (Sawislak) T 1:15-3:05

27A. Undergraduate Colloquium: The History of Mental Illness in the United States.
5 units, Win (Horn) T 3:15-5:05

AMERICAN POLICY AND INSTITUTIONS

179. Introduction to American Law—(Same as Law 106, Political Science 182F.) See "Core Lectures" above.
5 units, Aut (Friedman) MTWTh 9

180. The American Character—(Same as History 261S.) Descriptions of historical, literary, psychological, and sociological insights into the American character since the 17th century. (Required for the American Studies major.)
5 units, Aut (Gillam) sec. 1 T 1:15-4:05; sec. 2 Th 1:15-4:05
Spr (Fleigelman) MW 11-12:30

208. Seminar: Psychological Themes in American Fiction—(Same as English 186A.)
5 units, Spr (Moser)

211. Modern America in Historical Perspective—(Same as History 258.)
5 units, Win (Kennedy)

212. Ideas in America from the Revolution to 1900—(Same as History 271A.)
5 units, Aut (Fredrickson) M 1:15-3:05

214. The American 1960s: Thought, Protest, and Culture—(Same as History 260S.) Attempts to define the meaning of the American 1960s, emphasizing the "new sensibility" that emerged during this crucial decade in American history. Topics: black protest, the New Left, the
counter culture, the new literature and journalism, the role of the media in shaping dissent, and the legacy of the 60s protest.

**5 units, Spr (Gillam) TTh 1:15-3:05**

**221. Technology in American Culture**—(Same as History 252, VTSS 157.) Relationships between technological change and culture in 19th- and 20th-century U.S. Emphasis on themes such as technology and work, technological display and celebration, utopian and anti-utopian attitudes surrounding technology, subcultures devoted to particular technologies, and technology in popular culture.

**5 units, Aut (J. Corn) T 1:15-3:05**

**223. American Lives**—(Same as English 187F.)

**5 units, Win (Islas) T 4:15-5:45**

**227. The Poetics of Modernism: Studies in American Poetry and Poetics from World War II to the Eighties**—(Same as English 267.)

**5 units, Win (Perloff)**

**231. Technical Knowledge in the United States**—(Same as History 256S/356S, VTSS 221.) The production, dissemination, reception, and changing content of technical texts, including handbooks, household management guides, trade periodicals, popular science writing, owner's instruction manuals, and trade and engineering textbooks. The history of education and the book, the experiences of users of technology, the culture of consumption, and cultural history generally. Prerequisite: coursework in American history, the history of science or technology, or permission of the instructor.

**5 units, Spr (J. Corn) W 3:15-5:30**

**INDIVIDUAL WORK**

**195. Directed Research.**

**3-5 units (Staff) by arrangement**

**199. Directed Reading.**

**2-5 units (Staff) by arrangement**

**250. Honors Project**—Prerequisite: consent of the chairman of American Studies.

**5-15 units, any quarter (Staff)**

## ANTROPOLOGY


**Chair: George A. Collier**

**Professors:** Clifford R. Barnett (on leave), Harumi Befu, George A. Collier, Jane F. Collier, James Lowell Gibbs, Jr., Renato I. Rosaldo, Arthur P. Wolf

**Associate Professors:** Carol L. Delaney, William H. Durham, James A. Fox, John W. Rick (on leave), Sylvia Yanagisako

**Assistant Professor:** Akhil Gupta

**Professor (Research):** Thomas P. Rohlen

**Affiliated Faculty:** Shirley Brice Heath (English), Reynaldo Martorell (Food Research Institute), Raymond McDermott (School of Education)

**Lecturer:** Louise S. Spindler

**Acting Assistant Professors:** Sharon Nelson-Barber, Janice Stockard, Joel H. Streicker

**Visiting Assistant Professors:** Shahid Amin, Gaylene Becker, Lori D. Hager

The courses offered by this department are designed (1) to provide undergraduates with instruction in anthropology, a discipline treating humanity from the broad viewpoints of culture, society, biological heritage, 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.

The Anthropology Department is responsible for a large collection of historic and prehistoric cultural and skeletal material from all over the world, most notably from Native North America, the Pacific, Central and South America, and Africa. Some of these objects are used in anthropology courses and are exhibited in the Felis M. Keesing Museum (room 111K) in the Anthropology Department. Continuing excavations on Stanford property by department archeologists (under the direction of the Campus Archeologist) contribute materials to the collections.

## UNDERGRADUATE PROGRAMS

**BACHELOR OF ARTS**

The Department of Anthropology offers two programs leading to the Bachelor of Arts degree: the major in Anthropology, and an interdisciplinary program, the major in Social Science (Anthropology). An honors program is offered in both majors. To declare the major a student must fill out the Declaration of Major form at the Registrar's Office, then contact the academic...
Sree programs are as follows:

1. Competence in a foreign language beyond the first-year level. Such competence is usually demonstrated by completing a course at the second-year level with a letter grade indicator of "C-" or better, 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 anthropological theory and prepares them for upper division courses in the department.

The remaining requirements for the two degree programs are as follows:

Major in Anthropology—60 units, with at least 40 in anthropology. The remaining 20 units may be taken from courses in related departments; such outside courses must be approved by the student's advisor. Students whose programs require additional language study as part of a geographical or linguistics focus may petition the Undergraduate Committee to count up to 10 units of language courses toward the degree if such courses are at the second-year level or are in a second language. The units in anthropology must include at least one course in four of the five following topical categories: (1) Area Studies (15, 102-127); (2) Social and Cultural Anthropology (1, 7, 11-22, 128-168); (3) Linguistic Anthropology (4, 5, 18, 71-79, 167, 172-178); (4) Archeology (3, 183-189); (5) Biological Anthropology (2, 6, 180, 181). In addition, students must choose an area of concentration, taking at least 15 units in that field. Possible areas of concentration include archeology, biological anthropology, anthropological linguistics, and specialized areas within socio-cultural anthropology such as health and nutrition, gender studies, economic development, symbolic systems, or a particular culture area. Students must have their areas of concentration approved by their advisors. Finally, anthropology majors are urged to take a field work course in archeology, socio-cultural anthropology, or museum methods and to enroll in at least one departmental seminar in addition to Anthropology 90.

Major in Social Sciences—35 units in anthropology and 25 units in related social science fields. The 60 units must form a coherent program of study and be approved by the student's academic advisor and the Undergraduate Committee as part of the application for this major. Students whose program includes linguistic studies may petition the University Committee to have up to 10 units count toward the degree if such courses are at second-year level or are in a second language.

Honors Program in Anthropology—Candidates whose application to the honors program has been approved by the Undergraduate Committee must complete all of the requirements for their major, and submit an honors thesis no later than four weeks prior to the end of the quarter in which graduation is anticipated. The thesis is read by the candidate's advisor and a second reader appointed by the Undergraduate Committee. Honors candidates enroll in Anthropology 95. Honors Program Directed Individual Study, for as many as 15 units but may not count more than 5 of those units toward the 60-unit degree requirement.

All required units for undergraduate programs must be passed with a letter grade indicator of
cases are considered. as other Ph.D. applicants and only exceptional program; they must reapply on the same basis degree program cannot transfer to the Ph.D. gram. Students accepted for the terminal A.M. examination. Applicants for the A.M. program may enter during degree should apply directly to the Ph. D pro- file their scores on the Graduate Record Ex- amination. Other prospective students should apply formally through the Graduate Admissions Office, which will transmit their records to the department for consideration. Successful applicants for the A.M. program may enter only at the beginning of the Autumn Quarter. The final date for applications is January 1.

- Residence at Stanford for at least three quarters of full tuition graduate enrollment is required of all candidates for the master’s degree, including coterminal students. A.M. students in anthropology must take a minimum of 45 quarter units in anthropology beyond the undergraduate degree with a letter grade indicator of “B” or better in each course. Thirty-six of those units, which comprise the University minimum for the A.M. degree, must be at or above the 100-level, and 18 of the 36 must be in courses designated primarily for graduate students (typically at least at the 200 level). The Anthropology Department further requires at least 15 additional units of anthropology, taken at Stanford or elsewhere, constituting a minimum total of 60 units in anthropology. At the discretion of the department, the 15 additional units may have been taken in fulfillment of the undergraduate degree. Within the 45 units taken at Stanford, students must take one quarter (5 units) of History of Anthropological Theory, plus one additional course from those designated by the faculty as “core courses”. 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. Ph.D. students in the department may submit the first-year paper in fulfillment of this requirement.

- Full-time students entering the program with appropriate background 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 by the Graduate Admissions Committee. Applicants must file a report of their scores on the Graduate Record Examination and submit a sample of writing which demonstrates ability to produce analytical work at the graduate level. Successful applicants for the Ph.D. program may enter only at the beginning of the Autumn Quarter. The final date for applications is January 1.

The Ph.D. program includes a number of required courses and examinations. It also allows the student to develop a flexible program reflecting special interests, under the supervision of a faculty committee chosen by the student. Students are encouraged to plan for completion of all work for the Ph.D. in five years.
As part of the Ph.D. requirements, students must:

1. Pass within the first two years, at an acceptable graduate level, four of the courses designated by the faculty as "core courses."
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 year of graduate study. An approved internship may be substituted for part 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 their second year, a reading examination in a language other than English in which there is a substantial body of general theoretical literature relevant to anthropology. (This is a requirement of students whose native language is English. Students whose native language is not English are exempted from this requirement by demonstration of satisfactory command of English.)
6. By the end of the second year, after completing the above requirements and recruiting the special examination committee, and upon recommendation of the anthropology faculty, petition for admission to candidacy.
7. Pass a special examination (written and oral), normally given during the Spring 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.
8. Prepare a dissertation proposal to be approved by the student's dissertation committee before undertaking doctoral research.
9. Present an approved dissertation based upon independent research.

Ph.D. MINOR

The requirements for a minor in Anthropology consist of 30 units of anthropology taken at Stanford with a letter grade indicator of "B" or better in each course. Students minoring in Anthropology must: have an advisor within the department; with the advisor, develop a coherent course of study related to the Ph.D. program, including three courses in theory/methods and one course in a geographical area; file with the academic assistant in the department the Minor Requirement for Ph.D. Candidate form and a copy of the major department program or candidacy form; and have a representative from the Anthropology Department on the University Oral Examination Committee.

FINANCIAL SUPPORT

The department endeavors to provide needed financial support (tuition plus stipend) to all students admitted to the Ph.D. program who maintain a satisfactory course of study. Currently, the source of this support is University funds. 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. First-year students in the Ph.D. program who have not entered with outside funding are required to apply for such funding during their first quarter. No financial support is available to students enrolled 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

UNDERGRADUATE

GENERAL

Open to all students, these courses are 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, 4, and 6.

1. Social and Cultural Anthropology—(Upper division students register for 101.) Cross-cultural anthropological perspectives on human behavior, including cultural transmission, social organization, sex and gender, culture change, technology, war and other related topics. Lectures, films, and readings are used in the presentation of culture case studies illustrating basic generalizations. (DR:4* or DR:5*)

2. Genes, Culture, and Human Diversity—(Same as Human Biology 1.) Introduction to genetic and cultural evolutionary theory as applied to the analysis of human diversity. A case study approach illustrates general principles of...
evolution and similarities and differences between genetic and cultural change. Topics: Mendelian genetics, molecular biology, Darwinian theory, the modern synthesis, the concept of culture, cultural diversity, marriage and kinship, and cultural evolution. May be taken as a first course in anthropology or human biology. (DR:5* or DR:7*)

3 or 5 units, Spr (Durham, Wolf)
TTh 10-11:50

3. Human Prehistory—The aims, methods, and data of prehistoric archeology. 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 (Staff)

4. Language and Culture—(Same as Linguistics 4.) Language as part of culture. Individual and community repertoires of languages, dialects, jargons, registers, and nonverbal communication, and their rules of use. Structure of discourse, including conversation, narrative, and poetry. Language as a martial art: style, strategy, and politics in manipulating the rules of use. Linguistic relativity, encodability, and cultural origins of vocabulary and grammar. (DR:4*)

4-5 units (Fox) given 1991-92

5. Biology and Evolution of Language—(Same as Human Biology 113, Linguistics 5.) Language as an evolutionary adaptation of humans. Comparison of communicative behavior in humans and animals, and the inference of evolutionary stages. Structure, linguistic functions, and evolution of the vocal tract, ear, and brain, with associated disorders (stuttering, dyslexia, autism, schizophrenia) and therapies. Controversies over language “centers” in the brain and the innateness of language acquisition. Vision, color terminology, and biological explanation in linguistic theory. (DR:4)

4-5 units, Spr (Fox) MWF 11 section by arrangement

6. Human Origins—Evidence for the evolution of humankind from its beginnings several million years ago to the emergence of Homo Sapiens. Emphasizes consideration of fossil hominid remains—from their discovery to their interpretations for elucidating human origins. (DR:7)

5 units, Spr (Hager)

7. Investigating Culture: Introduction to Anthropology—Elements of everyday life are used as clues for investigating the implicit premises and explicit forms of culture, revealing its meaningful and constructed nature. Drawing upon the common experience of entering the university, compares and contrasts disorientation and reorientation with that experienced by anthropologists entering another culture and provides a means for considering the ways humans orient themselves, in space and time, with the body and structures of everyday life, by means of language and in terms of the symbols and frameworks of myth and religion. Lectures, discussions, and mini-fieldwork projects develop an anthropological approach to the study of culture. Appropriate for students going overseas, foreign students, and for freshmen.

5 units, Spr (Delany) MWF 9

11. Sex Roles and Society—(Same as Feminist Studies 140.) The diversity of women’s and men’s roles, experiences, and self-conceptions in a number of human societies. Provides a critical perspective on contemporary views of the “nature” of women and men, and how women and men shape and are shaped by particular forms of social life. (DR:5*)

3-5 units, Win (Stockard)

12. Introduction to Feminist Studies: Issues and Methods—(Same as Feminist Studies 101.) Interdisciplinary approaches to understanding the creation and perpetuation of gender inequality. Topics: feminist theory, the family, gender and work, sexuality, the politics of reproduction, domestic violence, and women’s culture. Examples from non-western societies illuminate the cultural and historical construction of gender in western society. (DR:5)

5 units, Aut (J. Collier) MWF 1:15-3:05

14. Cultures in Crisis—The present worldwide demise of tribal groups and peasant communities facing massive cultural change wrought by political and economic expansion from “Centers.” Processes leading to the current situation. The global and national factors of local problems. Seminar with maximum student participation. Enrollment limited to 15.

5 units, Spr (Befu) MWF 10

15. Anthropological Perspectives on American Culture—(Upper division students register for 116; same as African and Afro-American Studies 15, Education 116X.) Convergence and divergence in values, life styles, and psychocultural attributes are analyzed for mainstream, minority, and variant cultural patterns in U.S. society. Processes of boundary maintenance and identity reference. Current social movements in the perspective of counter-culturalism, marginality, and cultural change. Field studies of relevant phenomena are encouraged. (DR:3)

3-5 units (G. and L. Spindler) given 1991-92
18. Writing and Literacy—(Same as Linguistics 16.) Introduction to the origins, evolution, and diffusion of writing, its relationship to speech, and its roles in culture and civilization. Archaeological decipherment, major writing systems of the world, scribal practice, and current issues and problems in literacy. 
3 or 5 units (Staff) given 1991-92

21. The World Outside the West: Change and Tradition Before the Age of European Imperialism—(Same as African and Afro-American Studies 21, History 21.) A comparison of the cultural heritages and dynamics of change in three non-Western societies before extensive contact with W. Europe. Physical environment, economy, social and political structures, and religious and ethical values in Japan, Nigeria, and Egypt. (DR:5*; satisfies Area 3 when taken in sequence with Anthropology 22.)
6 units, Aut (Duus, Roberts, Chamberlain) MTWThF 10

22. The World Outside the West in the Age of European Imperialism—(Same as History 22, Political Science 22.) Confrontation and accommodation as non-European societies respond to Western Europeans, and to Western institutions and ideas, from the early 19th century to the present. Changes in production and trade, in social and political structures, and in religious and ethical values in Egypt, Japan, and Nigeria. Recommended: Anthropology/History 21. (DR:5*; satisfies Area 3 when taken in sequence with 21.)
6 units, Aut (Abernethy, Befu, Beinin) MTWThF 10

SPECIAL

71. Linguistic Field Methods—(Same as Linguistics 80.) Practical training in the collection and analysis of linguistic data from native speakers. Research goals, ethics, working in the community, technical equipment, and analytical strategies. Emphasis on the use of computers in collection and analysis, and attention to the preparation of materials useful to the subject community. Prerequisite: introductory course in linguistics.
5 units, Spr (Fox) MW 1:15-3:05

73A,B,C. First-Year Spoken Yucatec Maya—Introduction to the language of the Maya of Yucatan, Mexico. Emphasis on modern spoken Yucatec, with some attention to colonial and pre-Columbian writings. For beginners.
3 units, Aut, Win, Spr (Fox)

75A,B,C. First-Year Classical Nahua—I—Introduction to the language of the Aztecs of colonial Mexico. For beginners.
3 units (Fox) not given 1990-91

90. Theory in Social Anthropology—Anthropological interpretations of other societies contain assumptions about ourselves and about "Western" societies. Seminar highlights that interplay and considers how underlying assumptions and implicit categories have influenced the presentation of data in a set of major anthropological monographs. Concentrates on Karl Marx, Emile Durkheim, and Max Weber, along with a particular anthropological analysis of a nonwestern society. Enrollment limited to 20.
5 units, Aut (Staff) Win (Gupta) TTh 3:15-5:05 Spr (Wolf) MWF 11

93. Pre-Field Research Seminar—Prepares students for anthropological field research in other societies and the U.S. Instruction in data collection techniques including participant observation, interviewing, surveys, sampling procedures, life-histories, ethnography, and use of documentary materials. Strategies of successful entry in the community, research ethics, interpersonal dynamics, and the reflexive aspects of fieldwork. Prerequisite: introductory course in anthropology or consent of instructor.
5 units, Spr (Streicker)

94. Post-Field Research Seminar—Training and experience in coding, processing, and analyzing quantitative and qualitative research data. Participants complete a full-scale report on a body of field data normally collected during the preceding summer.
5 units, Aut (Streicker) T 3:15-6:05

95. Honors Program—Directed independent study and honors thesis work for students admitted to program.
any quarter (Staff) by arrangement

96. Directed Individual Study—For undergraduate students with special needs, and showing capacity to do independent work. Prerequisite: I or consent of instructor.
any quarter (Staff) by arrangement

99. Honors Writing Workshop—For students in the process of writing honors theses. Techniques of interpreting data, organizing bibliographic materials, writing, editing, and revising. Also, preparation of papers for undergraduate conferences and publications in anthropology.
2-6 units Aut, Win, Spr (Staff)

UNDERGRADUATE AND GRADUATE AREA STUDIES

102. Indians of North America—The cultures of the many indigenous peoples who made North America their home before European conquest. Lectures, readings, and films cover the pre-
contact situation, post-contact changes (including governmental policies), influences of Indian culture on American society and culture, and the contemporary situation of native peoples. A good antidote to TV and movie Western stereotypes. (DR:5*)

5 units (Barnett) given 1991-92

103. Mesoamerican Communities, Ethnicities, and Nations—Survey of the Mayas, the Aztecs, and their prehistoric neighbors; of how they fared under Spanish colonial rule; and of their descendants today.

3-5 units, Aut (G. Collier) MTWTh 10

105. Introduction to African and Afro-American Studies—(Same as African and Afro-American Studies 105.) Lecture introducing African and Afro-American Studies as an interdisciplinary field. Explores contrasting and contradictory interpretation of several key representative aspects of Africa and Afro-American social and cultural institutions. Topics: African survivals in the New World; New World slavery; the black family; the Afro-American as artist; and the Afro-American identity. Considers why interpretations developed at particular times and the relationship between African and Afro-American Studies and other disciplines. (DR:5*)

5 units, Win (Wynter)

108. African Societies in a Changing World—Lectures, discussion, and films introduce the social institutions and cultural forms of Black Africa in the wider context of colonialism, political independence, and national strategies of development. Topics: shifts in patterns of marriage and family life, the emergence of new classes, the impact of Islam and Christianity. (DR:5*)

5 units, Win (Wynter)

109. Dance and Culture in Latin America—(Same as Dance 177.) Selected dance cultures of Latin America viewed as aspects of human behavior. Emphasis on cultural influences (European, African, and indigenous) which have shaped ritual and social dance forms of Mexico, Cuba, Brazil, Argentina, and Chile. Corequisite: Dance 77 (lab). (DR:2*)

2-4 units, Spr (Cashion) TTh 1:15-3:05

110. Introduction to Chicano Life and Culture—(Same as History 64, Chicano Studies 110.) Interdisciplinary focus on the history and culture of Mexican Americans from the settling of the Spanish borderlands to the present. Historical perspectives are balanced with anthropological and literary views of the cultural diversity of Mexicans in the U.S. (DR:5)

5 units, Win (Arroyo) MWF 11

111. Islamic Science and Technology—(Same as VTSS 142.) The study of Islamic doctrine and culture as they have affected and been affected by science and technology. Topics: the role of religion in the achievements and decline of learning in the Islamic world. Doctrinal parameters of Islamic science and technology. Islamic responses to ethical and moral issues presented by science and technology. Technologies, historical and contemporary, that have been developed or adapted by and for Muslims to serve their needs.

4-5 units, Aut (Nabti) T 2:15-4:05

114A. The East-West Game—First of a two-quarter sequence studying the relationship between Islam and the Shriners (a Masonic Organization) as expressed at the East-West Game at Stanford Stadium. Background information on Islam and on the Shriners, draft questionnaire, practice interview techniques.

1 unit, Aut (Nabti)

114B. The East-West Game—Sequel to 114A. Students interview people at the East-West Game, input and analyze the data. Prerequisite: 114A.

1 unit, Win (Nabti)

115. Peoples of Island Southeast Asia—Topics: prehistory, the process and impact of colonization, the contrast between hill and valley peoples, subsistence modes, social organization, religion, and aesthetics. (DR5*)

5 units, Aut (Rosaldo) given 1991-92

116. Anthropological Perspectives on American Culture—(See Anthropology 15.)

117. Traditional Chinese Society—The society, culture, family, and political economy of late traditional China to 1949. The nature of social change in this premodern agrarian civilization. (DR:5*)

5 units, Aut (Stockard) TTh 1:15-3:05


5 units, Spr (Gupta, Mancall) MTWTh 9

121. Japanese Society and Culture—Japan's prehistory and its relation to neighboring areas: Institutional framework, and social and psychological background for development of the individual and gender differences in modern
Japan. Critique of several methods of Japanese society. Opportunities for reading in special subject areas.

5 units (Befu) given 1991-92

123. Japanese Economic Organization—The social and cultural factors in Japanese economic organization and business management, the motivational basis for commitment to work, the relation of kinship to economic system, "industrial graduation" and its correlates. (DR:5*)

5 units. Aut (Befu) MWF 10

125. Japanese Woman Through Novels—In anthropological literature on Japan, women tend to be relegated to the background of the social stage. Through analysis of novels written by Japanese women, in conjunction with anthropological literature, a new understanding of the position of women in Japan is presented.

5 units (Befu) given 1991-92

126. Issues in the Ethnography of the Middle East/Mediterranean Societies—Some issues that are closely associated with the ethnography of societies around the Mediterranean basin, e.g., honor and shame, public and private, sexual segregation, and orientalism. The differences and similarities between various cultures with regard to pastoral, farming, and urban lifeways; marriage and kinship; religion; and the notion of the Mediterranean as a culture area. For advanced undergraduates and graduate students.

5 units, Win (Delaney) TTh 3:15-5:05

SOCIAL AND CULTURAL ANTHROPOLOGY

128. Ethnographic Film—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. Recommended: 1.

5 units (Gibbs) not given 1990-91

130. Film Images of African-American Culture—(Same as African and Afro-American Studies 122, Communication 138.) The nature of the images of African-Americans and African-American culture as portrayed on film. The sources of those images (including the sources in African-American culture itself); their variations; and how they have changed over time. These historical trends are related to changes in African-Americans' self-conceptions, in their status and power in American society, and in their overall American race relations and American popular culture, including the filmic media. (DR:5)

5 units, Spr (Gibbs) MF 10, T 7:30 p.m.

132. Language, Culture, and Education in Native North America—Interdisciplinary examination of communication and language in cross-cultural educational situations, including language, literacy, and inter-ethnic communication as they relate directly to native classrooms. Emphasis on the implications of social, cultural, and linguistic diversity for educational practice in native classrooms, along with various strategies for bridging intercultural differences between schools and native communities.

5 units, Win (Nelson-Barber) MW 11-12:30

140. Aging: From Biology to Social Policy—(Same as Human Biology 178.) What can we expect when we join the ranks of the elderly? What are the biological processes that contribute to aging and are they the same across all populations and cultures? What are the cultural, social, and economic consequences of a large proportion of elderly people? What implications do they have for social policy? These questions are addressed through readings, lectures, and films. Students are assisted in research and working with the elderly. Those with strong clinical interests should enroll in Medicine 210.

3-5 units (Barnett) alternate years, given 1991-92

145. Women in Cities: A Cross-Cultural Perspective—(Same as Feminist Studies 142.) Women's experiences in cities throughout the world and the determinants of their similarities and differences. Topics: women and migration, changing forms of the sexual division of labor, changing family and kinship structures, prostitution, and political activism.

5 units (Yanagisako) given 1991-92

146. Urban Problems in Anthropological Perspective—Issues from current urban problems examined from the cross-cultural perspective of anthropology. Topics: the social consequences of crowding, rural-urban migration, changing sex roles, changing family and kinship patterns, urban ethnic communities and inter-ethnic relations, urban poverty, stratification, crime, and prostitution.

5 units, Spr (Staff)

149. Anthropology of Development—(Same as VTSS 161.) A history of anthropology in development projects from the Colonial Period through WWII. The involvement of anthropologists at the community level, e.g., Vicos, Administration of Pacific Trust Territories; intervention in development projects and disillusionment with same, "Camelot;" the "trickle-down" paradigm, e.g., the Green Revolution; the "Bottom-up" paradigm, anthropologists in AID, local systems analysis, including on the farm research, small-scale
fisheries, the rationality of peasant producers, and consideration of comparative research on diet, nutrition, and forms of exchange (implications of change from subsistence production to production for the market). Extensive use of case studies. Lectures and seminar discussion. Major paper.

5 units, Win (Siegel)

150. American Indian Ways of Knowing: Culture, Philosophy, Ecology—Interdisciplinary, introducing contrasting values, lifestyles, psycho-social attributes, and cultural systems of American Indian populations and western cultural tradition. Lectures/discussions center on philosophical aspects of Native world views, emphasizing systems of belief and knowledge, explanations of natural phenomena and relations of human beings to the natural environment. Native speakers provide students a level of direct experience from their own background.

5 units, Spr (Nelson-Barber) MW 11-12:30

152. Symbolic Anthropology—(For undergraduates.) Symbolic analysis has developed on the premise that examination of cultural meaning and phenomenological experience is essential for anthropological understanding. Recent monographs have applied symbolic approaches to history, ethnicity, politics, ritual, and social structure. Seminar critically examines 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.

5 units (Delaney) alternate years, given 1991-92

154. Creation/Procreation: A Comparative Study—(Same as Feminist Studies 154, Religious Studies 154.) An alternative to the study of religion and reproduction as distinct categories and separate domains. The gendered aspects of cosmological or religious systems and the cosmological significance of gender in terms of their symbolic interrelationships. Anthropological and other literature examines these relationships in several cultures, including our own. Emphasis on the ways these beliefs are embedded in practices and structures of social life and on Western categories and meanings, and their implications for theorizing.

5 units, Aut (Delaney) TTh 9-10:30

155. Food Production, Poverty, and Famines—The widespread and long-lasting famine in Africa has dramatically brought home the point that new technologies for the production of food and modern transportation have not by themselves eradicated hunger in the world. The distribution of food in its complex relationship with production, focusing on the paradox of poverty amidst plenty, the long-term ecological consequences of new agricultural technology, and the factors that lead to famine. Materials are drawn from different areas with emphasis on Africa and South Asia.

5 units (Gupta) given 1991-92

156. Law and Conflict Management—Seminar focusing on problems of order and conflict in society. Whether all societies have “law,” and the social settings of such dispute handling mechanisms as negotiation, mediation, arbitration, and adjudication. Readings in ethnographic accounts of conflict management in other societies and in modern American society.

5 units, Spr (J. Collier) MW 1:15-3:05

157. Law in Radically Different Cultures—(Same as Law 316, Political Science 182L; graduate students register for 257.) American law as a benchmark to examine comparable issues in the law of the People’s Republic of China (Eastern law), Republic of Egypt (religious law), and 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. Students must register for Winter and Spring Quarters, classes starting January 22. (DR:5*)

2 units, Win plus 3 units, Spr (Barton, Staff) not given 1990-91

158. The Sociology of Scientific Knowledge—(Same as History of Science 155, VTSS 155.) Some of the classical problems in the sociology of knowledge as represented in the writings of Marx, Durkheim, and Mannheim. Recent work in the social construction of scientific knowledge. Emphasis on recent studies in the historical-sociology of experimental science and laboratory practice. Using case studies and drawing on anthropological approaches in the works of Mary Douglas, Pierre Bourdieu, and others, a theory of practice and a critique of historically situated practical reason is explored as the foundation of the sociology of scientific knowledge.

4 units (Lenoir) given 1991-92

164. Ecological Anthropology—(Same as Human Biology 134.) Seminar on ecological analysis in anthropology, emphasizing patterns of co-variation between social systems and eco-systems. Sample societies from diverse habitats (arctic-desert, tropical rain forest, oceanic islands, mountain tops) motivate the exploration of theoretical topics including population growth and regulation, carrying capacity, niche analysis, resource competition, optimal foraging, resource management, and evolutionary culture theory.

3-5 units (Durham) given 1991-92
ANTHROPOLOGY 247

165. Psychological Anthropology—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. Topics: childhood and parental bonding; sex differences; cultural motivation and perception; ethnographic psychologies of cognition and consciousness; deviation and self-justification; and life cycle transitions. Prerequisite: 1 or Psychology 1, or consent of instructor. (DR:4*)
5 units, Win (Gibbs) MWF 10

167. Ethnography of Communication—(Same as Linguistics 147.) Language use in situations, organizations, and by members of different cultures. Examination of speech events and the role of conversation, narratives, and performance modes in different contexts. Focus is on ethnographic methods for the study of verbal and non-verbal communication.
4 units (Heath)

168. Medical Anthropology—(Same as Human Biology 168.) Western and non-western cultural systems of health; sociocultural correlates of health; illness experience; medicine as a social institution. Designed for students with interests in health care, any major.
5 units, Aut (Becker) TTh 11-12:30

171. Language and Gender—(Same as Linguistics 154.) A synthesis of the literature on the relations between gender and speech style, distinguishing linguistic, sociolinguistic, and feminist issues. Topics: language, socialization, oral and written language, language and class membership.
4 units, Spr (Heath, McElhinny)

LINGUISTIC ANTHROPOLOGY

173. Maya Hieroglyphic Writing—Decipherment of the hieroglyphic writing of the ancient Maya. Written Maya, Maya civilization, and theories of writing and literacy. Cylindrical, astronomical, astrological, historical, and mythological texts. Writing on stone, wood, bone, shell, ceramic vessels, and screenfold books. Maya scribal practice and literacy. The origin of Maya writing, and introduction to related Mesoamerican writing systems.
5 units (Fox) given 1991-92

177. Pidgins and Creoles—(Same as Linguistics 162.) The formation of simplified contact languages 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. Other simplified languages and registers. Prerequisite: introductory course in linguistics or anthropology or consent of instructor. (DR:4*)
4-5 units (Staff) given 1991-92

178. Introduction to Language Change—(Same as Linguistics 60.) Variation and change as the natural state of language. Differentiation of dialects and languages over time. Determination of historical relationships among languages and reconstruction of ancestral stages. Types and explanations of change. Parallels with genetic and cultural evolutionary theory, and implications for the description and explanation of language in general. Language as a window on history: contact, migrations, the vocabulary of ancient institutions, and the cultural origins of grammar. (DR:4)
4 units, Aut (Fox) MW 1:15-3:05

ARCHEOLOGY AND BIOLOGICAL ANTHROPOLOGY

180. Seminar in Current Problems in Human Evolution—The current state of knowledge on the earliest stages of hominid evolution, particularly the Australopithicus and the emergence of the genus Homo. Students must present a detailed research paper and findings in a seminar format. Prerequisite: 80, or consent of the instructor.
5 units (Staff)

181. Evolutionary Anthropology—(Same as Human Biology 114.) Seminar on the relationship between genetic and cultural evolution in human populations. Reviews new works relating genes, culture, and human diversity, including sociobiology, cultural transmission theory, Darwinian culture theory, and co-evolution; emphasizes theory and supporting examples. Teams of students conduct original research projects and report to the class. Prerequisites: 2, the Human Biology Core, or consent of instructor.
4 units, Spr (Durham) TTh 7:30-9 p.m.

184. Archaeological Methods: Research Seminar—Methods of research and analysis of archaeological materials. Local stone tool materials serve as data within a class-developed research strategy. Data recording, computer entry, and statistical analysis are guided by instructor. Class produces a major report on prehistoric stone tool technology of Stanford area. Prerequisites: 3, 185, 187, or consent of instructor.
5 units (Rick)

187. Hunter-Gatherers in Archaeological Perspective—(Same as Human Biology 183.) The organization and subsistence of band-level hunter-gatherers as approached through archaeological investigations. Modern hunter-
gatherers provide background for prehistoric groups. The archaeological record of Africa, Europe, and the New World provides examples of how archaeological data reconstructs the cultural systems of extinct hunter-gatherers. (DR:5*)  
5 units (Rick)  
alternate years, given 1991-92

RESEARCH METHODS

190A,B. Data Analysis—Introduction to data analysis through theory and use of parametric and non-parametric statistics, emphasizing applications in anthropology. Training in the use of the computer for data analysis. Continuous enrollment through both quarters required for credit.  
5 units (G. Collier) given 1991-92

195. Museum Methods—Individually directed work on anthropology collections. Introduction to the computerized storage and retrieval system, cataloging, exhibit techniques. Can be taken for one or two quarters with consent of instructor.  
1-4 units (Rick, Staff) not given 1990-91

GRADUATE AND ADVANCED UNDERGRADUATE

203A,B,C. Culture and Power in Contemporary Mesoamerica—Focuses on indigenous peoples, examining their articulation in contemporary states in relation to ethnic consciousness and cultural processes. Limited enrollment, consent of instructor. Prerequisite: Spanish reading literacy.  
1-5 units, Aut, Win, Spr (G. Collier)

5 units, Win (Amin)

233. Subordination: Traditions of Thought and Experience—(Same as Law 423.) Explores daily life in subordinated communities and considers interactions with the legal system. Materials: interdisciplinary and theoretical writings, ethnographies, depictions in literature, and self-descriptions by members of subordinated communities.  
5 units, Aut (Rosaldo, Gordon) ThF 12:30-2

5 units, Win (Gibbs) T 2:15-4:05

239. Education and Sociocultural Change—(Same as Education 306C.) Models of cultural change are developed that stress the impact of abrupt changes in the conditions of life on the personal adaptations of individuals and local communities, brought about by modernization and urbanization. Education as an instrument of change and its intervention in the process of indigenous cultural transmission as an aspect of these processes. Case studies document and help build appropriate models. Students, in a seminar setting, apply the models developed to the analysis of third world and other relevant situations.  
3-5 units, Win (McDermott) MW 1:15-3:05

240. Marxisms, Feminisms, Postmodernisms—(Same as Feminist Studies 240.) Examines current debates in the social sciences and humanities by setting up a three-way conversation between different strands of Marxism, feminism, and postmodernism. Focuses on Marxist and feminist appropriations and critiques of postmodernism by examining the literature on, and by, marginalized and repressed groups. Questions of identity, location, voice, exploitation, and political strategy highlighted. Prerequisites: 244 and 262 (or equivalent course in feminist theory), or consent of instructors. Enrollment limited to 20 students.  
5 units, Spr (Gupta, Yanagisako)  
TTh 1:15-3:05

244. Family and Kinship Organization—(Same as Feminist Studies 144.) Seminar on the major issues anthropologists have confronted in studies of family and kinship. Competing theoretical perspectives are evaluated through an examination of descent, marriage, gender, domestic groups, and kinship change. Prerequisite: graduate standing in anthropology or consent of instructor.  
5 units, Win (Yanagisako) MW 10-11:50
Anthropology and History—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 (Rosaldo) not given 1990-91

Gender and Social Theory—(Same as Feminist Studies 248.) Seminar analyzes the ways in which gender figures in the work of a variety of "classical" and contemporary social theorists.

5 units (Delaney) alternate years, given 1991-92

Nutritional Problems of Developing Nations—(Same as Food Research 250, Human Biology 110.) Malnutrition syndromes common in developing countries, emphasizing protein-calorie malnutrition, nutritional anemias, and vitamin A deficiency. Infection as a contributor to malnutrition. Methods and techniques of nutritional assessment applicable for use in developing nations. Effects of malnutrition throughout the life cycle. Undergraduate prerequisite: Food Research 119 or its equivalent. Open to graduate students and seniors in Human Biology and Anthropology.

5 units, Spr (Martorell)

Issues in Cultural Studies—Focuses on the politics of identity and community. Broader topics include questions of nationalism, displaced nationalitp, and ethnicity. Interdisciplinary readings in cultural studies provide a theoretical context.

5 units, Win (Rosaldo)

Advanced Symbolic Anthropology—Symbolic Anthropology is an approach to the study of human society developed along with the concept of culture as a system of symbols and meanings, a system presumed to be embedded in and expressed by institutions, values, attitudes, structures of everyday life, and social action. The intellectual roots of this approach and some contemporary works motivated by it.

5 units, Spr (Delaney) T 3:15-6:05

Religion—Theory 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 (Rosaldo) given 1991-92

Advanced Political Anthropology—Seminar presenting principle theoretical approaches in the anthropological analyses of political structures and processes, including structural functionalism, action theory, and political economy. Topics: levels of political organization from the band to the state; consensus and conflict in political behavior; and analysis of power and political process in contemporary developing societies, especially peasant-state relations. Theoretical works, selected classic and recent monographs assess alternative analytical frameworks.

5 units (J. Collier) not given 1990-91

Ideology and Cultural Nationalism—Ideology understood in broad sense to encompass "folk" and "hegemonic" ideology. Problems and processes of creating and maintaining cultural identity at the national level in relation to post-colonial nations and to older, established nation-states. Interplay of "ethnicity" of minority groups with national integration. Emphasis on cultural/symbolic processes rather than institutional/structural processes.

5 units (Befu) given 1991-92

Topics in Political Economy—Introduction to selected themes in political economy, particularly approaches that derive from the work of Marx. Topics: the development and articulation of capitalism, imperialism, colonialism, dependency, world systems, state formation, domination, resistance and class consciousness, the nature of late capitalism, postmodernism, the political economy of race, popular culture and sport, and the discourse of development. Emphasis on ethnographic material that employs these theories to examine specific socio-historical contexts.

5 units, Win (Gupta) TTh 10-11:50

Advanced Ecological Anthropology—Seminar on role of ecological models in the analysis of culture and social systems. Major monographs review early efforts linking environments and social systems (multilinear evolution, neo-functionalism, adaptive radiation), and evaluate current theory and research trends. Case studies include social stratification in Polynesia, agricultural involution in Java, ritual regulation in New Guinea, acculturation and social change in Amazonia, demographic change in the Swiss Alps, and peasant ecology of Central America. Prerequisite: 164 or graduate standing.

5 units, Aut (Durham) TTh 1:15-3:05

Advanced Psychological Anthropology—Analysis of selected psychocultural processes and theory. Attention to group and individual adaptations to rapid cultural change and urbanization. Prerequisite: consent of instructor.

5 units, Win (G. and L. Spindler) MW 1:15-3:05

Cultural Transmission: Education in Cross-Cultural Perspective—(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 a cross-cultural perspective, the sequence of culturally constructed experiences in life careers, cultural analysis, and sensitization. Attention to education in the U.S. and other complex societies, as well as in non-literate cultures. (DR:5)

3-5 units, Win (G. and L. Spindler)

T 7-10 p.m.

273. Seminar in Advanced Medical Anthropology—For those who wish to develop their research interests in problems which require a collaborative medical-biological orientation and a social science approach. Students work on topics of their choice. Prerequisite: 168 or consent of instructor.

5 units (Barnett) given 1991-92

274. Readings in Linguistic Anthropology—(Same as Linguistics 269.) Workshop: reading and discussion of key monographs and articles on a specific topic or geographic area, or by a specific author, on the relationships between language and culture.

2 units (Fox) not given 1990-91

276. Advanced Cognitive Anthropology—Seminar on how people give meaning to behavior and other events they experience from the anthropological side of the intersection of anthropology, linguistics, cognitive psychology, and sociology. Presents a cross-cultural perspective on the relationships among knowledge, language, and social behavior.

5 units (McDermott) not given 1990-91

277. Linguistic Anthropology—(Same as Linguistics 255.) Seminar on language in its cultural context. Topics: similar to Anthropology 4 plus the roles of linguistic models in the social sciences and more thorough treatment of key terminological systems (e.g., kinship). Emphasis is on critical reading and discussion of landmark monographs and associated articles. The sequence of topics is motivated by the readings.

5 units, Win (Fox) TTh 1:15-3:05

278. Topics in Linguistic Anthropology—(Same as Linguistics 356.) Seminar on a key issue in the relationships between language and culture.

5 units (Fox) given 1991-92

279. Readings in Linguistic Anthropology—(Same as Linguistics 269.) Reading and discussion of a few monographs and articles on a specific topic or geographic area, or by a specific author, on the relationships between language and culture.

2 units (Fox) by arrangement

280. Training Seminar: Ethnography of Education—(Same as Education 280.) How to learn about culture and to analyze education-relevant situations such as the multicultural classroom. The cultural process is approached by (1) acquiring techniques of observation, interview, and interpretation of behavior in context, and soliciting and recording the “native” explanations of their own behavior; (2) developing an internally consistent conceptual structure that orients observation and elicitation productively; (3) being sensitized to one’s own culture and how it influences perception and interpretation of behavior. Selected techniques of ethnographic research applicable to the study of schooling are demonstrated and applied in modest field research projects. Writing of one research report or proposal for research.

5 units, Sum (G. and L. Spindler)

W 1:15-4:05


5 units, Aut (Wolf) TTh 9-10:50

291. History of Anthropology: The 20th Century—A comparative analysis of the development of social and cultural anthropology in France, Britain, and the U.S., focusing on the interplay between the development of anthropological theory, and the changing political and economic circumstances in which it developed.

5 units, Win (J. Collier) TTh 1:15-3:05

292. Dissertation Seminar—For graduate students in the process of writing dissertations and preparing for professional employment.

5 units, Aut, Win, Spr (J. Collier) by arrangement

293. Internship.

any quarter (Staff) by arrangement

294. Design of Field Research—Seminar treating research design and the research process, emphasizing the interrelation of theory and method. Also, problems of preparing dissertation proposals and applications for research grants. Prerequisite: consent of instructor. Limited enrollment.

5 units, Spr (G. Collier) TTh 3:15-5:05

295. First Year Paper.

Win, Spr (Befu) by arrangement

296. Research Apprenticeship—Supervised work with an individual faculty member on the student research project. May be taken for more than one quarter.

5 units, any quarter (Staff) by arrangement
297. Directed Individual Study—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

APPLIED PHYSICS

Emeriti: (Professors) Marvin Chodorow, C. Chapin Cutler, Theodore H. Geballe, W. Conyers Herring; (Professor of Research) H. John Shaw

Chairman: Walter A. Harrison


Associate Professor: Aharon Kapitulnik

Assistant Professor: Martin M. Fejer

Professors (Research): Bertram A. Auld, George S. Brown, Philip H. Scherrer, J. Gethyn Timothy, Helmut Wiedemann, Herman Winick

Courtesy Professor: Douglas D. Osheroff

Affiliated Professors: Gordon S. Kino (Electrical Engineering), Anthony E. Siegman (Electrical Engineering), William E. Spicer (Electrical Engineering)

Lecturer: John D. Fox

Acting Assistant Professor: Christopher P. J. Barty

Consulting Professors: Richard G. Brewer, Bernardo A. Huberman, Robert M. White

The program in Applied Physics offers to qualified students with backgrounds in physics or engineering the opportunity for graduate coursework and research in those areas of physics which may be relevant to technical applications, and to natural phenomena. These areas include condensed matter physics, 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 Solid State Electronics Laboratory, 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 1, 1991. 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 program from an engineering 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.

MASTER OF SCIENCE

The University’s basic requirements for the master’s degree are discussed in the “Degrees” section in this bulletin. The minimum requirements for the degree are 36 units, of which at least 30 units must be graduate level courses in applied physics, physics, engineering, and mathematics. The required program consists of the following:

1. Courses in physics and mathematics to overcome deficiencies, if any, in undergraduate preparation.

2. Basic graduate courses.
   a) Advanced Mechanics and Mathematical Physics: one quarter, 3 units; Physics 210 or approved alternative course.
   b) Electrodynamics: two quarters, 6 units; Physics 220, 221, Electrical Engineering 241, 242
   c) Quantum Mechanics: two quarters, 6 units; Physics 230, 231, 232, 330, 331, 332, 370, Electrical Engineering 324

3. Additional advanced courses in science and/or engineering but not including Directed Study (Applied Physics 290) to complete the requirement of 36 units.

4. A final overall average letter grade indicator of “B” is required for courses used to fulfill degree requirements.

There are no departmental or University examinations, and a thesis is not 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.
DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. (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 coursework, research, a departmental oral examination, a research progress report, a University oral examination, and a dissertation as follows:

1. **Coursework:**
   a) Courses in physics and mathematics to overcome deficiencies, if any, in undergraduate preparation.
   b) Basic graduate courses.
      1) Advanced Mechanics and Mathematical Physics—two quarters; Physics 210 for one quarter; choice of Applied Physics 315, Physics 211, 212, or Electrical Engineering 261 for the other quarter.
      2) Electrodynamics—two quarters; Physics 220, 221, Electrical Engineering 241, 242
      3) Quantum Mechanics—three quarters; Physics 230, 231, 232, 330, 331, 332, 370, Electrical Engineering 324
      4) Laboratory: one quarter; Applied Physics 207, 208, 301, 302, 304, 305, Physics 200, 201, Electrical Engineering 245, 357
e) 24 units of additional advanced courses in science and/or engineering, not including Directed Study (Applied Physics 290) and Dissertation Research (Applied Physics 390).
d) A final average overall letter grade indicator of "B" is required for courses used to fulfill degree requirements.

2. **Research:** May be conducted under the supervision of a member of the Applied Physics faculty, or appropriate faculty from other departments.

3. **Departmental Oral Examination:** Must be passed before the third year of graduate registration. The examination consists of a seminar on a suitable subject delivered by the student before the faculty academic advisor (or an approved substitute), the research advisor, and one other member of the faculty selected by the department. Passing of the examination, together with satisfactory academic and research work, qualifies the student to apply for Ph.D. candidacy.

4. **Research Progress Report:** Before the end of the Winter Quarter of the fourth year, the student arranges to give an oral research progress report of approximately 30 minutes, of which a minimum of 10 minutes should be devoted to questions from the Ph.D. reading committee.

5. **The University Ph.D. Oral Examination:** Consists 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.

**ASSISTANTSHIPS**

Research assistantships are available for Ph.D. candidates. Information on applying for financial aid is included in the admission packet received from the Graduate Admissions Office.

**COURSES**

3A. Breakthroughs and Inventions in Science and Technology—(Enroll under same title in Freshman-Sophomore Seminars.)
   Aut (Cutler)
   15. The Nature of the Universe—For undergraduates without scientific background. The structure, origin, and evolution of the universe and our growing knowledge of the objects which make up galaxies, stars, planets, etc. Discussion of some enigmas of modern astronomy, such as quasars, x-ray sources, black holes, and pulsars. Presentation is non-mathematical. (DR:7)
   3 units, Win (Staff) TTh 2:15-3:30, plus one hour discussion by arrangement

15A. Cosmic Horizons—(Enroll in Physics 15.)
   Spr (Bloom)
   20. From Klystrons to Lasers: The Stanford Connection—The development of coherent radiation from the early radio and klystron sources to masers and lasers. Operational principles of the laser at the elementary level with laboratory visits. Principles of laser operation that are critical to many of the applications of modern lasers. Introduces the science and non-science student to the world of physics, chemistry, biology, and medicine through the application of modern laser sources. (DR:8)
   3 units (Byer) alternate years, given 1991-92

25. Evolution of the Cosmos—Similar to 15A in its subject matter, but at a higher level; intended for more advanced students and students majoring in science or engineering. Origin and evolution of astronomical objects, planets, stars, galaxies, and the universe at large, emphasizing modern development in astronomy and elementary particle physics relevant to the subject...
matter. The development of life and position of intelligent beings in the universe. Algebra used. Recommended: high school physics and calculus. (DR:7)

3 units, Aut (Petrosian) TTh 11-12:15
discussion by arrangement

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. Individual observations with a 16-inch Cassegrainian telescope are supplemented by lectures/discussion of basic observational techniques, astronomical catalogs and coordinate systems, and the relation of observations to astrophysical models. Limited enrollment. (DR:7)

3 units, Aut, Sum (Walker) M 4:15
by arrangement

100. Introduction to Observational and Laboratory Astronomy—Introduction to observational techniques in astronomy for physical science or engineering students. 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 using the 16-inch telescope at the Stanford Student Observatory. Limited enrollment. Prerequisites: one year of physics or concurrent registration in Physics 25, 57, or 63; and consent of instructor. (DR:7)

4 units, Spr (Walker) M 3:15-5
lab by arrangement

160. 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. Prerequisites: calculus and one year of college physics at the level of the Physics 50 series or equivalent.

3 units, Aut (Staff)

161. Introduction to 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 physical processes in the first three minutes. Prerequisites: calculus and one year of college physics at the level of the Physics 50 series or equivalent.

3 units, Spr (Petrosian)
254 SCHOOL OF HUMANITIES AND SCIENCES

State and device research. Prerequisites: Math. 113 and 131, or equivalents.

3 units, Aut (Auld) MWF 10
alternate years, not given 1991-92

220, 221. Classical Electrodynamics—(Enroll in Physics 220, 221.)
220. 3 units, Aut (Susskind)
221. 3 units, Win (Susskind)

230. 3 units, Aut (Theodorakis)
231. 3 units, Win (Theodorakis)
232. 3 units, Spr (Theodorakis)

271. Electrical and Magnetic Properties of Solids—(Enroll in Electrical Engineering 238.)
3 units, Win (Spicer)

3 units, Spr (Harrison) MWF 10

3 units, Aut (Harrison) MWF 10

3 units, Win (Harrison) MWF 10

3 units, Spr (Kapitulnik) MWF 9

290. Directed Studies in Applied Physics—Special studies under the direction of a faculty member for which academic credit may properly be allowed. May include laboratory work or directed reading.
any quarter (Staff) by arrangement

301. Astrophysics Laboratory—Combined seminar/laboratory. Investigates the fundamental observational basis of physical models of astronomical objects. Observational component uses the 16-inch telescope at the Stanford Observatory and ancillary photometric and spectroscopic instrumentation. Emphasis 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, not given 1991-92

302. Condensed Matter Physics Laboratory—The physical phenomena in solid state and statistical physics via understanding the different materials in which they are observed. Students prepare materials, characterize them, and perform appropriate measurements. Topics: magnetism in insulators, nonlinear optical materials and fiber optics, ceramic superconductors, superconducting tunneling, nonequilibrium growth and fractal materials, metal/insulator transitions, and impurities in semiconductors. Techniques for synthesis include: thin-films deposition, crystal growth, fiber pulling, electrochemistry, ion implantation, and ceramic techniques. Physical measurements include: magnetization, resistivity, Hall effect, magnetoresistance, optical measurements, and computer analysis of thin film micrographs.
3 units (Kapitulnik) alternate years, given 1991-92

3 units, Win (Fejer)
vices provide the radiation required to explore the linear and nonlinear properties of matter. Experiments on modulation, harmonic generation, parametric oscillators, modelocking, stimulated Raman and Brillouin scattering, Coherent Anti-Stokes Scattering, other wave mixing interactions such as wavefront conjugation and optical bistability. Optical pumping and spectroscopy of atomic and molecular species. Limited enrollment. Prerequisites: 304, Electrical Engineering 231 and 232, or consent of instructor.

3 units, Spr (Fejer)

306. Guided Wave Optics Laboratory—Theory and practice of integrated optic and fiber optic waveguides. Lectures emphasize simple physical models of phenomena underlying practical applications. Detectors and sources, waveguide properties, characterization of waveguides, linear and nonlinear propagation effects, coupled mode theory, waveguide couplers, periodic structures, amplification, second and third order nonlinear phenomena, applications to communications, sensors, and nonlinear devices. Consent of instructor required.

3 units, Aut (Fejer) MWF 8

307. Microstructures Fabrication Laboratory—(Enroll in Electrical Engineering 357.)

3 units, Sum (Bloom, Khuri-Yakub)

308. Wave Measurement Techniques—(Enroll in Electrical Engineering 245.)

3 units, Spr (Kino)


3 units, Spr (Staff)

alternate years, not given 1991-92

312,313. Basic Plasma Physics I and II—For the non-specialist who needs a working knowledge of plasma physics for space science, astrophysics, fusion, or laser applications. Material includes orbit theory, the Boltzmann equation, fluid equations, MHD waves and instabilities, EM waves, the Vlasov theory of ES waves and instabilities including Landau damping and quasilinear theory, the Fokker-Planck equation, and relaxation processes. More advanced topics are resistive instabilities, collisionless shock waves, particle acceleration, and radiation processes. Prerequisites: Physics 210 and 220, or Electrical Engineering 356, or permission of the instructor.

alternate years, not given 1991-92

312. 3 units, Win (Sturrock)

313. 3 units, Spr (Sturrock)

314. Crystal Physics—A systematic development from a phenomenological viewpoint of the material properties of crystals; a background for research in crystals and their applications. Point, space, and magnetic symmetries. Reciprocal lattices and x-ray orientation. Tensor and matrix notation. Thermodynamic principles. Representation surfaces. Application to electric, magnetic, elastic, thermal, piezo, and optical properties of crystals. Prerequisite: Physics 172 or equivalent.

3 units (Auld)

alternate years, given 1991-92


3 units, Spr (Lathrop)

320. Quantum Optics and Selected Topics in Atomic Physics—(Enroll in Physics 320.)

3 units, alternate years, given 1991-92

321. Laser Spectroscopy—(Enroll in Physics 321.)

3 units, Aut (Levenson)

322. Bound States and High Precision Tests of QED and Electroweak Unification—(Enroll in Physics 322.)

3 units, Spr (Lynn)

alternate years, not given 1991-92

323. Applications of Quantum Theory—(Enroll in Electrical Engineering 324.)

3 units (Pantell)

alternate years, given 1991-92

324,325. Physics of Particle Accelerators—Introduction to beam dynamics in beam transport systems, accelerators, and storage rings: fun-
256  SCHOOL OF HUMANITIES AND SCIENCES


3 units (Staff)
alternate years, given 1991-92

326. Microwave Linear Accelerators—For students with a general interest in electron linear accelerators, in electron linacs for free electron lasers or in future colliders. Review of beam transport and emittance concepts, electron injection (guns, bunching, and capture); accelerating structures; survey of RF power sources; beam loading; introduction to impedance and wake potential concepts; instabilities (emittance growth and beam break-up).

3 units, Spr (Miller, Wilson)

330,331,332. Quantum Field Theory—(Enroll in Physics 330, 331, 332.)

330. 3 units, Aut (Lynn)
331. 3 units, Win (Lynn)
332. 3 units, Spr (Dimopoulos)

334. Superconducting Electronics—(Enroll in Electrical Engineering 334.)

3 units, Win (Beasley)

360. Stellar Physics—Astronomical data on stars and star clusters; classification, Hertz-Spring-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. Prerequisite: Physics 220 or equivalent, or consent of instructor. Recommended: Physics 132.

3 units (Petrosian)
alternate years, given 1991-92

365. Extragalactic Astrophysics and Cosmology—Basic observational data and theories of the structure and evolution of the universe, emphasizing the physical processes in the early phases of the big bang universe. Observational properties and theoretical models of galaxies and galaxy activity, and of quasars emphasizing nonthermal processes. Prerequisite: Physics 221 or equivalent.

3 units (Staff)
alternate years, not given 1991-92

370. Theory of Many-Particle Systems—(Enroll in Physics 370.)

3 units, Win (Doniach)

376. Phase Transitions and Critical Phenomena—(Enroll in Physics 376.)

3 units, Spr (Laughlin)
alternate years, not given 1991-92

380,381. Lasers I and II—(Enroll in Electrical Engineering 231, 232.)

380. 3 units, Aut (Staff)
381. 3 units, Win (Staff)

382. Introduction to Nonlinear Optics—(Enroll in Electrical Engineering 346.)

3 units, Spr (Harris)


3 units, Aut (Harris)
alternate years, not given 1991-92

384. The Fourier Transform and Its Applications—(Enroll in Electrical Engineering 261.)

3 units, Aut (Inan)
Win (Nishimura)
Spr (Gray)
385. Introduction to Fourier Optics—(Enroll in Electrical Engineering 366.)
3 units, Win (Hesselink)

386. Two Dimensional Imaging—(Enroll in Electrical Engineering 262.)
3 units, Win (Bracewell)

any quarter (Staff) by arrangement

400. Astrophysics Seminar—Discussion of current research and literature in astrophysics offered by faculty, students, and outside specialists.
1 unit, Aut, Win, Spr (Petrosian) Th 4

460. Astrophysics Seminar—Discussion of current research and literature in astrophysics offered by faculty, students, and outside specialists.
1 unit, Aut, Win, Spr (Petrosian) Th 4

463. Special Topics in Astrophysics—Research level discussions of current topics in astrophysics. Content varies each quarter and year, depending on the interests of staff and students. Course may be repeated. Offered on an occasional basis.

470. Condensed Matter Seminar—(Same as Electrical Engineering 320.) Discussion of current research and literature in condensed matter physics offered by faculty, students, and outside specialists.
1 unit, Aut, Win, Spr (Kapitulnik, Spicer) Th 4

473. Special Topics in Condensed Matter Physics—Research level discussions of current topics in condensed matter physics. Content varies each quarter and year, depending on the interests of staff and students. Course may be repeated. Offered on an occasional basis.

1 unit, Win (Huberman)

473B. Theories of High Temperature Superconductivity—Review of conventional electron-phonon mechanism and why it breaks down; spectroscopy of copper-oxide planes; electron-electron interactions, Hubbard and t-J models; mean field treatments—BCS, RVB, and flux phase solutions; model field theories; behavior of a hole in a half-filled band; spin and charge excitations at finite doping; transport properties in the normal state; relationship to exact solutions in one dimension; long range Coulomb forces and the superconductor-insulator transition.
3 units, Aut (Doniach) TTh 11-12:15

483. Current Topics in Optics and Electronics—Weekly presentations and discussions of current research topics in lasers, quantum electronics, optics, and photonics by faculty, students, and invited speakers.
1 unit, Aut Win, Spr (Staff) M 4:15

ART

Emeriti: (Professors) Keith Boyle, Lorenz Eitner, Michael Sullivan
Chair: Wanda M. Corn
Principal Advisor to Undergraduate Studio Majors: Kristina Branch
Principal Advisor to Undergraduate Art History Majors: Jody Maxmin
Chairman of Graduate Program in Studio Art: Nathan Oliveira
Chairman of Graduate Studies in Art History: Suzanne Lewis
Professors: Wanda M. Corn (American art), Elliot Eisner (Art Education), Albert Elsen (mid-19th/20th century European art, American art since 1940, on leave Autumn), Matthew S. Kahn (Design), John-David La Plante (Indian art), Suzanne Lewis (Medieval art), Frank Lobdell (Painting, on leave Spring), Dwight D. Miller (Baroque art, on leave Spring), Nathan Oliveira (Painting/Printmaking), Richard Randell (Sculpture), Paul V. Turner (Architectural History)
Associate Professors: Kristina Branch (Painting/Drawing), Michael Marrinan (18th-19th century European art, on leave 1990-91), Jody Maxmin (Ancient art), Melinda Takeuchi (Japanese art), Richard Vinograd (Chinese art)
Assistant Professor: Alessandro Nova (Renaissance art)
Associate Professor (Teaching): Charles Bigelow (Art and Computer Science)
Affiliated Professor: John H. Merryman (Art and Law)
Senior Lecturers: Joel Leivick (Photography), Laura Volkerding (Photography)
Visiting Faculty: Judith Bettelheim (Native American art), Graham Budgett (Sculpture), Ruth Kedar (Design), Larry Thomas (Printmaking), Jeffry Weisman (Design)

The department offers courses of study in two areas: (1) the history of art; and (2) the practice of drawing, painting, sculpture, design, printmaking, and photography. 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 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 visual perception of the formal and expressive means of art and to encourage insight into a variety of technical processes. The collection of the Stanford Museum and the exhibitions program of the Stanford
Gallery supplement the regular academic pro-
gram of the department.

**PROGRAMS OF STUDY**

Undergraduates may major in History of Art 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 History of Art and Studio (including Product Design).

**HISTORY OF ART**

**BACHELOR OF ARTS.**

The major program in the history of art must include the following:

1. Eight units from the following: Art 1, 2, 3, 4, 5, 10, 20, 21, 22.

2. Forty units in art history courses above the 100 level, including one seminar and one other 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: Asian, 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 Satisfactory/No Credit. University units earned by placement tests or advanced placement work in secondary school are not counted within the 48 units.

4. **Collateral Requirements:** Each undergraduate 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 for graduate school in Asian art should take first year Chinese or Japanese. Each undergraduate major shall also take two upper-division courses in other departments that relate to his or her work in art history. Students should discuss the choice of these courses with their advisors as early as possible. The advisor must approve the collateral courses before the student registers for them.

5. Undergraduate majors planning to take courses at an overseas campus must have each course approved by their advisor prior to leaving for the overseas campus.

6. Art majors are required to meet with both their advisor and the department's academic secretary during the first two weeks of each quarter to have coursework approved and to make certain they are meeting degree requirements. Failure to do so will result in the withholding of registration for that quarter.

7. **Recommended Courses** (but which do not count towards the major): Art 40, 50, or 53 and 70.

**HONORS PROGRAM**

The department offers a program leading to Honors in Art History. Students accepted into this program, in addition to completing all the requirements for the degree in art history and maintaining a 3.5 letter grade indicator, both in the major and overall, write a scholarly essay. Prior to applying to the program, students must have discussed their proposed course of study with their advisor. A proposal lacking a faculty sponsor is not considered. The application package consists of a 3-5 page proposal. In addition, a paper demonstrating the writing ability and intellectual capacity of the student must also be submitted to a faculty committee as early as the Winter Quarter, but no later than the third week of the Spring Quarter, of the junior year.

While working on the scholarly essay, the student registers for 8-12 units of Art 240, Individual Work: Art History. These units are in addition to the 48 required for the major. The student's advisor assigns grades for the academic units; the faculty committee will decide whether the student graduates with honors. While it normally takes three quarters to complete the work, the scholarly essay may be turned in as early as the Winter Quarter, but no later than the first day of Spring Quarter, of the senior year.

**MASTER OF ARTS**

The Department of Art offers the Master of Arts (A.M.) and the Ph.D. degrees. The Master of Arts is granted as a step toward fulfillment of requirements for the Ph.D. 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.

Completion of the University's requirements for a Bachelor of Arts degree in the History of Art, or equivalent training, is required of students entering a program of study for the Master of Arts. The entering student's required cur-
Curriculum is determined by a committee consisting of three members of the art history faculty. The process includes the evaluation of transcripts and records, and a meeting (scheduled during the week prior to the opening of Autumn Quarter) with the student to discuss course deficiencies.

**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-tuition quarters or the equivalent in partial-tuition quarters of graduate registration.
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 are also 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 Asian art are required to demonstrate competence in one Asian language (equivalent to three years of study) and reading knowledge of a second.
4. Submission for consideration by the faculty of two term papers from among those written during the year.
5. Demonstration to the faculty, by coursework 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. The following are departmental requirements:

**Admission to Candidacy**—A graduate student's progress is formally reviewed during Spring Quarter of the second year; by the end of Winter Quarter of the second year the applicant for candidacy must complete the requirements which govern the A.M. program in the History of Art (see above), and an additional 24 units. The graduate student does not become a formal candidate for the Ph.D. degree until he or she has fully satisfied these requirements and has been accepted as a candidate by the University Committee on Graduate Studies.

**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, at least two years of which must be in residence at Stanford.

**Dissertation Proposal**—Dissertation subjects are chosen in consultation with the candidate's advisor. A concise written statement of the topic and a plan of research for the doctoral thesis must be submitted to the art history faculty for approval at the end of the third year.

**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 student's field of study requires competence in Greek and Latin or a third European language, or in the languages, institutions, thought, and literature of Asia, the permitted collateral units for the Ph.D. in the History of Art will be increased, with the advisor's approval in each case, to 24 or 26 (excluding first year Chinese and Japanese).

**Graduate Student Teaching and Museum Work Experience**—As a required part of their training, all graduate students in art history, regardless of their source of funding, must assist with the department's teaching program or, on some occasions, with museum projects. Twenty hours of training per quarter is required beginning with the second quarter of the entering year through the end of the third year. Additional assignments requiring classroom teaching duties carry either 4 units of teaching course credit or supplementary funding. Students are informed of their quarterly assignments at the beginning of each quarter, after enrollments are determined.

**Dissertation**—A senior member of the department acts 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 the 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 the candidacy for the Ph.D. degree. A candidate taking more than five years must apply for an extension of candidacy.

**Oral Examination**—The oral examination consists mainly of a defense of the dissertation but may range, at the committee's discretion, over a wider field. The student is required to discuss research methods and findings at some length and to answer all questions and criticisms put by members of the examining committee. Changes, resulting from the committee's criticism of the manuscript and subsequent examination of the student's research during the orals, must be incorporated by the student into the final draft of the dissertation for submission to
the department as the final requirement for the granting of the Ph.D. degree in History of Art.

Ph.D. MINOR
For a minor in History of Art, 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, 50 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 1)
18 units of painting courses
12 or more units of the modern art series (Art 120A through 121B)
Total units required: 49

REQUIREMENTS FOR SCULPTURE
Art 40, 50 or 53, 60, 70
Art 140, 141, 142 (two quarters required)
18 units of sculpture courses
12 units of modern art series
Total units required: 50

REQUIREMENTS FOR MONOTYPE
Art 40, 50 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 concurrently with Art 145, Painting 1)
Art 145 and 146
18 units of monotype courses
Art 120A, 121A, and 122
Total units required: 59

REQUIREMENTS FOR DESIGN
Art 40, 50 or 53, 60, 70
Art I plus two additional art history courses
Mechanical Engineering 101 plus one other Mechanical Engineering course at or above the 101 level
Art 160, 161, 162, 164, 166, 167 (intermediate design)
Art 261, 268 (advanced design)
Art 140, 145, or 150 (one quarter required)
Total units required: 59

REQUIREMENTS FOR PHOTOGRAPHY
Art 40, 50 or 53, 60, 70
Art 140, 141, or 142 (one quarter required)
Art 148
15 units of photography courses
One or more units of the modern art series (Art 120A through 121B)
Total units required: 47

The above area requirements for a major are part of the total of 65 units. A major in studio may take Satisfactory/No Credit units in courses outside the 65 units required for the major area of interest.

Students are required to meet with both their advisor and the department's undergraduate curriculum advisor during the first two weeks of each quarter to have coursework approved and to make certain they are meeting degree requirements. Failure to do so will result in the withholding of registration for that quarter.

Overseas Campus Credit for Studio Art Courses—A minimum of 32 of the 65 units required for the studio art major must be taken at the Stanford campus. This allows a student to take art courses at an overseas campus, but still requires that the bulk of the work be done under the guidance of an advisor and an approved curriculum. In all cases, a student should meet with his or her advisor prior to planning an overseas campus program.

Transfer Credit Evaluation—Upon declaring a studio art major, a student transferring from another school must have his or her work evaluated by an Art Department advisor. A maximum of 13 transfer units are applied toward the 65 total units required for the studio art major. This allows a student to receive some credit for coursework completed elsewhere, but still requires that the bulk of the work be done under the guidance of an advisor and an approved curriculum. A student wishing to have more than 13 units applied toward the major must submit a petition to the advisor and then have his or her work reviewed by a studio committee.

MASTER OF FINE ARTS

Programs for the Master of Fine Arts degree are offered in painting, sculpture, photography, and product or graphic design.

Graduate Program in Painting, Sculpture, 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 close faculty supervision.

Admission—Admission to the Master of Fine Arts (M.F.A.) degree program is based on:
1. The equivalent of a Bachelor of Arts degree in Art at Stanford.
2. A letter grade indicator of "B-" in at least 65 units of undergraduate work in art.

3. Portfolio Specifications:
   a) Painting and Sculpture: Six or more slides of paintings or sculpture and six more of drawings. Send in a Kodak Universal carousel. No actual work is accepted.
   b) Photography: 12 or more photographs.
      All slides must be labeled with the applicant's name. An accompanying slide list must be included indicating the size, date, and medium of each work. If applicants want portfolios returned, a stamped self-addressed container must be included.

4. Applications and portfolios for the studio program must be submitted by January 1. Students accepted to the program are admitted for the beginning of the following Autumn Quarter. No applicants for mid-year entrance are considered.

Recommendation for the Degree—The requirements for the degree of M.F.A. in painting, sculpture, and photography are:
1. Completion of a minimum of two years (six full quarters) of graduate work in residence or its equivalent at Stanford.
2. Completion of 36 units of study. Students must discuss their programs of study with the department's Administrator for Programs to ensure that the most favorable registration arrangement is made.
3. Participation in a weekly seminar in which their work is criticized and discussed in detail.
4. As a part of the training for the M.F.A. degree, all students, regardless of their source of funding, are required to assist with the department's teaching program for the equivalent of eight hours per week over the period of six quarters; the percentage of work assigned in a given quarter is at the department's convenience.
5. Participation in the M.F.A. exhibition at the end of the second year.

The studio faculty reserves the right to make use of graduate paintings, sculpture, and photographs in exhibitions serving the interests of the graduate program.

Graduate students must remain in residence at Stanford for the duration of the program.

The Graduate Program in Design—Working jointly, the Departments of Art and Mechanical Engineering offer graduate degrees in product and visual design. A large new physical environment, the Design Yard, provides professional caliper studio space 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. The 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. 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—Admission to the M.F.A. degree program in design is based on:
1. The equivalent of a Bachelor of Arts degree in Art at this University.
2. A letter grade indicator of "B-" in at least 65 units of undergraduate work in art.
3. Portfolio Specifications: 12 or more slides or photographs of creative work. All slides must be labeled with the applicant's name; if a carousel is sent, an accompanying slide list must be included indicating the size, date, and medium of each work; otherwise, slides should be labeled with the same information and sent in the standard cardboard box received from processing. If applicants want portfolios returned, a stamped, self-addressed container must be included.

Recommendation for the Degree—The requirements for the degree of Master of Fine Arts in Design are:
1. Completion of a minimum of two years (six full quarters) of graduate work in residence or its equivalent at this University.
2. Completion in the first year of 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. Participation in a weekly seminar in which their work is criticized and discussed in detail.
4. As a part of their training for the Master of Fine Arts degree, all students, regardless of their source of funding, are required to assist with the department's teaching program for the equivalent of eight hours per week over the period of six quarters; the percentage of work assigned in a given quarter is at the department's convenience.

Graduate students must remain in residence at Stanford for the duration of the program.

ART EDUCATION

Complete information concerning the Master of Arts in Teaching, Doctor of Education and Doctor of Philosophy in Education, and Teaching
Credential (Single Subject-Secondary) degrees and programs may be secured from the Office of the Dean of the School of Education.

**COURSES**

**HISTORY OF ART**

**BASIC**

1. **Introduction to Art**—Introduction to the fundamental problems of meaning, form, and historical development in the visual arts, emphasizing architecture, sculpture, painting, and printmaking. (DR:2)
   4 units, Win (Eitner)

2. **Ideas and Forms in Asian Art**—The religious and philosophical ideas and social attitudes of India, China, and Japan and how they are expressed in the architecture, painting, sculpture of the Orient and in such art forms as garden design. (DR:2*)
   4 units, Win (Vinograd)

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, and general principles relevant to the study of architecture are examined. (DR:2)
   4 units (Turner) not given 1990-91

4. **Theme and Style in Japanese Art**—Survey of masterpieces of Japanese art from pre-history to the present, emphasizing the interplay between Japanese and Chinese cultural traditions. Material includes temples, castles, teahouses, painting, sculpture, garden design, and ceramics.
   4 units, Win (Takeuchi)

5. **Introduction to Ancient Art I**—Greek art of the Archaic and Early Classical periods. A selective survey of the development of Greek art from Protogeometric beginnings to the decades preceding the age of Pericles. (DR:2)
   4 units, Aut (Maxmin)

100A/200A. **Ancient Art I**—Greek art of the Archaic and Early Classical periods. A selective survey of the development of Greek art from Protogeometric beginnings to the decades preceding the age of Pericles. (DR:2*)
   4 units, Aut (La Plante)

100B/200B. **Ancient Art II**—Greek art of the Classical and Hellenistic periods, emphasizing the formation, in 5th-century Athens, of the classical ideal and its development and diffusion in the centuries that followed. (DR:2)
   4 units, Spr (Maxmin)

100C/200C. **Ancient Art III: Roman Art**—Introduction to the rich and varied art and architecture of Rome from the Etruscans to the Late Empire. (DR:2)
   4 units (Maxmin) not given 1990-91

100D/200D. **Ancient Art IV**—The art of metropolitan Athens, from the city's cultural awakening around 1000 B.C. to the Persian invasion in 480 B.C., with attention to the development of sculpture and painting in the 6th century.
   4 units (Maxmin) not given 1990-91

102/202. **Ancient Art V: Greek Vase Painting**—(Same as Classics 120.) Introduction to the study and appreciation of Greek vases and their painters, especially the masters of Athenian black and red-figure who flourished in the culturally rich and volatile era of the tyrants Peisistratos and his sons.
   4 units, Aut (Maxmin)

103/203. **Late Roman and Byzantine Empire**—Art and architecture from Constantine (4th century) to the Turkish conquest of Constantinople (1452). Artistic traditions (mosaics, icons, manuscript illumination) and building types centered on patterns of ideology and patronage in Rome, Ravenna, Istanbul, Mt. Sinai, the Balkans, and Sicily.
   4 units, Aut (Lewis)
ART 263

104/204. Early Middle Ages—Art and architecture in Western Europe from c. 700 to 1095, centered on the Celtic, Anglo-Saxon, Carolingian, Ottonian, and Spanish Mozarabic phases of hybrid cultural formation and the creation of such works as the Book of Kells, the Sutton Hoo treasure, and the plan of St. Gall. In a period of social upheaval and political fragmentation, new modes of visual discourse emerge, and remnants of the late classical tradition survive within larger ideological patterns of assimilation and change.

4 units (Lewis) not given 1990-91

105/205. Age of the Crusades—Romanesque art and architecture in Western Europe from c. 1095 to 1200 developed to meet the expansionist demands of such movements and events as the Crusades, the Pilgrimage Roads, the Norman Conquest, and 12th-century humanism in the schools. How spatial environments are built and systems of visual discourse are designed within the ideological contexts generated by monastic and feudal institutions in centers such as Cluny, Citeaux, Moissac, Mont Saint-Michel, Vézelay, Winchester, Canterbury, Durham, Santiago de Compostela, and Monreale.

4 units (Lewis) not given 1990-91

107/207. Age of Cathedrals—Gothic art and architecture in Western Europe from c. 1150 to 1500, viewed within the ideological framework of the new monarchical structuring of Church and State, the emerging towns and universities, the appearance of the Mendicant Orders, the rise of individualism and literacy, and the consequent shifts in patterns of art patronage and practice in Chartres, Paris, Bourges, Strasbourg, Canterbury, London, Oxford, and Cambridge.

4 units, Win (Lewis)

108/208. Age of Realism: 15th Century Netherlandish Painting—Rediscovery of the visual world in the art of the Limbourg brothers, Van Eyck, Campin, Van der Weyden, Van der Goes, Fouquet, and Bosch. Focuses on the shift from court patronage to enterpreneurial art markets and the new position of the artist in society, within the unstable ideological contexts of late medieval optimism, disillusionment, and premodern spiritual crisis on the Eve of the Reformation.

4 units (Lewis) not given 1990-91

110A/210A. The Origins of the Renaissance: Art and Architecture in Italy, 1200-1400—A survey of this crucial period of transition between the Middle Ages and the Renaissance: the passage from an oral to a written tradition; the foundation of the Mendicant Orders; the emergence of the middle-class and of the art market; the development of new architectural typologies (e.g., the civic centers of the new public administration) and of new art forms such as the altarpiece which derive from the liturgical requirements approved by the Fourth Lateran Council in 1215.

4 units, Aut (Nova)

110B/210B. Early Renaissance Art, 1400-1480—The principles and events of the Early Italian Renaissance. A study of method, iconographic conventions, symbolic images and meanings, patronage, and a critical analysis of the bibliography. Part I: Florence and Tuscany and the major role played by the International Gothic style. Part II: analysis of each area of the Italian peninsula, taking into account its history and political structure and showing how Italy's political fragmentation gave birth to different kinds of Renaissance.

4 units, Win (Nova)


4 units, Spr (Nova)

115A/215A. Artistic Culture in Italy During the 17th Century: Caravaggio, Bernini, Borromini, and their Contemporaries—Important developments in painting emphasizing Rome and Bologna; major trends of style and problems of iconography.

4 units (Miller) not given 1990-91

115B/215B. 17th-century Art in the Low Countries: The Age of Rubens and Rembrandt—Major artistic developments in the Low Countries during the 17th century focused on the great personalities and important episodes during this period. The artist's position in his society serves as the point of departure.

4 units, Aut (Miller)


4 units, Win (Miller)

116A/216A. Masterpieces and Monuments of the Baroque Age—

4 units (Miller) not given 1990-91

120A/220A. 18th Century Art in Europe, 1715-1780—A survey of the major developments in painting and sculpture on the continent from the death of Louis XIV to the eve of the French Revolution. Topics: the premises and social structure of the Rococo; its diffusion across Europe as a signature style of the ancien régime;
Enlightenment thought and the rationalization of vision; the impact of archaeology and anti-quetarianism; the development and implications of moralizing painting. Artists: the Tiepolos, Giordano, Batoni and Mengs; Ricci, Pellegrini and Thornhill; Gainsborough, Watteau and Boucher; Chardin and Longhi; Reynolds and West; Hogarth and Greuze; Vien and the early David. (DR:2)

4 units (Marrinan) not given 1990-91

120B/220B. Painting in the Age of Revolution, 1780-1830—A survey of painting in Europe during the French Revolution and its aftermath. Lectures to align ruptures in the traditions of representation with shifting social formations. Topics: antiquity, virtue and the imagery of revolution; the renunciation of Enlightenment rationalism; modern history and studio practice; literature, language, and representation; stylistic revivals as innovations; the end of History Painting. Artists: David and his students; Gros and the painters of Napoléon; Géricault; Blake. Fuseli and Goya; Turner and Constable; Fried-ich, Runge and the Nazarenes; Ingres and Delacroix. (DR:2)

4 units (Marrinan) not given 1990-91

120C/220C. Realism and Impressionism—The origins of Impressionism in mid-19th-century realist art and in the work of the Barbizon School. The masters of Impressionism, Monet and Re-noir, are dealt with in detail, as well as Manet and Degas, who shared some of the goals and interests without fully identifying themselves with Impressionism. (DR:2)

4 units, Win, (Eitner)

120D/220D. Alternatives to Impressionism: European Art, 1850-1900—Cezanne, VanGogh, Seurat, Gauguin, Symbolism, Lautrec, Ensor, Munch. (DR:2)

4 units (Elsen) not given 1990-91

121A/221A. 20th-Century European Painting, 1900-1920—Fauvism, Matisse, German and Austrian Expressionism, Picasso, and Cubism, Orphism, Futurism, and Abstraction. (DR:2)

4 units (Elsen) not given 1990-91

121B/221B. 20th-Century Painting, 1920-1960—Dada, Surrealism, and Abstract Expressionism. (DR:2)

4 units (Elsen) not given 1990-91

123/223. Rodin—The art of Rodin and its relation to the time in which he lived. Lectures are supplemented by sessions in the Museum and Cantor Rodin Sculpture Garden. (DR:2)

4 units (Elsen) not given 1990-91

123A/223A. The Golden Age of Modern European Sculpture, 1900-1940—The art of Rodin, Matisse, Brancusi, Picasso, Lipchitz, Gabo, Arp, Giacometti, Gonzalez, Moore and Calder. (DR:2)

4 units (Elsen) not given 1990-91

123B/223B. Modern Sculpture in America, 1945 to the Present—In addition to individual sculptors (Calder, Noguchi, Smith, Oldenberg, Segal and Christo), focus is on groups such as the Minimalists and environmental artists, and the emergence of modern public sculpture in the U.S. (DR:2)

4 units (Elsen) not given 1990-91

123C/223C. Modern Sculpture in Europe and America—A thematic approach that stresses the animating ideas and formal daring of the most important artists including Rodin, Matisse, Brancusi, Picasso, Lipchitz, Gabo, Arp, Giacometti, Moore, Gonzalez, Noguchi, D. Smith, Segal, Oldenberg, and Christo. Films, field trips, and use of the University's collections are planned. (DR:2)

4 units, Spr (Elsen)

124/224. Picasso—Lectures cover Picasso's work in all media. (DR:2)

4 units, Win (Elsen)

125/225A. 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. Traces the changes in style until the introduction of papermaking in the 16th century, which permitted the full bloom of the Moghul and Rajput schools of the 16th through the 18th centuries. (DR:2)

4 units, Win (La Plante)

125B/225B. The Art of India. (DR:2)

4 units, Win (La Plante)

125C/225C. The Art and Architecture of Mo-ghul India. (DR:2)

4 units (La Plante) not given 1990-91

126/226. Introduction to Chinese Art—Major themes and forms in Chinese art from the Neolithic period to the present. Architecture, ritual bronzes, sculpture, painting, calligraphy, and ceramics in their historical and cultural contexts. (DR:2)

4 units (Vinograd) not given 1990-91

126A/226A. Introduction to Chinese Painting—Overview of Chinese painting from the Han dynasty to the 20th century. Emphasis on the interplay of painting and art theory, the social and institutional contexts of painting, pictorial genres, and pivotal artists and styles. (DR:2)

4 units, Spr (Vinograd)

126B/226B. Early Chinese Pictorial Art—Major developments in the pictorial art of early Imperial China, Han through Sung dynasties. Emphasis on recent archaeological discoveries, the appearance of a theoretical and critical literature
for painting, and the diversity of functions and conceptions of painting in the Sung period.
4 units (Vinograd) not given 1990-91

126C/226C. Later Chinese Painting—Issues of style, theory, and interpretation in Chinese painting of the Yuan, Ming, and Ching dynasties. Focuses on the social and cultural environments of the literati, court artists, individualists, and urban painters of later Imperial China.
4 units (Vinograd) not given 1990-91

128A/228A. Ritual Bronzes of Ancient China.
4 units (La Plante) not given 1990-91

128B/228B. Chinese Ceramics.
4 units, Spr (La Plante)

128C/228C. Buddhist Art in Asia.
4 units (La Plante) not given 1990-91

128D/228D. Architecture and Gardens of Japan.
4 units (La Plante) not given 1990-91

128E/228E. Japanese Ceramics.
4 units (La Plante) not given 1990-91

129A/229A. Japanese Art from Prehistory to the Muromachi Period—Introduction to important historical developments in Japanese art from approximately 5000 B.C. through 1600 A.D.: the evolution of prehistoric ceramics, the great tombs and their contents, the introduction of Buddhism from China and its revolutionary impact on Japanese art and culture, the glittering arts of the age of courtly splendor, and the rise of samurai culture.
4 units (Takeuchi) not given 1990-91

129B/229B. Japanese Art of the Momoyama and Edo Periods—Survey of the highlights of Japanese art from the 16th to the 19th century: the mighty castles, fragile tea houses, magnificent gardens, and variety of modes of painting of the Japan's pre-modern era.
4 units, Spr (Takeuchi)

129C/229C. A Survey of Japanese Painting—Introduction to the richness and diversity of Japanese painting from the 8th century to the present.
4 units (Takeuchi) not given 1990-91

130A/230A. American Art and Culture in the Guided Age—Interdisciplinary study of the art, literature, patronage, and cultural institutions of the late 19th century. Covers aestheticism, conspicuous consumption, the grand tour, and the expatriate experience; also the period's great artists, collectors and tastemakers, and the symbolic importance of world fairs, and expositions. (DR: 2)
4 units, Spr (W. Corn)

130B/230B. Paris and New York: Transatlantic Exchange in Early Modernism—The artistic and cultural exchange between Paris and New York in the early decades of the 20th century. The Franco-American circles around Gertrude Stein, Alfred Stieglitz, and Walter Arensberg, and movements such as Cubism, Expressionism, and Dada. Enrollment limited to juniors and seniors. (DR: 2)
5 units (W. Corn) not given 1990-91

130C/230C. Culture in Crisis: American Art in the 1930s—The American artists' response to the Great Depression, to the New Deal, and to European fashion. Emphasis on the rise of the short-lived Regionalist movement, Depression era photography, New York modernism, government patronage of the arts, and the heated debates on culture and politics. (DR:2)
4 units (W. Corn) not given 1990-91

130D/230D. American Art after World War II—Contemporary art as it developed in New York and on the West Coast after the war. The Abstract Expressionists and Pop artists in New York, and the Assemblagists, Bay Area figurative, and Funk artists on the West Coast.
4 units (W. Corn) not given 1990-91

130E/230E. The Poet and the Artist in American Modernism—Interdisciplinary study of the friendships, exchanges, and common concerns of writers and artists in the early modern period. 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, A. Gelpi) not given 1990-91

131A/231A. Native American Art—Archaeological and historical survey of the traditional arts of Native American peoples. Film screenings, museum/gallery visits, and classroom discussions.
4 units, Spr (Bettelheim)

134. A History of Photography—A survey of the medium, from its pre-history in the Renaissance to the present. Discussions on the work of photographers who used available techniques to serve individual expression and the social and
scientific uses of photography through its history. Required readings are thematically directed.

4 units (Leivick) not given 1990-91


4 units, Aut (Turner)

175A,B/275A,B. Modern Architecture I, II—A two-quarter tracing of the 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. (DR:2)

4 units, Win, Spr (Turner)

176/276. American Architecture and Urbanism—The development of architecture and city planning in the U.S. since colonial times, concentrating on those characteristics and problems which are distinctively American. (DR:2)

4 units (Turner) not given 1990-91

190X. Reading in Art History—(Same as German 52C.) For students with a knowledge of German (one year or equivalent) who want to acquire German reading proficiency in art.

3-4 units (Staff) given 1991-92

ADVANCED UNDERGRADUATE AND GRADUATE

201. Colloquium: Pots and Politics in 6th-Century Athens—A study of certain 6th-century painters and the extent to which their work can be seen to reflect the history and political shenanigans of their age. Prerequisite: 100A or 102.

4 units, Spr (Maxmin)

206A. Seminar on Illuminated Manuscripts—Readings, discussion, and critical analyses centered on the production and consumption of the illustrated book in the Middle Ages within the framework of a textually generated concept of visual perception and experience. Explores a range of problematics: genres of texts, literacy and reader response, semiotics, pictorial exegesis, ownership and patronage, codicology, paleography, and the role of the artist vs. the designer of the book.

4 units, Aut (Lewis)

206B. Undergraduate Seminar on the Gothic Cathedral—Readings, discussion, and term project centered on the Gothic cathedral in the context of medieval culture and society. Questions of spatial design, engineering, economics, political ideology, and social and religious functions. Concentrates on Chartres, Notre-Dame in Paris, Bourges, Canterbury, and the special cases of Saint-Denis and Westminster Abbey.

4 units (Lewis) not given 1990-91

214A. Seminar: Mannerism.

4 units, Aut (Nova)

214B. Colloquium: Iconology, Astrology, and the Warburg Institute from Aby Warburg to the Present—The past and recent history of the London-based humanities institute named after the great German scholar, Aby Warburg. Students read and discuss books written by art and cultural historians associated with the institute: Saxl, Seznece, E. Panofsky, Yates, Gombrich and Baxandall.

4 units (Nova) not given 1990-91


4 units, Spr (Nova)

217. Connoisseurship in 17th-Century Italian Drawing.

4 units, Win (Miller)

218. Colloquium: 18th-Century European Artistic Culture in Italy and England—A study of some of the principal artifacts of 18th-century collecting, practical aesthetics, and fashions of taste.

4 units (Miller) not given 1990-91

219. Colloquium on Political Ideology in 17th-Century European Art in Court and Church—Monarchial eulogy and related political allegory; the art of religious propaganda of the age of the Counter-Reformation.

4 units, Aut (Miller)

219A. Colloquium: The Bolognese School of Painting, 16th-18th Centuries.

4 units (Miller) not given 1990-91

219B. Colloquium on the History of Printmaking.

4 units (Miller) not given 1990-91

221. Graduate Seminar: Problems in European Art c. 1800.

4 units (Eitner) not given 1990-91

221C. Seminar: Aspects of Realism in 19th-Century Painting.

4 units (Marrinan) not given 1990-91

221D. Undergraduate Colloquium: Construction of the 19th-Century Masterpiece.

4 units (Marrinan) not given 1990-91
223C. Seminar on Late 19th-Century Art: Rodin.
4 units (Elsen) not given 1990-91

223D. Colloquium: Modern Sculpture in Europe and America.
4 units (Elsen) not given 1990-91

224A. Seminar: Picasso—Prerequisites: 224 and consent of instructor.
4 units (Elsen) not given 1990-91

226E. Colloquium: Across Cultures—Encounters of Eastern and Western Art—Cross-cultural interactions and appropriations between the art of E. Asia, Europe, and America from the 16th century to the present. Artistic interchange in the context of culturally based attitudes toward visual representation, imagery, and the idea of the foreign.
4 units (Vinograd) not given 1990-91

226F. Colloquium: Psychological and Psychoanalytic Approaches to the Visual Arts—Issues of perception, illusions, representation, and interpretation presented in theory and as related to case studies of major monuments and artists.
4 units, Win (Vinograd)

227A. Seminar: Painting and Theory in the Sung Dynasty—Studies of the diverse social and institutional contexts of painting in the Five Dynasties and Sung periods, against the background of developing art theory and criticism. Court, Buddhist, and scholarly modes of painting are considered in relation to issues of representation, genre, evaluation, and program.
4 units (Vinograd) not given 1990-91

227B. Seminar: Studies on 18th- and 19th-Century Chinese Painting—Investigation of newly important pictorial genres, antiquarian and popular taste, and the changing social role of urban painters in 18th- and 19th-century Yangchou and Shanghai.
4 units, Aut (Vinograd)

4 units (Vinograd) not given 1990-91

4 units (Takeuchi) not given 1990-91

4 units, Aut (Takeuchi)

229H. Undergraduate Seminar: Silent Revolutionaries—The Nanga Painter of Japan—Chinese scholar-painting (Nanga), imported into Japan with Confucianism as part of the feudal regime’s ruthless program of legitimizing its power, had the unforeseen consequences of deeply undermining the social agenda of the shogunate. Examines the paintings and writings of these scholar-artists and investigates the ways in which they brought about the redefinition of the role of the artist, and of the individual, in the repressive social climate of 18th- and 19th-century Japan.
4 units (Takeuchi) not given 1990-91

231A. Undergraduate Seminar: Photographs as Historical Documents—(Same as History 230S.)
5 units (J. Corn, W. Corn)
not given 1990-91

233. 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. Enrollment limited.
4 units (W. Corn)

235. Seminar on Art Historical Methodology—Introduction to the major methods and approaches developed in the modern praxis of art history through discussion, and analysis of selected readings.
4 units (Lewis) not given 1990-91

235A. Seminar on Art History: Ideas and Ideology—Readings and discussion of contemporary art history and art criticism, dealing with the problematics of post-structuralism, feminism and culture, and the modern day “creative print” movement. Undergraduate colloquium.
4 units, Spr (Takeuchi)
issues of gender, the new Marxism, reception theory, semiotics, and deconstruction.

236. Art History Bibliography and Library Methods—Introduction to reference works and library techniques essential to the study of art history and architectural history. Sources of artistic, historical, and cultural information are covered in their printed and automated forms. Primarily for art history graduate students; upper-class undergraduate majors who plan to continue in art history on the graduate level may enroll with the consent of the instructor.

4 units (Bowen, Ross) not given 1990-91


4 units (Elsen) not given 1990-91

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; consumer protection and counterfeit art, etc. Restricted to graduate students in law, business, and art history. Undergraduate senior art history majors need approval of the instructor.

2-3 units, Win, Spr (Elsen, Merryman)

239. Colloquium: The Western Artist From Antiquity to 1900—Readings and discussion of important developments in the history of the artist's profession. For art history majors and graduate students.

4 units (Elsen) not given 1990-91

239A. Colloquium: The Western Artist in the 20th Century—Readings and discussion. Topics: the artist as a political and social critic, censorship, artists' rights, the art world, and self-imposed limits on artistic freedom. For art history majors or graduates students.

4 units (Elsen) not given 1990-91


any quarter (Staff) by arrangement

277. Seminar: Le Corbusier and Problems in Modern Architecture—Prior consent of instructor required.

4 units (Spr) (Turner)

278. Seminar: The Design of the American College Campus—Prior consent of instructor required.

4 units (Turner) not given 1990-91


4 units (Turner) not given 1990-91


4 units, Win (Stout, Turner)

295. Teaching and Professional Work Experience.

4 units, Aut, Win Spr (Staff) by arrangement


any quarter (Staff) by arrangement


any quarter (Staff) by arrangement

RELATED TOPICS

Topography and Monuments of Greece—(See Classics 108.)

Classical Athletics—(See Classics 14.)

PRACTICE OF ART

Students enrolled at the overseas campuses who wish to sign up for studio courses during advanced registration for the following quarter must send notification to the Art Department detailing course number and section for the classes in which they wish to register.

SPECIAL SEMINARS

These courses are designed for non-majors in studio art. No prerequisites.

14. Special Seminar in Drawing.

2 units, Aut, Win (Staff)

15. Special Seminar in Printmaking.

2 units


2 units, Spr (Staff)

17. Special Seminar in Photography.

2 units, Win (Staff)

BASIC

40. Basic Drawing—Basic drawing concepts introduced through charcoal.

3 units, Aut, Win, Spr (Staff)

50. Clay Modeling—The human head and figure. Class projects are concerned with modeling from life using historical and modern sources.

3 units, Aut, Win, Spr (Randell)

53. Constructed Art—Simple assembly techniques, welding, and metal fabrication are used to construct non-representational sculpture using wood, metal, plastic.

3 units, Aut, Win, Spr (Randell)
54. 3-D Fundamentals—With a sculptural emphasis, deals with basic principles of spatial design from the intimate to the environmental. Various formal "languages" of spatial organization (and their use as vehicles for meaning) are explored through studio and "extra-studio" practices, supported by illustrated presentations and demonstrations of basic construction models.

3 units, Win (Budgett)

60K,W. Basic Design—Introduction to visual language and media, and their applications to communication and environment. Two- and three-dimensional projects.

4 units, Aut, Win, Spr (Kahn, Weisman)

70. Photography I—Introduction to basic camera and laboratory techniques. Class lecture and discussion, viewing of slides, and field work. Viewing sessions in the Stanford Museum and Art Gallery scheduled according to current exhibitions. A 35mm camera is required.

4 units, Aut, Win, Spr (Leivick, Volkerding)

INTERMEDIATE


4 units, Aut (Katz)

140. Drawing I—Fundamentals of composition in black and white. Emphasis on the visual aspects of specific subjects which include still-life, model, landscape using charcoal, pencil, pen and ink, and pastel. Recommended as the beginning drawing class for studio art majors.

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, landscape and figure studies in oil paint with an emphasis on painting directly from life. 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.

3 units, Aut, Win, Spr (Staff)

147. Painting III—Advanced painting with emphasis on the individual point of view. Prerequisites: 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. Prerequisite: 40 or 140. May be repeated for credit.

3 units, Aut, Win, Spr (Staff)

148A. Introduction to Printmaking.

3 units, Aut (Thomas)

153. Recent Sculpture Concepts and Projects—Study and practice of the art of recent decades emphasizing current post-abstract procedures. Various materials and non-materials. Prerequisite: any one of 40, 50 or 53, 60 or 70.

3 units (Randell)

154. Sculpture for the Camera—Recent phenomenon of sculpture "constructed to be photographed," and the inversely related field of three-dimensional artwork which incorporates the photographic image through illustrated presentations, demonstrations, studio practice, and critique. Visual arts experience recommended, but only minimal photographic skills are necessary.

3 units, Win (Budgett)

160K,L. Design I: Intermediate Design—Comprehensive design assignments in diverse media, emphasizing the relationship between professional design problems and their underlying elements and procedures. Prerequisite: 60.

3 or more units, Aut, 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

162. Design III: Typographic Design—An introduction to typography, emphasizing the expressive use of type. Prerequisite: 161.

3 units
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, Aut (Weisman)

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 (Kedar)

167. **Metalsmithing**—Projects in jewelry and small, fine objects. Emphasis on design and craftsmanship in metal construction and lost wax casting. Prerequisite: 160.
4 or more units (Kahn) not given 1990-91

168A. **Introduction to Urban Design**—Urban design in theory and practice. Theoretical ideas of city form and image, from historical principles inherited from the cities of Western Europe to late 20th-century models exemplified by Los Angeles and the sunbelt cities. Case studies examine urban design examples, projects, and controversies in North America. Workshops on analysis of the image and physical characteristics of San Francisco neighborhoods. A 5-week term urban design problem summarizes principles discussed in the readings, seminars, and workshops.
5 units, Win (Gast)

168B. **Urban Design Studio**—A 10-week comprehensive urban and architectural design project taken from a current problem in San Francisco. A systematic understanding of the urban design process and problem solving methods. Graphic, diagrammatic, and other visual tools of analysis and communication are used in the study project. Recommended: Urban Studies 170. Enrollment limited to 14 students.
5 units, Spr (Gast)

169. **Professional Design Exploration**—Six to eight mature projects stimulated by weekly field trips into significant areas of design activity or need.
5 units (Kahn)

170. **Photography II**—Students individually pursue a topic of their own definition. Class sessions meet for individual and group critiques, lab demonstration, and discussions.
3 units, Win, Spr (Volkerding)

172. **Alternative Processes**—Concerned primarily with technical procedures and the uses of primitive and hand-made photographic emulations. Prerequisites: 70, 170, 270, or consent of instructor. Limited to 10 students; priority 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 (Leivick, Volkerding)

**ADVANCED UNDERGRADUATE AND GRADUATE**

241. **Advanced Drawing and Painting Criticism I**—Prerequisites: at least two quarters of painting or drawing; prior consent of instructor.
Aut, Win, Spr (Oliveira) by arrangement

242. **Advanced Drawing and Painting Criticism II**—Prerequisite: at least two quarters of painting or drawing; prior consent of instructor.
Aut, Win, Spr (Staff) by arrangement

243. **Advanced Drawing and Painting Criticism III**—Prerequisite: at least two quarters of painting or drawing; prior consent of instructor.
Aut, Win, Spr (Staff) by arrangement

244. **Advanced Drawing and Painting Criticism IV**—Prerequisite: at least two quarters of painting or drawing; prior consent of instructor.
Aut, Win, Spr (Branch) by arrangement

246. **Individual Work: Drawing and Painting**—Prerequisite: at least two quarters of painting or drawing; prior consent of instructor.
Aut, Win, Spr (Staff) by arrangement

248. **Advanced Monotype**—Continuation of monotype, dealing with advanced technical and aesthetic problems in the medium. Prerequisites: 148.
3 or more units, Aut, Win, Spr (Staff)

250. **Individual Work: Sculpture**—any quarter (Randell) by arrangement

260. **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. Class projects focus on producing a cohesive visual program of identity system. Prerequisites: any two design courses above 160.
3 or more units (Kedar)

262. **Advanced Design II: Graphic Organization**—Design experiences in visual communication through analytical approaches of visual
problem solving. Class projects developed as book or similar sequential formats.
3 or more units (Kedar)

268. Design Synthesis—Mature semi-elective problems in composite and multi-media design areas. Prerequisite: any two design courses above 160.
4 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 (Kahn)

270. Photography III.
Aut, Win, Spr (Leivick, Volkerding) by arrangement

271. Directed Advanced Photography: The View Camera, Its Uses and Techniques—Designed for the serious student of photography who wishes to gain greater control and refine skills in image-making. 4x5 view cameras are provided. Limited to eight students.
3 units, Aut (Volkerding) Win, Spr (Leivick)

any quarter (Leivick, Volkerding) by arrangement

272. Concepts of Text—(Same as Computer Science 273.) What every literate person should know about the basic principles of the visual organization of text. Subjects: handwriting, typewriting, typography, and computerized documents. Perceptual, linguistic, and semiological issues are discussed. Consists primarily of visual exercises.
3 units, Spr (Bigelow)

Aut, Win, Spr (Staff) 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 TOPICS

Visual Thinking—(See Mechanical Engineering 101.)

Human Values in Design—(See Mechanical Engineering 115A.)

Philosophy of Design—(See Mechanical Engineering 214.)

OVERSEAS STUDIES

The following courses are approved for the Art major and taught overseas at the campus indicated below. Students should discuss with their major advisors on campus which courses would best meet their educational needs. Course descriptions can be found in the “Overseas Section” section of this bulletin or in the Overseas Studies Program office, 126 Sweet Hall.

111A. Tuscan Art from Giotto to Leonardo—Florence. (DR:2)
4 units, Aut, Spr (Todorow)

111B. High Renaissance and Mannerism in Florence, Rome, and Venice—Florence. DR:2
4 units, Win (Todorow)

119X. Introduction to French Art: Romanesque to Renaissance—Tours. (DR:2)
4 units, Aut (Dufresne)

120X. New Ways of Seeing—Berlin. (DR:2)
4 units, Win (Neckenig)

123X. German Art in the Weimar Republic and the Nazi Period—Berlin. (DR:2)
4 units, Spr (Neckenig)

ASIAN LANGUAGES

Emeriti: (Professors) David S. Nivison, Frederic Spiegelberg
Chairman: Makoto Ueda
Professors: Albert E. Dien, Makoto Ueda, John C. Y. Wang (on leave Autumn)
Associate Professors: Thomas W. Hare, William A. Lyell, Susan K. Matisoff (on leave 1990-1991)
Assistant Professor: Steven Van Zoeren
Senior Lecturers: Kazuko M. Busbin, Yin Chuang, Hiroyasu Kubota, Kimie Nishimura Nebrig, Hiroshi Sakamoto, Dorothy Shou
Lecturers: Fumiko Arao, Young-Mee Cho, Yu-hwa Liao Rozelle
Visiting Professor: Dexi Zhu
Visiting Assistant Professors: Sharalyn Orbaugh (Winter and Spring), Misato Tokunaga (Autumn), Youqin Wang
Visiting Lecturer: Noriko Komatsu

Chinese-Japanese Language and Area Studies Faculty

Professors: Masahiko Aoki (Economics), Harumi Befu (Anthropology), Albert E. Dien (Asian Languages), Peter Duus (History), Harold L. Kahn (History), John D. La Plante (Art), Lawrence Lau (Economics), John W. Lewis (Political Science), Jeffrey Mass (History), Makoto Ueda (Asian Languages), Lyman P. Van Slyke (History), John C. Y. Wang (Asian Languages), Arthur P. Wolf (Anthropology), Lee H. Yearly (Religious Studies)
Associate Professors: Carl W. Bielefeldt (Religious Studies), Bernard Faure (Religious Studies), Thomas W. Hare (Asian Languages),
William A. Lyell (Asian Languages), Susan K. Matisoff (Asian Languages, on leave 1990-91), Daniel I. Okimoto (Political Science), Melinda Takeuchi (Art), Richard Vinograd (Art)

Assistant Professors: Nina Halpern (Political Science), James E. Ketelaar (History), David Palumbo-Liu (Comparative Literature), William J. Poser (Linguistics), Peter Sells (Linguistics), Steven Van Zoeren (Asian Languages)

Professor (Research): Thomas P. Rohlen (Anthropology, on leave Winter and Spring)

Senior Lecturers: Kazuko M. Busbin (Asian Languages), Yin Chuang, Hiroyasu Kubota (Asian Languages), Kimie Nishimura Nebrig, Hiroshi Sakamoto, Dorothy Shou (Asian Languages)

Lecturers: Fumiko Arao (Asian Languages), Young-Mee Cho (Asian Languages), Russell Kirkland (Religious Studies), Yu-hwa Liao Rozelle (Asian Languages)

Acting Assistant Professor: Philip J. Ivanhoe (Religious Studies)

Visiting Assistant Professor: Youqin Wang (Asian Languages)

Visiting Lecturer: Noriko Komatsu

The Department of Asian Languages offers courses in the languages, cultures, and literatures of China, Japan, and Korea. The department accepts candidates for the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy in Chinese or Japanese. It also offers a minor in Chinese or Japanese language and literature for the degree of Doctor of Philosophy.

For information concerning other opportunities for study in the Asian field, see listings under the following departments and programs: Anthropology, Art, Business, Comparative Literature, East Asian Studies, Economics, Humanities Special Programs, History, Law, Linguistics, Philosophy, Political Science, Religious Studies, and Sociology. Students interested in Asian languages not listed should contact the Special Language Program, Department of Linguistics.

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 with a letter grade indicator of "C" or better:

1. Concentrations in Chinese: Asian Languages 91, Chinese 113, Asian Languages 131, 132, 133, and four other content courses dealing with China at the 100 level, as approved by the Undergraduate Advisor.

2. Concentrations in Japanese: Asian Languages 92, Japanese 103, and seven other content courses dealing with Japan at the 100 level, as approved by the Undergraduate Advisor. At least two of these courses must be selected from the sequence 135, 136, 137, 138.

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

Majors with an overall letter-grade indicator 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 begins in the Spring Quarter of the junior year, and for the first two quarters takes the form of directed reading with the chosen supervisor; the finished essay (normally about 15,000 words) is submitted to the committee no later than the end of the Winter Quarter in the senior year. From 10 to 15 units of credit are granted for the finished thesis.

COTERMINAL PROGRAMS

Students may elect to combine programs for the A.B. and A.M. degrees in Chinese or Japanese. For details, see the "Degrees" section of this bulletin.

EAST ASIAN STUDIES

THEME HOUSE

EAST House, located at Governor's Corner on campus, is an undergraduate residence which houses 60 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.

SUMMER PROGRAM OF INTENSIVE LANGUAGE COURSES

A nine-week program, which begins at the same time as the University's general summer program and continues one week 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 and 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.

GRADUATE PROGRAMS

ADMISSION

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 of 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 (pre-modern), Chinese linguistics, Chinese literature, Chinese philosophy, Japanese cultural history, Japanese literature.

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 the first year of graduate study at the Taipei or Yokohama centers 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, including a 36-unit minimum requirement, are given in the "Degrees" section in this bulletin. Departmental requirements are set forth below.

CHINESE

The candidate must:

1. Meet the department's requirements for the Bachelor of Arts in Chinese or their equivalent.

2. Complete the following coursework: 103, 201, 202, 221, 222, 223, 299; four courses in Chinese numbered between 230 and 273; 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.

JAPANESE

The candidate must:

1. Meet the department's requirements for the Bachelor of Arts in Japanese or their equivalent.

2. Complete the following coursework: 201, 202, 211-213 or 221-223, 246, 247, 248, 299; four courses in Japanese numbered between 256 and 298; 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 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 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 Ph.D. are given in the "Degrees" section in this bulletin. Departmental requirements are set forth below.

ADMISSION TO CANDIDACY

Students admitted with an A.B. only are evaluated by the graduate faculty during the Autumn Quarter of their second year at Stanford. The evaluation is 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 formally decides 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 takes place in the Spring Quarter of the student's first year. If a student goes to the Taipei or Yokohama centers during
his or her first two years, the department will consider an extension for admission to candidacy. The timing of the evaluation of a student admitted with an A.M. in Asian Studies is 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.

REQUIREMENTS
A candidate must fulfill the following requirements:

1. Demonstrate a reading knowledge of French, German, or another European language approved by the Graduate Advisor before completing the A.M. degree.

2. Complete two seminars at the 300 level. These seminars must be in different subjects.

3. Pass an examination in the supporting Asian language. A candidate whose field is Chinese is 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 is 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. Pass a set of four comprehensive written examinations. One of these tests the candidate's methodological competence in a discipline. The remaining three fields are 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, Chinese anthropology, Japanese literature, Japanese history, Japanese religion, Japanese art, and Japanese anthropology.

University Oral Examination—General regulations governing the oral examination are found in the "Degrees" section in this bulletin. The candidate is examined on questions related to the dissertation, after acceptable parts thereof have been completed in draft form.

Dissertation—The candidate writes a dissertation demonstrating ability to undertake original research based on primary materials in Chinese or Japanese.

Ph.D. MINOR
A student taking a minor in Asian language must complete at least 30 units of work within the department at the 200 and 300 level, chosen in consultation with a departmental advisor. The student must elect either Chinese 201-202 or Japanese 201-202 unless the department is satisfied that work done elsewhere has provided similar training. The student must also pass a written examination in the Chinese or Japanese language.

SPECIAL PROGRAMS
Properly qualified students may plan special interdepartmental programs in the Asian field for the degree of Doctor of Philosophy. See the "Graduate Division Special Programs" section in this bulletin.

STUDYING ABROAD
Students interested in a serious study of Japanese language, history, culture, and social organization can apply to the Kyoto Center for Japanese Studies (KCJS), a September-to-April program managed by Stanford which includes students from eight other American universities. In addition, in Spring Quarter, the Stanford Center in Technology and Innovation (SCTI), also in Kyoto, focuses on Japanese technology and the political economy of research, development, and production of high technology and advanced industries, followed by a two-to-three month internship in an agency, firm, or laboratory in Japan. For information about either program, students should contact the Overseas Studies Office in Sweet Hall.

Attention is called to the programs of the Inter-University Program for Chinese Language Studies in Taipei and the Inter-University Center for Japanese Studies located in Yokohama (both of which are administered by Stanford University). See the "The Institute of International Studies" section in this bulletin.

Special attention is called to the exchange program established with the Chinese Department at Peking University in Beijing. Those interested in the program should consult the chairman of the department early in the academic year.

COURSES
Since unavoidable changes occasionally have to be made in course offerings after Courses and Degrees has gone to print, students are advised to consult the department each quarter.
GENERAL

These courses are open to all undergraduates and graduate students, are taught in English, and do not require a knowledge of an Asian language.

46. Introduction to Chinese Thought—(Same as Philosophy 46, Religious Studies 55.) Religious and philosophical thought of early China, especially the "Classical" period, 550 B.C.-200 B.C. Development of Chinese thought as an extended dialogue among various thinkers who provided uncommon and often contradictory answers to a common set of problems. Limited enrollment. (DR:3*)

4 units, Aut (Ivanhoe) MWF 10
plus section by arrangement

50. The Japanese Language—(Same as Linguistics 62.) Introduction to the Japanese language in terms of its linguistic characteristics, historical development, and cultural context. For students learning Japanese and wishing to gain background information about it.

3 units, Aut (Tokunaga) MW 10

91. Traditional East Asian Civilization: China—Introduction to Chinese culture in a historical context. (DR:2*)

5 units, Aut (Van Zoeren) MWThF 11

92. Traditional East Asian Civilization: Japan—Introduction to traditional Japanese culture, emphasizing the relation between intellectual currents and the arts from the 8th-18th centuries. (DR:5*)

5 units, Win (Hare) MWThF 10

131. Chinese Poetry in Translation—Readings in traditional poetry and poetics emphasizing genre, theme, and style. (DR:2*)

4 units, Aut (Van Zoeren) TTh 1:15-2:30

132. Chinese Fiction and Drama in Translation—A survey of fiction and drama from early times to the 19th century, emphasizing literary and thematic discussions of major representative works available in English translation. (DR:2*)

4 units, Win (Wang) MWThF 11

133. Modern Chinese Literature in Translation—Readings in representative 20th-century works of fiction, drama, and poetry. (DR:2*)

4 units, Spr (Lyell) MWThF 11

135. Japanese Drama in Translation—The development of drama from early religious ritual forms through noh, puppet theater, and kabuki. Plays are analyzed as dramatic literature and in terms of performance. Video tapes and short films supplement lectures. (DR:2*)

4 units (Matisoff) not given 1990-91


4 units (Staff) not given 1990-91

137. Japanese Fiction in Translation—Introduction to major works of prose narrative from pre-modern Japan (7th through mid-19th centuries), read in English translation, emphasizing the historical, intellectual, and cultural context in which they were written. Works vary each year; course may be repeated for credit with the instructor's permission. (DR:2*)

4 units, Aut (Hare) MWThF 10

138. Modern Japanese Literature in Translation—Introduction to Japanese poetry, drama, and fiction since 1868. Authors: Tanizaki, Kawabata, Mishima, etc. Knowledge of pre-modern Japanese literature not required. (DR:2*)

4 units, Spr (Orbaugh) TTh 11-12:15

145. Popular Literature in Postwar Japan—Japanese literature in translation in the contemporary social and cultural context. Works include recent best-sellers, detective fiction, and comics. Emphasis on understanding and challenging distinctions between pure and popular literature in Japan and the U.S.

4 units, Win (Staff) M 3:15, W 3:15-5:05

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*)

4-5 units, Spr (Dien) MTWThF 1:15

153. Science and Technology in Traditional China—(Same as History 193, History of Science 153.) The technological achievements and scientific undertakings of traditional China and the ideological and social factors which aided or hindered such enterprises. (DR:5*)

5 units (Dien) given 1991-92

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. (DR:5*)

5 units, Aut (Dien, Kahn) MTWThF 11

169. A Question of Nature: The Lyric in Classical China and the English Romantic Age—(Same as English 169C, Comparative Literature 169C.) Comparison of the uses of nature as constitutive of lyric voice. How do poets from these varied traditions see themselves in, and through, their idea of Nature?

5 units, Win (Palumbo-Liu) MW 11-12:30

181. Japanese Women Writers—The 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 read in translation. (DR:2*)

4 units (Matisoff) not given 1990-91


3 units (Ueda) not given 1990-91

CHINESE

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 Chinese before entering Stanford.

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 (Shou) MTWThF 9, 10, 11, or 1:15
2. 5 units, Win (Shou) MTWThF 9, 10, 11, or 1:15
3. 5 units, Spr (Shou) MTWThF 9, 10, 11, or 1:15

1B,2B,3B. First-Year Modern Chinese for Bilingual Students—For students with elementary comprehension and speaking skills, but lacking knowledge of grammar, reading, and writing Chinese characters. Equivalent to 1, 2, 3.

1B. 3 units, Aut (Wang) MWF 2:15
2B. 3 units, Win (Wang) MWF 2:15
3B. 3 units, Spr (Wang) MWF 2:15

5. Intensive First-Year Modern Chinese—Equivalent to 1, 2, and 3 combined.

12 units, Sum (Staff) MTWThF 8-12

7.8. Beginning Conversational Chinese—A two-quarter sequence to equip students with basic language skills in Mandarin to function abroad.

7. 2 units, Win (Yin) TTh 2:15
8. 2 units, Spr (Yin) TTh 2:15

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 or 1:15
22. 5 units, Win (Chuang) MTWThF 9 or 1:15
23. 5 units, Spr (Chuang) MTWThF 9 or 1:15

21B,22B,23B. Second-Year Modern Chinese for Bilingual Students—For students with advanced comprehension and speaking skills, but lacking equivalent knowledge of grammar, reading, and writing Chinese characters. Equivalent to 21, 22, 23.

21B. 3 units, Aut (Wang) MWF 3:15
22B. 3 units, Win (Wang) MWF 3:15
23B. 3 units, Spr (Wang) MWF 3:15

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 Chinese Conversation—Prerequisite: 3 or consent of instructor.

27. 2 units, Aut (Shou) TTh 2:15
28. 2 units, Win (Shou) TTh 2:15
29. 2 units, Spr (Shou) TTh 2:15

51. Chinese Calligraphy—Practice in writing Chinese characters with a brush and learning different scripts. Limited enrollment. Prerequisite: 3 or equivalent.

1-2 units, Spr (Chuang) TTh 1:15

ADVANCED

101,102,103. Third-Year Chinese (Modern)—Introduction (using annotated texts) to newspapers, documents, and belles-lettres. Prerequisite: 22 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: 22 or equivalent.

12 units, Sum (Staff) MTWThF 8-12

111,112,113. Third-Year Chinese (Classical)—Prerequisite: 23 or equivalent.

111. 5 units, Aut (Zhu) TTh 2:15-4:05
112. 5 units, Win (Zhu) TTh 2:15-4:05
113. 5 units, Spr (Wang) TTh 2:15-4:05

121,122,123. Advanced Chinese 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. 3 units, Aut (Staff) by arrangement
132. 3 units, Win (Staff) by arrangement
133. 3 units, Spr (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 by arrangement, 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

211, 212, 213. Advanced Modern Chinese—A year-long sequence designed to help students become functional speakers, readers, and writers of modern Chinese through articles and essays from newspapers, magazines, and scholarly journals. Frequent opportunities for oral presentations will reflect the students' interests and form the basis of papers. Appropriate for non-majors and individuals with language experience overseas. Prerequisite: minimum three years of Chinese language training.

211. 5 units, Aut (Staff) by arrangement
212. 5 units, Win (Staff) by arrangement
213. 5 units, Spr (Staff) by arrangement

221, 222, 223. Advanced Classical Chinese—Prerequisite: 113 or equivalent.

221. Philosophical Texts.

5 units, Aut (Ivanhoe) MWF 1:15
222. Historical Narration.

5 units, Win (Dien) MWF 1:15
223. Literary Essays.

5 units, Spr (Van Zoeren) MWF 1:15

230. Interpreting Confucian Texts—(Same as Religious Studies 212.) Illustrates critical importance of historical and philosophical issues to the task of interpretation. Seminar, pace and range determined by constituents. Prerequisite: consent of instructor.

5 units, Win (Ivanhoe) TTh 2:15-4:05

231. Neo-Confucianism—(Same as Religious Studies 119A.) Introduction to later Confucian thought as represented in the Song through Qing dynasties. Brief introduction to Buddhist concepts which provided some of the theoretical foundations for the reinterpretation of Confucian thought in its later phase of development. The thought of Cheng Hao, Cheng Yi, Juxi, Wang Yangming, Dai Zhen and Zhang Xuecheng. Prerequisite: Religious Studies 55 or consent of instructor.

3 units, Win (Ivanhoe) MW 9

241, 242, 243. Modern Chinese Literature—The short story, essay, and novel introduced through original and annotated texts.

241. The Short Story.

5 units, Aut (Lyell) MWF 1:15

5 units, Win (Chuang) MWF 11
243. The Novel.

5 units, Spr (Lyell) MWF 11

255. Literary History and Methodology—Selected readings and discussion of modern Chinese literary history (1918-1949), Western literary theory, and the art of translation. Students write on literary history or methodology and complete a critical translation of a short story or chapter from a novel.

5 units (Lyell) given 1991-92

260. Introduction to Chinese Poetry—Introduction to the basic assumptions, techniques, and genres of Chinese poetry. Prerequisites: 223 or consent of instructor.

4 units (Van Zoeren) not given 1990-91

261. Shih-ching and Ch'u-tz'u—Selected readings in the two earliest anthologies of Chinese poetry. Prerequisite: 260 or consent of instructor.

4 units (Van Zoeren) not given 1990-91

263. Lyric (shih) I—Selected readings in the early history of the lyric (shih), Han through Sui dynasties. Prerequisite: 260 or consent of instructor.

4 units, Spr (Van Zoeren) TTh 1:15-2:30

264. Lyric (shih) II—Selected readings in the T'ang dynasty lyric (shih). Prerequisite: 260 or consent of instructor.

4 units (Van Zoeren) not given 1990-91

266. Songs and san-ch'u—Selected readings of songs (tz'u) and san-ch'ü, Tang through Ming. Prerequisite: 260 or consent of instructor.

4 units (Van Zoeren) not given 1990-91

271. Traditional Chinese Fiction—Selected readings in short stories and longer works of fiction from early times to Ch'ing. Prerequisite: 113 or consent of instructor.

4 units, Spr (Wang) TTh 11-12:15

273. Chinese Drama—Selected readings in dramatic works of the Yuan, Ming, and Ch'ing periods emphasizing literary, not theatrical qualities. Prerequisite: 113 or consent of instructor.

4 units (Wang) not given 1990-91

291. The Structure of Modern Chinese—(Same as Linguistics 291.) Overview of the grammatical properties of the Chinese language, with emphasis on Chinese syntax. Prerequisite: consent
of instructor. Recommended: some background in linguistics and knowledge of Chinese.
4 units, Spr (Zhu)

299. Master's Thesis or Translation—A total of 5 units taken in one or more quarters.
Aut, Win, Spr (Staff) by arrangement

334. Seminar in Modern Chinese Literature—May be repeated for credit. Prerequisite: 243 or consent of instructor.
5 units (Lyell) not given 1990-91

371. Seminar in Chinese Narrative—Readings in traditional Chinese commentaries vis-a-vis relevant individual texts and current theories of narrative in the West. Prerequisite: 271 or consent of instructor.
5 units (Wang) not given 1990-91

1-12 units, Aut, Win, Spr, Sum (Staff) by arrangement

400. Advanced Language Training—Open only to students in the Taipei Program. For more information, see the "Inter-University Program for Chinese Language Studies in Taipei" section in this bulletin. Offered on a Satisfactory/No Credit basis.
15 units per quarter (Staff)

JAPANESE

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 Japanese before entering Stanford.

1, 2, 3. First-Year Modern Japanese—Basic conversation, grammar, reading, elementary composition. Daily sections may be set at the beginning of the quarter to suit schedule requirements.
1. 5 units, Aut (Sakamoto, Staff)
MTWThF 9, 10, 11, or 1:15
2. 5 units, Win (Sakamoto, Staff)
MTWThF 9, 10, 11, or 1:15
3. 5 units, Spr (Sakamoto, Staff)
MTWThF 9, 10, 11, or 1:15

5. Intensive First-Year Modern Japanese— Equivalent to 1, 2, and 3 combined.
12 units, Sum (Staff) MTWThF 8-12

7/107. 3 units, Aut (Busbin) MWF 9 or 10
8/108. 3 units, Win (Busbin) MWF 9 or 10
9/109. 3 units, Spr (Busbin) MWF 9 or 10

17/117, 18/118, 19/119. Second-Year Japanese for Professionals—Continuation of 7, 8, 9 to build functional language skills.
17/117. 3 units, Aut (Busbin) MWF 11
18/118. 3 units, Win (Busbin) MWF 11
19/119. 3 units, Spr (Busbin) MWF 11

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 (Nebrig, Staff)
MTWThF 9, 11, or 1:15
22. 5 units, Win (Nebrig, Staff)
MTWThF 9, 11, or 1:15
23. 5 units, Spr (Nebrig, Staff)
MTWThF 9, 11, or 1:15

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. Intermediate Japanese Conversation—Development of oral proficiency through practice of simple sentence patterns, use of audiotapes, oral presentations, vocabulary building exercises, discussions. Sequence course. Prerequisite: 3 or consent of instructor.
27. 2 units, Aut (Kubota) TTh 1:15 or 2:15
28. 2 units, Win (Kubota) TTh 1:15 or 2:15
29. 2 units, Spr (Kubota) TTh 1:15 or 2:15

ADVANCED

101, 102, 103. Third-Year Modern Japanese—Conducted entirely in Japanese. Designed to achieve high level of proficiency in written and oral Japanese. Representative styles of modern writing read and analyzed. Short writing assignments focus on fine grammar points, idiomatic usage, advanced vocabulary. Sequence course. Prerequisite: 23 or equivalent.
101. 5 units, Aut (Kubota) MWF 11-12:20
102. 5 units, Win (Kubota) MWF 11-12:20
103. 5 units, Spr (Kubota) MWF 11-12:20

105. Intensive Third-Year Modern Japanese—Equivalent to 101, 102, and 103 combined. Prerequisite: 23 or equivalent.
12 units, Sum (Staff) MTWThF 8-12

111. 3 units, Aut (Kubota) MW 2:15-3:30
112. 3 units, Win (Kubota) MW 2:15-3:30
113. 3 units, Spr (Kubota) MW 2:15-3:30

121, 122, 123. Advanced Japanese Conversation—Focuses on improvement in fluency and listening
comprehension. Use of audiotapes, oral presentations, discussions. Sequence course. Pre-requisite: 23, 29, or consent of instructor.

121. 2 units, Aut (Kubota) TTh 11
122. 2 units, Win (Kubota) TTh 11
123. 2 units, Spr (Kubota) TTh 11

199. Individual Reading in Japanese— (Asian Languages majors only.) Prerequisite: 103 or consent of instructor.
4 units, Aut, Win, Spr (Staff) by arrangement

GRADUATE

200. Directed Reading in Japanese—Prerequisite: 213 or consent of instructor.
units by arrangement, Aut, Win, Spr (Staff) by arrangement

201. 5 units (Matisoff) given 1991-92
202. 5 units (Hare) given 1991-92

211, 212, 213. Advanced Modern Japanese—Intended to help students become functional speakers, readers, and writers of modern Japanese through articles and essays selected from newspapers, magazines, and other publications. Prerequisite: minimum three years of modern Japanese.
211. 5 units, Aut (Komatsu) TTh 11-12:15
212. 5 units, Win (Komatsu) TTh 11-12:15
213. 5 units, Spr (Komatsu) TTh 11-12:15

211, 221, 222, 223. Readings in 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 (Staff) not given 1990-91
221. Newspaper Articles.
5 units (Ueda) not given 1990-91
222. Fiction.
5 units (Matisoff) not given 1990-91

246. Introduction to Classical Japanese—The basic principles of the classical literary language, concentrating on grammar and vocabulary. Prerequisite: 103 or equivalent.
5 units, Aut (Staff) by arrangement

247, 248. Readings in Classical Japanese—Selected readings of texts in classical Japanese from Nara through Tokugawa periods. Attention to literary analysis, rhetoric, and poetics (Japanese and Western). Courses are offered alternate years and can be taken independently. Prerequisite: 246; 247 is not a prerequisite to 248.
247. 5 units (Matisoff) given 1991-92
248. 5 units, Win (Hare) by arrangement

250. Introduction to Kambun—Selected readings from a variety of Japanese works written in Kambun, ranging from Kafusio to Yoshida Shoin’s diary. Offered when there is sufficient demand.
4 units, Spr (Ueda) TTh 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.
5 units (Mass) not given 1990-91

4 units (Ueda) not given 1990-91

5 units (Bielefeldt) not given 1990-91

286. The Structure of Japanese— (Same as Linguistics 177.) The salient grammatical properties of the Japanese language. Survey of the main properties and features of Japanese sentence-types, phrase-types, particles, etc., covering the material in both volumes of Jorden’s Beginning Japanese. Primarily for students of Japanese; however, students who have some prior study in Japanese syntax may use it as an introduction to the language. Prerequisite: one year of Japanese and/or Linguistics 120.
4 units (Sells) not given 1990-91

287. Teaching Japanese as a Second Language— (Same as Linguistics 187/287.) Study of theoretical and practical problems involved in teaching Japanese as a second language. Prerequisite: 103 or consent of instructor.
4 units, Aut (Tokunaga) MW 11-12:15
294. Major Haiku Poets—Reading and discussion of selected haiku by Bashō, Buson, Issa, and others. Prerequisite: 103 or equivalent.
4 units (Ueda) not given 1990-91

296. Readings in Modern Japanese Literature—Readings and discussion of works selected from contemporary authors. Prerequisite: 213 or equivalent. May be repeated for credit.
4 units (Ueda) not given 1990-91

297. Images of Women in Modern Japanese Literature—Reading and discussion of selected literary works illuminating various aspects of the female experience in modern Japan. Prerequisite: 213 or equivalent.
4 units (Ueda) not given 1990-91

298. Translation Workshop—Discussion of problems involved in translating Japanese into English. Students produce an original translation of a literary or documentary work from their major field of interest.
4 units, Aut (Ueda) TTh 2:15-3:30

299. Master’s Thesis or Translation—A total of 5 units, taken in one or more quarters.
Aut, Win, Spr (Staff) by arrangement

300. Seminar in Heian Fiction—Advanced work in Heian fiction concentrating on <i>Genji monogatari</i>. Substantial reading in the original text, discussions of narrative voice, literary structure, the interaction of poetry and prose, and critical reception. Students complete a major paper. Prerequisite: 247 or 248.
5 units (Hare) not given 1990-91

301. Seminar in Japanese Classical Drama—Advanced work in traditional dramatic forms focusing on Noh drama, emphasizing the relationship between Zeami’s dramatic theory and selected plays of the modern repertory. Also, issues of performance, contemporary and historical. Students complete a major paper. Prerequisite: 246.
5 units (Hare) not given 1990-91

302. Seminar in Modern Japanese Literature—May be repeated for credit.
5 units, Win (Orbaugh) TTh 11-12:15

1-12 units, Aut, Win, Spr, Sum (Staff) by arrangement

400. Advanced Language Training—Open only to students at the Yokohama Center. For more information, see the program description under the "Inter-University Center for Japanese Studies in Yokohama" section in this bulletin. Offered on a Satisfactory/No Credit basis.
15 units per quarter (Cho)

KOREAN

1,2,3. First-Year Modern Korean—Conversation, grammar, reading, elementary composition. Daily sections may be set at the beginning of the quarter to suit the schedule requirements.
5 units, Aut, Win, Spr (Cho) MTWThF 1:15

21,22,23. Second-Year Modern Korean—Further instruction and practice in conversation, grammar, reading, and composition. Daily sections may be set at the beginning of the quarter to suit schedule requirements.
5 units, Aut, Win, Spr (Cho) MTWThF 2:15

101,102,103. Third-Year Modern Korean—Readings in modern Korean scholarly, journalistic, and literary prose. Prerequisite: 23 or equivalent.
3 units, Aut, Win, Spr (Cho) by arrangement

200. Directed Reading in Korean—Prerequisite 103 or consent of instructor.
units by arrangement, Aut, Win, Spr (Cho) by arrangement

271. The Structure of Korean—(Same as Linguistics 271.) Survey of the grammatical structure of Korean, emphasizing the interactions of phonology, morphology, and syntax. Topics: interaction of morphology with phonology within the lexicon, morphosyntax, and phrasal phonology.
4 units, Win (Cho) by arrangement
ASTRONOMY COURSE
PROGRAM

Committee in Charge: Vahe Petrosian (Chairman), Ronald N. Bracewell, Von R. Eshleman, Peter A. Sturrock, Robert V. Wagoner, Arthur B. C. Walker, Jr.


Assistant Professor: Peter F. Michelson (Physics)

Professors (Research): Philip H. Scherrer, J. Gethyn Timothy, G. Leonard Tyler (Electrical Engineering)

Although Stanford University does not have a degree program in Astronomy or Space Science, teaching and research in various branches of these disciplines is an ongoing activity in the Departments of Aeronautics and Astronautics, Applied Physics, Electrical Engineering, and Physics. For the convenience of students interested in the general areas of astronomy, astrophysics, cosmology, and space science, a course program for undergraduate and graduate study is listed below.

The program is especially committed to providing introductory courses for the student who wishes to be informed about the fields of astronomy without the need for prerequisites beyond high school algebra and physics; Astronomy courses numbered below 100 are designed to serve this group of students.

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 radioscience.

The course descriptions for these basic studies are listed under the appropriate department sections in this bulletin. 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 and are recommended to students considering advanced study: 100, Introduction to Observational and Laboratory Astronomy; 160, Introduction to Stellar and Galactic Astrophysics; 161, Extragalactic Astrophysics and Cosmology; 163, Planetary Exploration; 167, Essential General Relativity. Students planning study in astronomy beyond the B.S. are urged to consider an undergraduate thesis (Astronomy 169).

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. For graduate research opportunities see the "Center for Space Science and Astrophysics" section in this bulletin, or contact the Stanford-Ames Institute for Space Research.

The following courses are recommended for students planning to conduct research in astronomy and astrophysics: 301, Astrophysics Laboratory; 360, Stellar Physics; 363, Solar Physics; 312, 313, Basic Plasma Physics I and II; 362, High Energy Astrophysics; 365, Extragalactic Astrophysics and Cosmology; 364, Gravitation; 460, Astrophysics Seminar.

Students interested in 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.

COURSES

15. Topics in Modern Astronomy—15A and B are for students not majoring in the sciences and are taught in different quarters by different instructors, but related in topic. Students should not take more than one of the courses.

15A. The Nature of the Universe—(Enroll in Applied Physics 15.) For undergraduates without scientific background. The structure, origin, and evolution of the universe and our growing knowledge of the objects which make it up; galaxies, stars, planets, etc. Discussion of some enigmas of modern astronomy: quas-
ars, x-ray sources, black holes, and pulsars. Presentation is non-mathematical. (DR:7)

3 units, Win (Staff) TTh 2:15-3:30

15B. Cosmic Horizons—(Enroll in Physics 15.) Familiarizes the non-science student with modern cosmology. The physical laws that govern the universe, its evolution from the initial primeval fireball through the formation of galaxies, stars, and planets to the development of life. Also, exotic astronomical objects, quasars, pulsars, and black holes. Some algebra is used. (DR:7)

3 units, Spr (Bloom) TTh 2:15-3:30

25. Evolution of the Cosmos—(Enroll in Applied Physics 25.) Similar to 15 in its subject matter but at a slightly higher level; intended for more advanced students and students majoring in science or engineering. Origin and evolution of astronomical objects, e.g., planets, stars, galaxies, and the universe at large, emphasizing modern development in astronomy and elementary particle physics relevant to the subject matter. The development of life and position of intelligent beings in the universe. Algebra used. Recommended: knowledge at the level of high school physics and calculus. (DR:7)

3 units, Aut (Petrosian) TTh 11-12:15 discussion by arrangement

50. Astronomy Laboratory and Observational Astronomy—(Enroll in Applied Physics 50.) 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. Individual observations with a 16-inch Cassegrain telescope are supplemented by lectures which include discussions of basic observational techniques, astronomical catalogs and coordinate systems, and the relation of observations to astrophysical models. (DR:7)

3 units, Aut, Sum (Walker) lecture M 4:15 laboratory by arrangement

100. Introduction to Observational and Laboratory Astronomy—(Enroll in Applied Physics 100.) Introduction to observational techniques in astronomy for physical science or engineering students. Emphasis on measurement of fundamental astronomical parameters, e.g., distance, temperature, mass, and composition of stars. One 2-hour lecture and one night of observation using the 16-inch telescope at the Stanford Student Observatory. Limited enrollment. Prerequisites: one year of physics or concurrent registration in Physics 25, 57, or 63; consent of instructor. (DR:7)

4 units, Spr (Walker) M 3:14-5 laboratory by arrangement

106. Planetary Exploration—(Enroll in Electrical Engineering 106.) The other worlds of our solar system as revealed by recent space missions. Comparative properties of the terrestrial and Jovian planets; planetary atmospheres, surface, interiors; rings of Saturn; planetary and satellite orbits and spacecraft trajectories, orbital perturbations; properties of the interplanetary gas, dust, comets, and meteorites. What the planets can tell us about potential terrestrial catastrophes (nuclear winter, runaway greenhouse, collision with an asteroid or large comet). 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. Prerequisite: one year of college engineering, mathematics, or physics.

3 units, Spr (Eshleman) MWF 9


3 units, Aut (Staff) MW 2:15-3:30

161. Introduction to Extragalactic Astrophysics and Cosmology—(Enroll in Applied Physics 161.) 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. Prerequisites: calculus and one year of college physics at the level of the Physics 50 series or equivalent.

3 units, Spr (Petrosian)

167. Essential General Relativity—(Enroll in Physics 167.)

3 units, Win (Michelson)

169A,B,C. Independent Study in Astrophysics and Honors Thesis—A detailed study of a selected problem in astrophysics with one or more faculty members. While not all projects require 3 quarters, the sequence below suggests the format most projects are expected to follow. Projects may commence in any quarter.

169A. Selection of the Problem—Selection of the problem to be studied and development of the theoretical apparatus or initial interpretation of the selected problem. Preparation
of 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

169B. Continuation of Project—Substantial completion of the required computations or data analysis for the research project selected.

1-9 units, Win (Staff) by arrangement

169C. Completion of the Project—Completion of research and writing of a detailed paper presenting methods used and results.

1-9 units, Spr (Staff) by arrangement

3 units, Spr (Sleep) TTh 10-11:30

227. Atmospheric and Space Physics—(Enroll in Aeronautics and Astronautics 227, Mechanical Engineering 246.)
3 units, Aut (Spreiter) TTh 2:45-4

249. Introduction to Space, Telecommunications, and Radioscience—(Enroll in Electrical Engineering 249.)
3 units, Aut (Bracewell)
alternate years, not given 1991-92

262. Introduction to Gravitation and Astrophysics—(Enroll in Physics 262.)
3 units, Spr (Wagoner) TTh 9:30-10:50

279A. Space Mechanics—(Enroll in Aeronautics and Astronautics 279A.)
3 units, Win (DeBra) TTh 8-9:15

279B. Advanced Space Mechanics—(Enroll in Aeronautics and Astronautics 279B.)
3 units, Spr (Breakwell)
alternate years, not given 1991-92

279C. Optimal Space Trajectories—(Enroll in Aeronautics and Astronautics 279C.)
3 units (Breakwell)
alternate years, given 1991-92

301. Astrophysics Laboratory—(Enroll in Applied Physics 301.)
3 units, Sum (Walker)
alternate years, not given 1991-92

312,313. Basic Plasma Physics I and II—(Enroll in Applied Physics 312, 313.)
3 units, Win, Spr (Sturrock)
alternate years, not given 1991-92

350. STAR Laboratory Seminar in Radioscience—(Enroll in Electrical Engineering 350.)
1 unit, Aut, Win, Spr (Vesecky)
M 4:15-5:30

352. Electromagnetic Waves in the Ionosphere and Magnetosphere—(Enroll in Electrical Engineering 352.)
3 units, Spr (Helliwell)
alternate years, not given 1991-92

354. Introduction to Radio Wave Scattering—(Enroll in Electrical Engineering 354.)
3 units, alternate years, given 1991-92

360. Stellar Physics—(Enroll in Applied Physics 360.)
3 units (Petrosian)
alternate years, given 1991-92

3 units (Staff)
alternate years, given 1991-92

3 units (Sturrock)
alternate years, given 1991-92

364. Gravitation—(Enroll in Physics 364.)
3 units, Win (Staff) not given 1991-92

365. Extragalactic Astrophysics and Cosmology—(Enroll in Applied Physics 365.)
3 units (Staff)
alternate years, given 1991-92

460. Astrophysics Seminar—(Enroll in Applied Physics 460.) Discussion of current research and literature in astrophysics offered by faculty, students, and outside specialists.
1 unit, Aut, Win, Spr (Petrosian)

463. Special Topics in Astrophysics—(Enroll in Applied Physics 463.) Research-level discussions of current topics in astrophysics. Content varies each quarter and year depending on the interests of staff and students. Course may be repeated. Offered on occasional basis.
ATHLETICS, PHYSICAL EDUCATION, AND RECREATION

Emeriti: (Professors) John E. Nixon, Wesley K. Ruff; (Associate Professors) Miriam B. Lids-ter, Marian S. Ruch; (Director of Intramurals) William P. Fehring; (Athletic Director) Joseph H. Ruetz; (Associate Director) Robert C. Young

Director: Ferdinand A. Geiger
Assistant to the Director: Sue LemMon
Senior Associate Director: Alan A. Cummings
Associate Director, Intercollegiate Services: Thomas Beckett
Associate Director: Cheryl Levick
Director, Major Gifts: John R. Kates
Director, Annual Giving: Jon Denney
Assistant Director Financial Planning: Karen Bennett
Assistant Director, Development: Elizabeth Sloan
Assistant Director, Marketing and Promotions: Jim Brungard
Assistant Director, Club Sports, Recreation, and Education Programs: Shirley H. School
Director, Physical Education: Elizabeth P. Weeks
Chairperson of Dance Division: Susan Cashion
Senior Lecturers: Susan Cashion, Carroll Diaz, Sharon Donovan, Elizabeth Weeks, Inga Weiss
Lecturers: Anne Gould, Tony Morris-Kramer, Halifu Osumare, Janice Ross, Gwendolyn Watson
Sports Directors: Berhane Andeberhan (Soccer, women), Tim Baldwin (Golf, women), Frank Brennan (Tennis, women), John Davis (Crew, women), Tara VanDerveer (Basketball, women), Dante Dettamanti (Water Polo), Wallace Goodwin (Golf, men), Richard Gould (Tennis, men), Dennis Green (Football), Breck Greenwood (Gymnastics, women), Sadao Hamada (Gymnastics, men), Chris Horpel (Wrestling), Brooks Johnson (Cross Country, Track and Field), Skip Kenney (Swimming, men), Mark Marquess (Baseball), Blake Middleton (Sailing, Director and Head Coach), Mike Montgomery (Basketball, men), Sherry Posthumus (Fencing, women), Richard Quick (Swimming, women), Richard Schavone (Diving), Don Shaw (Volleyball, women), Frederick Sturm (Volleyball, men), Zoran Tulum (Fencing, men)
Sport Assistant Coaches: Brian Billick (Football), Renee Brown, Mike Chasson (Swimming, women), Scott Chism (Track and Field), Denise Corlett (Volleyball, women), Tom Crowley (Basketball, men), Wendy Davis (Crew, women), Tong Fei (Gymnastics, men), Chris Foerster (Football), Lele Forood (Tennis, women), Penny Hauschild (Gymnastics, women) Ernie Kent (Basketball, men), Ted Knapp (Swimming, men), Kirk Mason (Baseball), Mike Nelson (Football), Ruben Nieves (Volleyball, men), Doug Oliver (Basketball, men), John Pescatore (Crew, men), Julie plank (Basketball, women), Betsy Riccardi (Track and Field), Scott Schuhmann (Football), Willie Shaw (Football), Dean Stotz (Baseball), Dave Tipton (Football), Michael Tolleson (Football), Amy Tucker (Basketball, women), Ron Turner (Football), John Whittington (Tennis, men), Tyronne Willingham (Football)
Teaching Specialists: Kate Coughlin, (Aerobics), Stanley Scott (Athletic Training)

From the founding of the University, Stanford's leaders have believed physical activity is valuable for its own sake and complementary to the educational purpose of the University. The mission of the Department of Athletics, Physical Education, and Recreation is to offer the widest possible range of quality programs for athletic participation and physical fitness at all levels of skill and interest. Within the limitations of its resources, the department is expected to provide a broad range of instructional, recreational, and competitive programs for all who wish to participate. The intrinsic value to the participant is the primary criterion by which the worth of the programs should be judged.

The goals of the instructional programs are to promote understanding of the value and role of physical activity as an important dimension of the human condition, to develop performance skills in dance and sport, to develop the participation habit, and to provide leadership opportunities in aquatics, dance, sports 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.

PROGRAMS
ACADEMIC DEGREES

No degrees are offered in Physical Education. The Master of Arts degree in Education: Dance Specialization is offered through the School of Education either as a coterminal degree or as a post-bachelor's degree program. At the undergraduate level, students may design an independent, interdisciplinary major through the
Dance Division. Undergraduate students interested in such a major should consult with Dance Degree Advisor Susan Cashion.

DANCE DIVISION

The dance program focuses on the union of the physical and theoretical qualities of dance as an aspect of human behavior. Dancers learn the technical skills and communicative function of dance as an art form through theoretical and practical classes in a diversity of dance forms.

Modern dance technique, choreography, and improvisation are the core of the program. Students can also receive extensive experience in ballet, jazz, social, and non-Western forms through practical work in the classroom and in performance.

Dancers are encouraged to develop their own creative potential through choreographing and performing in works created by students, faculty, or visiting artists. The undergraduate classes, in particular, stress dance as a theatrical form. The emphasis is on enhancing a general appreciation of the performing arts and in offering students creative performing opportunities in modern dance as well as the Dunai International Folk Ensemble and Ballet Folklórico de Stanford.

Undergraduates may elect an Individually Designed Major in Dance. The Dance Division and/or Undergraduate Advising Center offers specific counseling for designing such a major. Undergraduates may also enter a co-terminal degree program during their eighth quarter, permitting them to study simultaneously for the Master of Arts in Education Dance Specialization degree and a bachelor's degree of their choice.

The graduate program awards the Master of Arts in Education: Dance Specialization, and is designed for students preparing to continue professionally as dance educators. To apply for admission to graduate study, successful completion of undergraduate courses in dance at Stanford, a bachelor's degree in dance from an accepted university or college, or proof of equivalent professional experience is required.

Graduate students are expected to develop a proficiency in teaching, research, choreography, or performing with either a modern or ethnic dance emphasis. Attainment of these skills is demonstrated through an individually designed creative project, completion of a teaching apprenticeship, and acceptance of a research paper. For further information about the Dance Division, contact Susan Cashion, Chairperson for Dance.

INTERCOLLEGIATE ATHLETICS

In keeping with American university tradition, Stanford offers a broad intercollegiate athletic program. The objectives are to provide the opportunity to compete at the highest possible level without jeopardizing the integrity of the individual or the institution, to adhere strictly to all University, association, and conference rules governing athletic participation, and to encourage effectively the achievement of academic goals by student athletes at the same rate as by other University students. As a member of the National Collegiate Athletic Association (NCAA), Stanford fields both men's and women's varsity teams. Those for men are: baseball, basketball, crew, cross country, fencing, football, golf, gymnastics, sailing, soccer, swimming and diving, tennis, track and field, volleyball, water polo and wrestling; for women: basketball, crew, cross country, fencing, field hockey, golf, gymnastics, sailing, soccer, swimming and diving, tennis, track and field, and volleyball.

Both men's and women's teams are affiliated with the Pacific Ten Conference, one of the premier athletic conferences in the nation. Additional or alternative intercollegiate athletic competition is available for all teams.

CLUB SPORTS

The Stanford Club Sports program is coeducational. It provides competition in sports not included in the intercollegiate varsity program and instruction in classes or activities not included in the Physical Education program. It also develops student leadership in organizing, administering, and funding activities. The club program is actively supervised by the Director of Club Sports, but the emphasis is on student interest and leadership to initiate, organize, and conduct the respective clubs. Those students in clubs which meet the criteria for inclusion in the formal curriculum may apply for units of credit through the Director of Physical Education, Elizabeth Weeks. 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 director of Club Sports, Shirley Schoof.

INTRAMURAL SPORTS (IM)

Students interested in intramural competition may receive information through their campus residences of the IM Director, Howard Dallmar. The program includes formal competition in league and tournament play for 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 (ROOM 354, ENCINA GYM) ON THE DAY BEFORE THE START OF CLASSES TO OBTAIN MEETING DATES AND TIMES. EACH QUARTER'S PRINTED MATERIALS AND IM HANDBOOKS ARE AVAILABLE ON OR AFTER THE DAY BEFORE THE START OF CLASSES. THE INTRAMURAL MANAGER MEETINGS ARE HELD THE FIRST WEDNESDAY OF THE FIRST WEEK OF CLASSES EACH AUTUMN, WINTER, SPRING, AND SUMMER QUARTERS.

RECREATION

The department provides facility use for faculty, staff, and students (and, for some activities, their immediate families) to participate in aquatic, conditioning, dance, and sports for general recreation. Specific recreation hours for all the facilities are publicized throughout the year both in the Campus Report and at the respective facilities.

The golf course and driving range are available for faculty, staff, and student use on a fee basis; information is available from the Golf Pro Shop. For further information about recreation opportunities, contact the Recreation Coordinator, Shirley Schoof.

FACILITIES

Athletic facilities are located throughout the campus. The dance studio (for classes and dance concerts); small activity rooms, a multipurpose gymnasium, weight training facilities, an outdoor swimming pool, and a large playing field are located at Roble Gym on the west side of campus as well as lighted tennis courts near Governor's Corner.

The east side of campus includes the Encina Gym weight room, many intramural fields, outdoor volleyball courts, and tennis courts. Multipurpose rooms for volleyball, basketball, badminton, aerobics, martial arts, gymnastics, and wrestling are included in the newly completed Ford Center for Sports and Recreation. The deGuerre Complex houses swimming and diving pools as well as handball, racquetball, and squash courts.

The 18-hole championship golf course, a driving range, a sailing center, and a rowing facility are also available for the department's broadly based program.

CURRICULUM AND SERVICES

The diverse instructional program accommodates the dance and sport interests of all undergraduate and graduate students. Only intercollegiate varsity men's and women's teams are limited to undergraduates. Homogeneous skill groupings and limited class sizes enable the student or the advanced performer to achieve success within the limits of individual motivation and potential. Skill level in, and knowledge about, a specific activity as well as available space during class-list signing are the only limitations to enrollment. Physically handicapped students are encouraged to contact Director of Physical Education Elizabeth Weeks, or Chairperson for Dance Susan Cashion for enrollment advice.

Academic Credit—Activity classes carry 1 unit of credit for satisfactory completion of work. Although there is no limitation on the number of activity classes in which a student may enroll, no more than 12 units of these activity classes (and/or music activity classes) may be applied toward undergraduate graduation requirements (see the "Undergraduate Degrees" section of this bulletin). Classes which are exempt from this University policy are identified as (PE:X); no limit is placed on PE:X units counting toward graduation.

Units for satisfactory completion of a lower skill level class in the same sport or activity in which units have been received previously do not count toward graduation.

Auditing/Zero Units—No auditing is allowed in activity classes. Students who wish to take a class but who cannot use or do not want unit credit must still record enrollment on the Official Study List and indicate 00 units. Zero-unit enrollment is allowed on a space-available basis, after enrollment for credit and by permission of instructor. The End Quarter Grade Report and student transcript record enrollment and grade.

Faculty and staff may take an activity class on a space-available basis with instructor permission after student enrollment is completed.

Class Fees—Fees are charged for enrollment in badminton, horsemanship, fencing, golf, martial arts, sailing, SCUBA, windsurfing, and Club Sports classes.

Fees are payable at the first class meeting and are required by the second class meeting for a student to remain in class. Late enrollees must submit fees no later than the second time they attend the class.

Full refund is given to students who drop a class during the first week of classes and request a refund at that time. Half refund is given to students who drop a class during the second week and request a refund. No refund is given if a student either neglects to request a refund under the conditions listed previously or drops the class after the second week.

Equipment and Uniforms—No department uniform is required. Students provide their own equipment for badminton (racket), tennis (racket and balls), SCUBA (see course descriptions), and aquatics classes at Roble Pool (swim caps). Specific information on equipment and rec
Athletics, Physical Education and Recreation 287

Recommended class attire is available from the department and on the first day of class instruction.

Lockers—Lockers are available for students, without charge, from the equipment managers at Encina and Roble Gyms. Roble Gym students not enrolled in a class must wait until the second week of each quarter for locker assignment.

Towels and Swim Caps—Towels may be purchased at the Encina and Roble Gym locker-rooms and subsequently exchanged, without charge, for clean towels. Swim caps are required at the Roble Gym pool.

COURSES
DANCE ACTIVITY AND THEORY

All courses/classes are coeducational. Only courses with PE:X notation are exempt from the 12-unit activity class limitation policy. Series classes (I, II, III) should be taken in order or with consent of instructor. Selected dance courses may fulfill the Distribution Requirements. (See "Appendix" in the back of this bulletin.)

INTRODUCTORY

Open to all students. No previous dance experience is needed.

60. Introduction to Dance—(Same as Drama 60) The contrasting movement styles and disciplines of dance as a non-verbal vehicle of cultural, artistic, and social expression. Technical and historical perspectives of modern and non-Western dance forms presented.
1-2 units, Spr (Cashion)

61. Modern Dance I—Technical and creative principles of modern dance designed to develop the body as an articulate instrument.
1 unit, Aut, Win, Spr (Morris-Kramer)

62. Dance Lab—Open studio session for those at all levels interested in movement. Investigates dance-related performance skills in weekly participatory lab sessions. Topics change quarterly.
1 unit, Aut, Win, Spr (Frank)

64. Movement for Actors—(Same as Drama 27A) Exercises and improvisations for those concentrating on developing freedom and spontaneity in stage movement. Emphasis on development of characterization through movement and an examination of physical realization of scripted scenes. (PE:X)
2 units, Aut (Morris-Kramer)

65. Musical Theater Workshop—(Same as Drama 27B) Dance performance skills and choreography appropriate for musical theater. (PE:X)
2 units, Win (Cashion)

66. Movement and Music for Actors—(Same as Drama 27C) Introduction to movement skill in conjunction with knowledge of music that is useful to the actor. Attention to voice and body training in development of characterization. (PE:X)
2 units, Spr (Morris-Kramer, Toenjes)

71. Ballet I—Emphasis on fundamentals of classical technique: alignment, basic barre exercises, and movement sequences in the center and across the floor.
1 unit, Aut, Win (Delmar)

75. Mexican Dance and Folklore I—Three forms of Mexican dance: regional, popular/social, and religious. Taught for technical and cultural understanding. Designed for the novice dancer. (PE:X)
2 units, Aut (Cashion)

77. Dances of Latin America—Selected dances of Latin America, specifically Mexico, Cuba, Brazil, Argentina, and Chile. Dances in relation to their cultural context.
1 unit, Spr (Cashion)

1 unit, Aut, Win, Spr (Morris-Kramer)

91. International Folk Dance—Students learn approximately 15 dances from different cultures reflecting a variety of styles and techniques.
1 unit, Spr (Staff)

1 unit, Aut (Staff)

96. Social and Folk Dance Forms of North America—A sampling of dances found in the popular dance culture of North America including waltz, swing, contra, round, and square.
1 unit, Aut, Win, Spr (Staff)

INTERMEDIATE

160A. Dance History and Philosophy—(Same as Drama 127A) Historical lecture survey of the lives and works of key figures in Western theatrical dance, from the Renaissance to the present, through films, videos, and discussions. Topics: public attitudes and perceptions and the Romantic ideal in ballet, the changing image of the birth of abstraction in dance, the male dancer, and the pioneering matriarchs of modern dance. All are discussed against the social and cultural background of the time. (PE:X) (DR:2)
3 units, Win (Ross)

160B. Dance and Live Art in the 20th Century—(Same as Drama 127B) A critical history and analysis of the development of live art in post-
modern dance and performance art of the 20th century. Topics: the body as an art medium, performance art, experimental dance, and redefinitions of gender in live art. (PE:X) (DR:2)

3 units, Spr (Ross)

162. Modern Dance II—Intermediate technique. Emphasis on using improvisation and composition in direct studies. Prerequisite: two quarters of 61 or equivalent. (PE:X)

2 units, Aut, Win, Spr (Morris-Kramer)


2 units, Win, Spr (Frank)

165. Dance Heritage: History and Styles—Workshop/seminar on the origins of movement forms that have influenced Western contemporary dance, e.g., Duncan, Graham, Limón, Taylor, Cunningham. Specific approaches and techniques utilize cross-cultural and historical perspectives; studio work is amplified by lectures, films, and readings.

3 units, Aut, Win (Ross, Frank)

167. Chamber Music: Improvisation—(Same as Music 171.) Development of skills in the accompaniment of dance in performance. Open to any student with sufficient vocal skills or technical ability to play in small combinations of string, wind, keyboard and percussion instruments.

1 unit, Aut (Watson)

168. Performance Workshop: Public Performance—A workshop designed to explore and develop performance skills. Includes public performance in faculty and/or student-directed productions.

1 unit (Morris-Kramer) by arrangement

169. Faculty Choreography—Rehearsal and performance of faculty choreography. Selection by audition.

1 unit (Staff) by arrangement

172. Ballet II—Beginning/intermediate level. Continuation of 71, repeating the fundamentals with increased complexity and introducing additional movement vocabulary. Prerequisite: 71 or equivalent.

1 unit, Aut, Spr (Delmar)

173. Ballet III—Stresses accuracy and facility with fundamental classical vocabulary. Attention to movement shape and line, spatial concepts, musicality, and phrasing. Prerequisite: 172 or equivalent.

1 unit, Win, Spr (Delmar)

175. Mexican Dance and Folklore II—Emphasis on two to three selected regional dance styles. Taught within the framework of their cultural context. Concentration on increasing skill in footwork. (PE:X)

2 units, Win (Cashion)

177. Dance and Culture in Latin America—(Same as Anthropology 109.) Selected dance forms of Latin America viewed as aspects of human behavior. Emphasis on cultural influences, e.g., European, African, and indigenous, which have shaped ritual and social dance forms of Mexico, Cuba, Brazil, Haiti, Argentina, and Chile. Corequisite: 77. (PE:X) (DR:2)

2 units, Spr (Cashion)

178. Mexican Dance Performance—Regional material of Mexico taught and rehearsed for rhythmic, stylistic, and technical proficiency. Performances on and off campus are planned and executed by the students. Prerequisites: Mexican Dance and Folklore series or consent of instructor.

2 units, Aut, Win, Spr (Cashion)

182. Jazz Dance II—Intermediate level emphasizing alignment, control, rhythmic coordination, and the learning of movement combinations. Prerequisite: 81 or equivalent.

1 unit, Aut, Win, Spr (Osumare)

183. Jazz Dance III—Advanced level of technical proficiency. Focuses on advancing performance skills of projection and movement quality. Prerequisite: consent of instructor.

1 unit, Win (Osumare)


2 units, Aut (Osumare)

186. African-Caribbean Dance Technique—Based on the Katherine Dunham technique which utilizes traditional African diasporic dance forms and contemporary modern dance. Studio work amplified by lectures/reading. (PE:X)

2 units, Spr (Osumare)

187. Improvisation Plus—Development of improvisation skills as creative process for the craft of choreography, emphasizing concepts of design, form, and content. (PE:X)

2 units, Aut (Staff) by arrangement

191. Stanford International Folk Dance Ensemble—Training in stylistic versatility and mastery of traditional folk dance forms. Advanced folk dances are taught in rehearsal-like form
to prepare for several performances each quarter.

2 units, Aut, Win, Spr (Staff)

**ADVANCED**

Designed for advanced undergraduates and graduates in the A.M. program.

100/200. Individual Study—Administrative internship or in-depth study of topics directly related to the discipline of dance. (PE:X)

1-3 units, Aut, Win, Spr (Ross)

by arrangement

260. Labanotation—Introduction to the principles and tools for the analysis and recording of movement based on the Laban system of notation. (PE:X)

2-3 units, alternate years, given 1991-92

266. Dance Education for Children—The role of dance in education, emphasizing elementary and secondary school levels. The relationship of dance to the arts and other academic subjects. Weekly theory discussions and technique sessions; lab session with elementary school children. (PE:X)

3 units (Joyce)

alternate years, given 1991-92

267. Dance Teaching Internship—Methodologies of teaching dance and using music resources within a variety of classroom situations. Instruction and guided practice in the preparation of lesson plans, developing sequence and progression in class setting, and using accompaniment. (PE:X)

1-3 units, Win (Watson, Weiss)

268. Society, Education, and Dance—(Same as Education 218.) The role of dance as a transmitter of cultural perspectives. A cross-cultural analysis tracing the roots of dance from ritual to higher education and incorporating 20th-century philosophers' perspectives on the social functions of dance. (PE:X) (DR:2*)

3-5 units (Cashion, Ross)

alternate years, given 1991-92

269. Graduate Design Project—A three part, individually designed creative project required for completion of the master's degree. (PE:X)

3 units (Cashion) by arrangement

290. Directed Research—Individual project in work of any choreographer, period, genre, or dance-related topic. Thesis work need not be exclusively in Dance Division.

1-4 units (Ross) by arrangement

**PHYSICAL EDUCATION AND SPORTS THEORY**

PE:X indicates that the course is exempt from the 12-unit policy.

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, and sports. (PE:X)

3 units, Aut, Spr (Weeks) TTh 9-10:50

107. Classical Athletics—(Same as Classics 14.) The origins and 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 to the spirit of competition apart from athletics. Lectures (illuminated) and discussion groups. (PE:X) (DR:5)

2-3 units (Raubitschek)

161. CPR/Standard First Aid Instructor—Designed for those wishing to teach Red Cross CPR and Standard First Aid. Includes learning the skills in CPR and first aid. Also, IHSE teaching methodology, and practice teaching. Red Cross certifications upon successful completion.

3 units, Aut (Staff)

184. Athletic Training—For students intending a teaching/coaching, athletic training, or sports medicine career. Includes the spectrum of prevention, care, and rehabilitation of injuries associated with dance and sports activities. Prerequisites: consent of instructor and course in human anatomy or analysis of human movement. (PE:X)

3 units, Win (Scott) TTh 9-10:50

alternate years, not given 1991-92

205. Sports Medicine: Medical Aspects of Land, Underwater, and Altitude Sports—(Same as Medicine 280.) Emphasis on basic physiology, proper training, and conditioning for endurance sports, underwater sports, racquet and contact land sports, and altitude sports. Biomechanics and weight training introduced; goal is to enhance enjoyment of these sports and to prevent injury. Recommended: biology or basic physiology. (PE:X)

2 units, Aut (Spivack, Staff) W 3:15-5

**LEADERSHIP OPPORTUNITIES IN PHYSICAL EDUCATION**

PE:X indicates that the course is exempt from the 12-unit policy.

81. Student Assistant—Directed observation, individual and small group instruction, organi-
zation, supervision and assistance; evaluation of skill performances, and other activities as directed by master teacher. Prerequisite: consent of instructor.

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

181. Sport Internship—For highly skilled students in a given sport seeking experience in teaching/coaching. Work under close guidance of experienced teacher/coach. Lesson plans; organization and evaluation of practice; teaching; skill demonstrations; paper relevant to sport. Prerequisite: consent of instructor. (PE:X)

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

AQUATIC ACTIVITY AND THEORY

Advanced classes are listed under 100 numbers. PE:X indicates that the course is exempt from the 12-unit policy.

47. Swimming I: Beginning—For non-swimmers or those who can swim about 10 yards but are not comfortable in deep water. Includes instruction in safety skills, front crawl, and a back stroke. Additional strokes introduced as ability warrants.

1 unit, Aut, Spr (Donovan, Dettamanti)

48. Swimming II: Advanced Beginning—For those with limited swimming ability and safety skills who are not fully comfortable in the water. Includes work on safety skills, crawl, and elementary backstroke or back crawl. Introduction to sidestroke and breaststroke. Improve skills and increase time and distance of swim. Prerequisite: ability to swim 25-50 yards on front and on back reasonably comfortably.

1 unit, Aut, Win, Spr (Weeks, Donovan)

49. Swimming III: Intermediate—Continued work on crawl, elementary backstroke, sidestroke, and safety skills. Introduction to or review of breaststroke and back crawl. Conditioning as ability permits. Prerequisites: a fair crawl, elementary backstroke, and some sidestroke; ability to swim approximately 100-200 yards continuously.

1 unit, Aut, Win, Spr (Weeks, Donovan)

50. Water Polo—Introduction to and refinement of skills used in water polo.

1 unit, Aut, Spr (Dettamanti)

52. Lifeguard Training—Increasing awareness of water hazards and accident prevention. Victim recognition, rescue skills, and development of speed and endurance. Lifeguard responsibilities and facilities operation. Current Adult CPR and Standard First Aid required for Red Cross Lifeguard certification. Priority to those with summer jobs requiring certification; bring letter from employer to first class meeting. Fee for books. Prerequisites: pass swim test. See instructor for details.

2 units, Aut, Win, Spr (Donovan, Weeks)

54. Sailing: Beginning—Basic skills, theory, and techniques to enable beginners to sail with confidence. Fee.

1 unit, Aut, Spr (Middleton)

55. Sailing: Intermediate—Refinement of skills. Introduction to racing. Fee. Prerequisite: consent of instructor.

1 unit, Spr (Middleton)

56. Windsurfing—Theory and techniques of windsurfing safely and confidently. Fee.

1 unit, Spr (Middleton)

147. Swimming IV: Advanced—Review and refinement of all basic strokes and safety skills. Butterfly and flipturn introduced. Includes stroke drills and information on conditioning and designing individual workouts. Prerequisite: average to good strokes; ability to swim 500 yards continuously.

1 unit, Aut, Win, Spr (Kenney, Donovan, Quick)

148. Swim Conditioning—For students wanting to improve cardio-respiratory endurance through directed swimming workouts. Prerequisite: advanced swimmer.

1 unit, Aut, Win, Spr (Chasson, Dettamanti, Quick, Knapp)

149W. Swimming Officiating—Rules, scoring records, responsibilities of officials. Practical experience in organizing meets as well as development of officiating skill and technique in meet situation.

1 unit, Win (Quick) by arrangement

152. Water Safety Instructor—Learning to teach swimming and basic and emergency water safety. Not for teaching lifeguarding. Extensive textbook readings and written assignments. American Red Cross certification for successful course completion. Pass test in Red Cross Swimmer skills and written water safety test. Priority to those with summer jobs requiring certification. Letter indicating same required at first class meeting. Prerequisites: 17 years of age, at least Red Cross Swimmer level, and current Emergency Water Safety or Lifeguard Training Certificate. (PE:X)

3 units, Spr (Weeks, Donovan)

153. Skin and SCUBA Diving—Lectures, skill sessions, and three field trips. NAUI Openwater I certification upon successful completion. Student supplies mask, fins, snorkel, boots, gloves, depth gauge, underwater watch, and compass (to be discussed in class). Priority to students
ATHLETICS, PHYSICAL EDUCATION AND RECREATION

accepted for study at Hopkins Marine Station. Pick up information sheet at Roble Gym. Pre-requisites: swim test, medical clearance, consent of instructor. Fee. (PE:X)

3 units, Aut, Win, Spr (Donovan)

154. SCUBA Rescue Techniques: Diving Safety and Rescue Procedures—Accident prevention, recognition, and management. Pool exercises and lecture sessions. Ocean field trips. Priority to those wishing to assist with SCUBA classes or classes at Hopkins Marine Station. Pre-requisites: Openwater I certification or equivalent and current certification in First Aid and Community CPR. Information sheet available at Roble Gym. Fee.
3 units, Aut, Win, Spr (Donovan)

155. Sailing: Advanced—Refinement of heavy weather sailing skills, with emphasis on racing. Fee. Prerequisite: 55 or consent of instructor.
1 unit, Spr (Middleton)

253. SCUBA: Open Water II—Open water program developing confidence beyond basic levels. Weekly lecture/discussion and three diving field trips. Emphasis on navigation, skill review, dive planning. NAUI Openwater II upon successful completion. Student must provide gear for dives including depth gauge, compass, watch, power inflator, and alternate air sources. Information sheet available at Roble Gym. Prerequisites: SCUBA certification, medical clearance, and consent of instructor. Fee. (PE:X)
1-3 units, Aut (Donovan)

INDIVIDUAL AND TEAM SPORT ACTIVITIES

Advanced classes are listed under 100 numbers. PE:X indicates that the course is exempt from the 12-unit policy.

1. Posture—Individual posture evaluation; exercises for proper body alignment emphasizing flexibility and balance of muscle strength development; techniques for correct body mechanics; some nutrition, relaxation, and weight management; group and individualized exercise program.
1 unit, Aut, Win (Weeks)

2. Conditioning—Introduction to basic principles of conditioning. General knowledge of physiological aspects of conditioning, fitness parameters, and principles of training. Emphasis on proper stretching, monitoring of heart rate, correct techniques of running, and development of own fitness program. May include introduction to other forms of conditioning and aerobic activities. Individualized according to ability.
1 unit, Aut, Win, Spr (B. Johnson, Andeberhan, Chisom)

2A. Low Impact Aerobics: Beginning/Intermediate—Continuous, total body movement at low intensity designed to enhance cardiovascular capacities. Focuses on body awareness and creation of a balance between controlled, powerful exercises that develop strength and large, fluid, ongoing movements that promote flexibility. Fundamentals of form and basic routines.
1 unit, Aut, Win, Spr (Coughlin)

1 unit, Aut, Win, Spr (Staff)

3A. Weight Training: Intermediate—Review of basic exercises and techniques. Emphasis on individualized programs. Further discussion on exercise physiology. Prerequisite: 3 or thorough knowledge of basic weight training principles.
1 unit, Aut, Win, Spr (Staff)

3W. Weight Training for Women—Introduction to techniques and equipment for weight training, especially Universal Gym. Emphasis on stretching, proper form and progressions, and injury prevention. Basics of physiology of strength training and planning of individual programs. All levels welcome, but designed for the beginner.
1 unit, Aut, Win, Spr (Ricardi, Hauschild, Andeberhan)

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, Fei)

20. Horsemanship: Beginning Riding—No background or very little. Includes walk, trot, and canter. Fee.
1 unit, Aut, Win, Spr (Saxe, Staff)

20A. Horsemanship: Advanced Beginning Riding—Can walk and trot, but not with very secure seat. Gymnastic work develops position and rhythm. Fee.
1 unit, Aut, Win, Spr (Saxe, Staff)

1 unit, Aut, Win, Spr (Saxe, Staff)

22. Golf: Beginning—Fundamentals of golf swing, use of various clubs, golf etiquette, and knowl-
edge of rules to enable a beginner to play a round of golf. Fee.

1 unit, Aut, Win, Spr (Diaz, Mason, Baldwin, Hamada)

23. Golf: Intermediate—Improvement and perfection of previously learned fundamentals. Utilization of these skills in the game. Fee. Prerequisite: 22 or the equivalent.

1 unit, Aut, Win, Spr (Diaz, Mason)


1 unit, Aut, Win, Spr (Dettamanti)


1 unit, Aut, Win, Spr (Nieves, Schavone, Corlett)


1 unit, Aut, Win, Spr (Posthumus)

31. Fencing: Intermediate—Continuation of 30; introduction of electrical foil fencing. Fee. Prerequisite: 30 or consent of instructor.

1 unit, Aut, Win, Spr (Tulum)

32. Tennis: Beginning—Covers fundamental strokes (forehand, backhand, service, and net play), rules, and scoring.

1 unit, Aut, Win, Spr (A. Gould, D. Gould, S. Johnson, Whitlinger)

33. Tennis: Intermediate—Fundamental stroke review and increased emphasis on singles and doubles tactics. Prerequisite: low intermediate class or average ability in fundamental strokes and regular playing experience.

1 unit, Aut, Win, Spr (A. Gould, Posthumus, Schavone, Horpel, Whitlanger, Forood)

33A. Tennis: Low Intermediate—Intended as a bridge between beginning and intermediate classes. Review of fundamental strokes, and utilization of these skills in a game situation. Prerequisite: beginning level class or knowledge of rules and scoring and average ability in fundamental strokes.

1 unit, Aut, Win, Spr (A. Gould)

34. Wrestling: Beginning/Intermediate—Introduces intercollegiate 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, Spr (Horpel)

40. Soccer: Beginning—Introduction to soccer. Includes skills of passing, shooting, control dribbling as well as general offensive and defensive tactics and rules.

1 unit, Aut, Win, Spr (Staff)


1 unit, Aut, Win, Spr (Shaw)

42. Volleyball: Intermediate—Drills to improve skills and game playing strategy. As ability indicates, more emphasis on team play and strategy.

1 unit, Aut, Win, Spr (Shaw)

102A. Low Impact Aerobics: Intermediate/Advanced—Continuous, total body movement at high intensity to enhance cardiovascular capacities. Focuses on body awareness and creation of a balance between controlled powerful exercises that develop strength and large, fluid, ongoing movements that promote flexibility. Fundamentals of form and basic routines.

1 unit, Aut, Win, Spr (Coughlin)

103. Weight Training: Advanced—Designed around Olympic-style lifting (cleans, jerks, snatches, high pulls) and power lifts. Prerequisites: intermediate weight training or equivalent and consent of instructor.

1 unit, Aut, Win, Spr (Schulz)

115. Gymnastics: Intermediate/Advanced—For students with background in gymnastics. Emphasis on tumbling and somersaulting. Group instruction and individualized work to enable some specialization on the various pieces of apparatus for men and women. Fee.

1 unit, Aut, Win, Spr (Greenwood)

120. Horsemanship: Advanced Riding—For those who have developed good control over the horse. Includes more advanced movements and jumping more demanding courses. Fee.

1 unit, Aut, Win, Spr (Saxe, Staff)

122. Golf: Advanced—Understanding of and refining the golf swing and increasing power and distance. Fee. Prerequisites: ability to hit with relative accuracy and distance, and swing with good form. Fee.

1 unit, Aut, Win, Spr (Diaz, Mason)

122A. Golf: Tournament—Advanced drills and practice on golf course for experienced players of near-varsity-level ability. Prerequisite: advanced golf or previous tournament play. Consent of instructor. Fee.

1 unit, Win (Goodwin)

128. Badminton: Advanced—Review of all fundamental strokes with an emphasis on re-
finement. Concentration on developing high level of ability and on strategic skills practiced in a competitive atmosphere. Fee.

1 unit, Aut, Win, Spr (Schavone, Corlett)

131. Fencing: Advanced—Continuation of intermediate fencing with the introduction of saber and épée. Consent of instructor. Fee.

1 unit, Aut, Win, Spr (Tulum)

131A. Fencing: Sabre and Épée—Emphasis on saber and épée technique with review of basic fencing footwork and skills; drilling and bouting. Fee. Prerequisite: 31 or consent of instructor.

1 unit, Spr (Tulum)

131W. Fencing Officiating—Supervised bouting with application of rules and officiating technique. Prerequisite: 131 or consent of instructor.

1 unit, Spr (Tulum, Posthumus)

132. Tennis: Advanced—Review of fundamental strokes. Drills to emphasize footwork, serve 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 (Brennan, A. Gould, Horpel, Schavone, Whitlinger)

132A. Tennis: Tournament—Advanced drills and practice sessions for tournament-experienced players of near-varsity-level ability. Tryouts at Varsity Courts in Autumn Quarter for autumn enrollment and position on all-University ladder for winter and spring classes. Prerequisite: consent of instructor.

1 unit, Aut, Win, Spr (Brennan, D. Gould, Horpel, Schavone, Whitlinger)

140. Soccer: Intermediate/Advanced—Review of the basic skills and rules. More in-depth work on offensive and defensive tactics. Includes work and scrimmage time.

1 unit, Aut, Win, Spr (Staff)

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 (Sturm)

182. Athletic Team Management—For student managers of intercollegiate teams. Prerequisite: consent of respective varsity team head coach.

1 unit, Aut, Win, Spr (Staff)

182A. Athletic Team Management: Computer Tennis—Use of computer for analyzing tennis matches. Assist players and coaches by collecting data on player performance. Background in computers and statistics helpful but not necessary. Prerequisite: consent of instructor. Recommended: excellent knowledge of tennis.

2 units, Aut, Win, Spr (Brennan, D. Gould) 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

MARTIAL ARTS


1 unit, Aut, Win, Spr (Moses)

7. Aikido—A Japanese martial "way" or harmony with the principles and forces of nature. Practice develops skills, conditioning, self-confidence, and a spirit of cooperation. Self-defense training in a supportive atmosphere, and at an energy level appropriate for each individual. Fee.

1 unit, Aut, Win, Spr (Doran)

8. Shotokan Karate—A weaponless martial art developed in Okinawa. Cultivates mental strength, physical suppleness, and self-defense skills. Affiliated with Shotokan Karate of America, whose head instructor is Tsutomu Ohshima. All levels. Fee.

1 unit, Aut, Win, Spr (Sagawa)


1 unit, Aut, Win, Spr (Haramoto)


1 unit, Aut, Win, Spr (Schnoor)

12. Tai Chi Chuan: Beginning—This exercise trains one in mental tranquility and physical relaxation, improving strength, concentration, body awareness, and unification of action between mind and body. Basic stretching and warm-up exercises plus 45 of the 81 postures in the Slow Tai Chi Chuan practice. History of Tai Chi and information on how the practice relates to other fields of study. Fee.

1 unit, Aut, Win, Spr (Chuck)
12A. Tai Chi Chuan: Intermediate—The remaining postures of the Slow Tai Chi Chuan exercise and introduction to the two-person exercise (Push-Hands) and basic Shaolin postures used to develop more flexibility and leg strength. Fee.
   1 unit, Aut, Win, Spr (Chuck)

   1 unit, Aut, Win, Spr (Kim)

   1 unit, Aut, Win, Spr (Schnoor)

112. Tai Chi Chuan: Advanced—Refine and study in greater detail the postures of the Slow Yang style of Tai Chi Chuan learned in 12 and 12A. Related Tai Chi practices such as Fast-Tai Chi, Tai Chi Sword, and Tai Chi Broadsword. Fee.
   1 unit, Aut, Win, Spr (Chuck)

INTERCOLLEGIATE ATHLETIC TEAMS

All classes below are subject to the 12-unit limitation policy.

Varsity and junior varsity men’s and women’s teams in PAC-10 are for the highly talented and motivated undergraduate student. Unless specified, team tryouts are open to men and women students.

116V. Gymnastics: Varsity (men’s and women’s teams).
   1-2 units, Aut, Win, Spr (Hamada)
   MTWThF 2:30-5:30 S 10-12 (men)
   2 units, Aut, Win (Greenwood)
   SuMTThF 2:30-5:30
   Spr MTWThF 2:30-5:30 (women)

117V. Track and Field: Varsity (men’s and women’s teams).
   1-2 units, Aut, Win (B. Johnson, Staff)
   MTWThF 3:30
   Spr (Johnson, Staff) MTWThF 2

118V. Cross Country: Varsity (men’s and women’s teams).
   1-2 units, Aut (B. Johnson, Staff)
   MTWThF 3:30

123V. Golf: Varsity (men’s and women’s teams).
   1-2 units, Aut, Win, Spr (Goodwin, Baldwin) MTWThF 1-5

131V. Fencing: Varsity—Men’s foil, épée, and saber teams and women’s foil team.
   1-2 units, Aut, Win, (Tulum, Posthumus)
   MW 3:15-6, TTh 7:30-10

133V. Tennis: Varsity (men’s and women’s teams).
   1-2 units, Aut, Win, Spr (Gould, Brennan)
   MTWThF 3:15-5:30 (men)
   MTWThF 2:30-5 (women)

134V. Wrestling: Varsity.
   1-2 units, Aut Win (Horpel)
   MTWThF 3:15-5:30
   Spr MW 4:15-5:30

135V. Baseball: Varsity.
   1-2 units, Aut, Win, Spr (Marquess, Stotz)
   MTWThF 1:30-5

136V. Basketball: Varsity.
   1-2 units (Montgomery, Staff)
   men’s team
   Aut MTWThF 3:30-6
   Win MTWThF 1:30-3
   (Van Dermeer, Staff) women’s team
   Aut MTWThF 12:45-3:30
   Win, Spr MTWThF 3:30-6

137V. Field Hockey: Varsity (women’s team).
   1-2 units, Aut (S. Johnson)
   MTWThF 3:30-5:30
   Win T 3:30-5:30, Th 8-10 p.m.
   Spr MWThF 3:30-5:30

138V. Football: Varsity.
   1-2 units, Aut (Green, Staff)
   MTWThF 3:30-5:30
   Spr MWF 3:30-5:30, S 9:30-12

140J. Soccer: Junior Varsity (men’s team).
   1-2 units, Aut (Staff) MTWThF
   3:15-5:45
   Win MWF 3:30-5:30
   Spr MTWThF 3:30-5:30

140V. Soccer: Varsity (men’s and women’s teams).
   1-2 units, (Staff) men’s team
   MTWThF 3:15-5:30
   Win MW 3:15-5 Su 7-9 p.m.
   Spr MTWThF 3:15-5:30
   1-2 units, (Andeberhan) women’s team
   Aut, Win, Spr MTWThF 3:15
V. Volleyball: Varsity (men's and women's teams)
1-2 units (Sturm) men's team
Aut, Win, Spr MTWThF 6-8:30 p.m.
1-2 units (Shaw) women's team
Aut MTWThF 4-7
Win MTWThF 1-4
Spr MTWThF 1-4

V. Swimming: Varsity (men's and women's teams)
1-2 units, Aut, Win, Spr (Kenney, Quick)
MTWThF 6-8, 2:15-4:30 S 8-11

V. Diving: Varsity (men's and women's teams)
1-2 units (Schavone)
Aut MWF 1-4, TTh 9-12
Win MWF 9-12, 1-4, TTh 9-12, 3-4:30
Spr MWF 1-3:30, TTh 10-12, 3-4:30

V. Water Polo: Varsity
1-2 units, Aut (Dettamanti)
MTWThF 3-5
Win MWF 3-5, TTh 9-12

V. Sailing: Varsity (men's and women's teams)
1-2 units, Aut, Spr (Middleton)
MTWThF 2:30-6
Win (Middleton) MWF 2:30-6

V. Crew: Varsity (men's and women's teams)
1-2 units (Staff) men's teams
Aut MTWTh 3:15-6, F 6-8
Win, Spr MTWTh 3:15-6
F 6-8, S 7-10
1-2 units (Davis) women's team
Aut MTWTh 3:15-6
Win MTWTh 3:15-6, S 6-45-9:30
Spr MTWTh 6-8, S 6:45-9:30

CLUB SPORTS
All classes below are subject to the 12-unit limitation policy.

The Stanford Club Sports Program is affiliated with the department but is initiated, organized, and conducted by students. All clubs are coeducational except as specified. Clubs, whose instructional classes meet the criteria for academic credit, are scheduled for meeting times as published each quarter in Time Schedule. For additional information, contact Club Sports Director Shirley Schoof.

C. Judo Club Team.
1 unit, Aut, Win, Spr

C. Ski Club Team.
1 unit, Win

C. Cycling Club Team.
1 unit, Aut, Win, Spr

C. Wrestling Club Team.
1 unit, Aut, Win

C. Field Hockey Club Team (women).
1 unit, Aut, Win, Spr

C. Rugby Club Teams (men's and women's).
1 unit, Aut, Win

C. Lacrosse Club Teams (men's and women's).
1 unit, Aut, Win, Spr

C. Ice Hockey Club Team.
1 unit, Aut, Win

C. Softball Club Team (women).
1 unit, Aut, Win

C. Synchronized Swimming Club Team.
1 unit, Aut, Win

C. Water Polo Club Team.
1 unit, Aut, Win

C. Judo Club Team.
1 unit, Aut, Win, Spr

C. Ski Club Team.
1 unit, Win

C. Cycling Club Team.
1 unit, Aut, Win, Spr

Emeriti: (Professors) Isabella A. Abbott, Arthur C. Giese, Daniel Mazia, David D. Perkins, Colin S. Pittendrigh, John H. Phillips, Jr., David C. Regnery; (by Courtesy) C. Stacy French

Chair: Robert D. Simoni
Associate Chair: Patricia P. Jones


Associate Professors: Mark W. Denny, William F. Gilly, Sharon R. Long, Stuart H. Thompson; (by courtesy) Richard Scheller

Assistant Professors: Ron R. Kopito, Paul M. Macdonald, Susan K. McConnell, Robert Sapolsky; (by courtesy) Neil S. Hoffman

Senior Lecturer: Charles H. Baxter
Lecturers: Sara Fultz, Fran Thomas, Melanie Yelton
Directors of Systematic Collections: Paul R. Ehrlich (Entomological Collections), John H. Thomas (Dudley Herbarium)
Librarian: Joseph G. Wible

The facilities and personnel of the Department of Biological Sciences are housed in Herrin Laboratories, Herrin Hall, Keck Science Building, and the Jasper Ridge Biological Preserve on the main campus; and at the Hopkins Marine Station in Pacific Grove on Monterey Bay. The new Gilbert Building, under construction on campus, will be completed in mid 1991.

The department provides: (1) courses designed for the non-major; (2) a major program leading to the degree of Bachelor of Science; (3) a co-terminal program leading to the Master of Science degree; and (4) a program leading to the degree of Doctor of Philosophy.

Coursework and laboratory instruction in the Department of Biological Sciences conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities" as stated in the back of this bulletin.

The Jasper Ridge Biological Preserve is a 1,200-acre natural area containing an unusual diversity of plant communities. It is managed solely for teaching and research purposes and is available to investigators from various institutions. Many courses 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 pamphlet Hopkins Marine Station, available at the department’s Student Services office (Herrin R-211) or from Hopkins Marine Station.

The department’s large collections of plants (Dudley Herbarium), fishes, reptiles, and amphibians, as well as smaller collections of birds, mammals, and invertebrates are housed at the California Academy of Sciences in San Francisco, where they, and 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 1200 current subscriptions 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 Biological Sciences faculty are available for advising on such academic matters as choice of courses and career plans. The Student Service office (Herrin R. 211) maintains a current list of faculty advisor, advising schedules, and research interests.

The Student Services office is prepared to answer questions on administrative matters, such as requirements for the major, eligibility of courses as electives, and necessity for petition. The Bachelor of Science Handbook, which delineates policies and requirements, is also available.

The BioBridge is operated by undergraduates as an adjunct to departmental advising. Its staff members provide advice on choosing an advisor and courses, organize departmental functions and activities such as the weekly noon lecture series (Biology 2) and new majors orientation, and are also available for informal, drop-in counseling in the Barth Room (Herrin T-333).

Each declared major in Biological Sciences is expected to select a departmental advisor at the time of declaring. 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 co-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
   - Biology 31 5
   - Biology 32 5
   - Biology 33 5
   - Biology 44X 4
   - Biology 44Y (may be replaced by 3 units of 175H) 3
   Total 22

2. Elective Courses
   - Electives 21
   Total Core and Electives 43
   Note: for classes up until 1991, requirements are for 18 units of electives, but 21 units are strongly recommended.

3. Cognate Courses
   Required courses in cognate fields include:
   a) Introductory, organic, and physical chemistry with laboratory; Chemistry 31, 33, 35, 36, 130 (or 132), 131, 135
   b) General Physics: Physics 21, 22, 23, 24; or 51 53, 55
c) Mathematics through calculus: Mathematics 19, 20, 21; or 41, 42

d) One additional course in mathematics, statistics, or computer science: Mathematics 43 or beyond; Biology 141, or Psychology 60, or Statistics 60 or beyond; or Computer Science 106A.

Electives must be 100-level or above and selected from the offerings in the Department of Biological Sciences or from the list of approved out-of-department electives. This list may be obtained from the Student Services office. Biology majors who are in the classes of 1990 and 1991 and who are completing the elective course requirement must take approved elective courses from at least three different Stanford faculty members, of whom at least two must be faculty in the Department of Biological Sciences.

Responding to rapid changes in the field, and to the need for increasing rigor of training, the department’s faculty has adopted a new set of upper division requirements, applicable to the class of 1993 and beyond. It is hoped that the class of 1991 will also want to meet the new requirements.

The program for the junior and senior year should include a total of 21 elective units beyond the core. The courses making up these units should include at least one course from at least three of the following four areas. The remainder of the 21 units can include more courses from this central menu, or courses available in diverse areas directly after the core, and/or advanced courses for which “menu” courses are prerequisites. Flow charts with suggested courses for students interested in several subdisciplines are available in the Student Services Office.

Central menu courses are:

1. Molecular Biochem. 200
   Molecular Biology: Bio 119
   Genetics: Bio. 118 (may be used to satisfy either area I or II requirement):

   Developmental Biology:
   Bio 108

3. Organismal Genetics: Bio. 118 (may be used to satisfy either area I or II requirement):

4. Population Vertebrate Bio.:
   Nervous System: Bio. 176
   Plant Physiology:
   Bio. 153
   Viruses: Bio. 213
   Introductory Microbiology: Micro. Immunology 101
   Problems in Marine Biology: Bio. 175H

For the class of 1992 and beyond, no more than 6 units from individual instruction courses (175H, 195, 198, 199, 290, or 291) may be applied toward the total number of elective units.

Students intending to pursue research careers in biology, especially in ecology, population genetics, or theoretical biology, should be aware that Math. 19, 20, 21, or Math. 41, 42 are minimum mathematics requirements for the B.S. degree in Biological Sciences. Substantial additional training in mathematics, including differential equations, linear algebra, and probability theory, is often highly advisable. Students should consult Biological Sciences faculty for detailed advice on particular needs.

Additionally, even though only two or three quarters of physics are required, students should be aware that many graduate and professional schools (e.g., medicine and education) require a year of general physics with laboratory. Biological Sciences majors are therefore advised to take the year-long physics sequence Physics 21, 22, 23, 24, 25, 26 (or Physics 51, 52, 53, 54, 55, 56, 57, 58).

For students considering taking the 15-unit research course at Hopkins Marine Station during Spring Quarter (175H), or going overseas, fulfillment of as many University distribution requirements as possible in the first two years is recommended. Note that 175H may count toward the departmental requirement as 6 biology elective units if it also is used to substitute for 44Y. Careful schedule planning will guarantee free quarters during the junior and senior years for those courses.

### TYPICAL SCHEDULE FOR A FOUR-YEAR MINIMUM PROGRAM

#### FIRST YEAR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. &amp; Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Chemistry, 31, 33, 35, 36</td>
<td>4</td>
</tr>
<tr>
<td>Math. 19, 20, 21. Calculus and Analytic Geometry</td>
<td>3</td>
</tr>
<tr>
<td>Freshman Requirements or Electives</td>
<td>8</td>
</tr>
<tr>
<td>Totals</td>
<td>15</td>
</tr>
</tbody>
</table>

#### SECOND YEAR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. &amp; Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Biology 31. Principles of Biology</td>
<td>5</td>
</tr>
<tr>
<td>Biology 32. Principles of Biology</td>
<td>5</td>
</tr>
<tr>
<td>Biology 33. Principles of Biology</td>
<td>5</td>
</tr>
<tr>
<td>Biology 44. Core Experimental Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry, 131 or 132; 135. Organic &amp; Physical Chemistry</td>
<td>8</td>
</tr>
<tr>
<td>Distribution Requirements or Electives</td>
<td>3</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
</tr>
</tbody>
</table>
THIRD YEAR

<table>
<thead>
<tr>
<th>Course</th>
<th>A</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 21, 22, 23, 24. Introductory Physics</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Distribution Requirements or Electives</td>
<td>11</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

FOURTH YEAR

<table>
<thead>
<tr>
<th>Electives</th>
<th>A</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

TRANSFER STUDENTS

Due to differences between Stanford undergraduate courses and prerequisites and those of many other institutions, transfer students may face problems not encountered by entering freshmen. Transfer students are strongly urged to visit the Student Services office in Herrin R-211 during Transfer Orientation Week to get credit evaluations and an outlined course program. Course catalogs, syllabi, and/or lecture notes from the former institution are necessary in the evaluation and accreditation process. Transfer students are encouraged to find a faculty advisor soon after arrival.

All transfer courses intended to fulfill department requirements must be evaluated on Evaluation of Transfer Course Content forms (available in the Student Services office) which will be kept in the student's file. This is a departmental procedure that is separate from the process of having units transferred for credit to appear on the Stanford transcript.

HONORS PROGRAM

In order to graduate with departmental honors a student must: (1) complete at least 10 units taken for a letter grade of an approved 199 research project; (2) obtain at least a 3.0 (B) letter grade indicator (LGI) in all Biological Sciences major requirements taken at Stanford (cognate, core, and elective courses). Grades earned from directed reading (198), teaching (290), and research (175H or 199) are not computed into this LGI; (3) submit an honors petition proposal to the department's Undergraduate Studies Committee by January 18 if graduating Spring Quarter; (4) if graduating in June, participate in the Achauer Honors Symposium which takes place Spring Quarter (or, if graduating in a quarter other than Spring, produce a poster); and (5) complete and submit by the end of the quarter of graduation two signed copies of an honors thesis approved by at least two readers (one of whom must be from the faculty of the Department of Biological Sciences). Further information on the honors program is available from the Undergraduate Research Coordinator, Herrin T-252.

PREMEDICAL, PREDENTAL, AND PREPARAMEDICAL REQUIREMENTS

Premedical, predental, and preparamedical students who are not biology majors should take at least the following courses in Biological Sciences: 31, 32, 33, 44XY, 44Y, and such upper division electives as may be recommended by Stanford's Premedical Advising office (Undergraduate Advising Center, Sweet Hall).

COTERMINAL B.S./M.S. DEGREE

The Department of Biological Sciences admits a limited number of undergraduate students to work for coterminal B.S. and M.S. degrees in Biological Sciences. Students should apply to the program between their seventh and eleventh quarters and before they complete 180 units (advanced placement and transfer units inclusive). They are required to submit a complete application which includes a statement of purpose; a Stanford transcript; official GRE scores; two letters of recommendation, at least one of which should be from a faculty member in this department; and a list of courses in which they intend to enroll to fulfill degree requirements. Students must meet all requirements for both B.S. and M.S. degrees. They must complete 15 full-time quarters (or the equivalent), or three full quarters after completing 180 units. Unit requirements for a coterminal program are 180 units for the bachelor's degree and 45 units for the master's degree. A more detailed description of the coterminal master's degree program may be obtained from the Student Services 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 wish 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 in this bulletin or may be obtained from the Credential Administrator, School of Education.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the "School Education" section of this bulletin or address...
an inquiry to the Credential Administrator, School of Education.

**DOCTOR OF PHILOSOPHY**

*Preparation for Graduate Study—* Students seeking entrance to graduate study in Biological Sciences ordinarily should have the equivalent of an undergraduate major in Biological Sciences at Stanford. However, students from other disciplines, particularly the physical sciences, are also encouraged to apply. Such students are advised at the time of initial registration of how they should complete 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 submits applications to the department for approval. The deadline for receipt of applications is December 15. Scores on the general test and the advanced biology test of the Graduate Record Examination (GRE) are required. It is strongly recommended that the GRE be taken in October so that scores are available when applications are evaluated.

Competitive for admission to the Ph.D. program is keen and in recent years it has been possible to offer admission to only 15-20 percent of applicants.

Admitted students are normally offered financial support in the form of biology teaching assistantships, research assistantships, NIH traineeships, or Biological Sciences fellowships. Such awards are for one year and, assuming continuing excellent performance, are renewable as funds permit. It is current policy not to offer financial support from departmental funds beyond the fourth year of graduate study. Grants awarded to individual professors typically support Ph.D. graduate students beyond their fourth year of study, if necessary. Qualified applicants should apply for predoctoral national competitive fellowships, especially those from the National Science Foundation and the Howard Hughes Medical Institute, 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. Some printed information on graduate schools is available in the Bio Bridge office (Herrin T-333), while a more extensive collection is available at the Undergraduate Advising Center in Sweet Hall.

An admitted applicant is required to fulfill the requirements of the University as outlined in the "Degrees" section in this bulletin and the departmental requirements stated below.

Each student must take at least 3 units of coursework under each of four or more Stanford faculty members. Coursework is planned in consultation with the departmental advising committee. All first-year graduate students in the Ph.D. program are required to complete the Biology 301 sequence in the first year.

Teaching experience and training are part of the graduate curriculum. Each student assists in teaching two courses in the department, one of which is a core laboratory course.

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. Seminars are presented under individual course listings or are announced by the various research groups.

A departmental seminar meets on most Mondays at 4 p.m. Topics of current biological interest are presented by speakers from Stanford and 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 committees meet with each student before the first quarter to plan an integrated first-year program, taking into consideration the student's needs in an area of specialization, and deficiencies both in and out of the specialty. 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. 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. The selection of a major professor elsewhere in the University requires special permission from 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 Spring Quarter of the second year,
the student, in consultation with the dissertation committee, submits a dissertation proposal describing an area of specialization and a general outline of proposed research. The student then defends the dissertation proposal in an oral examination administered by the dissertation committee. The exam covers the proposed dissertation and the area of specialization. Success in the departmental oral examination is followed by advancement to candidacy.

The dissertation committee remains active for advice and guidance during the remainder of the 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 to five years.

The dissertation is 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 University oral examination consists of a formal seminar open to the public, followed by a closed session for questioning. The examination is taken after the dissertation is completed in draft form and approved by all members of the reading committee. More information on oral examination procedures is available at the Student Services office.

**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. degree. However, because of family and childbearing 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.

**COURSES**

Additional courses not listed here are frequently offered by selected postdoctoral or advanced Ph.D. personnel in the areas of their special research competence. They are listed in the quarterly *Time Schedule*, with course descriptions available in the Student Services office, Herrin R-211.

**INTRODUCTORY**

2. Current Research Topics in Biological Sciences—Weekly seminars by faculty on current research in biological sciences. Molecular biology and genetics; theory and mathematics in biology; ecology, physiology, and the environment; molecular and cellular aspects of neurobiology, immunology and developmental biology; biological chemistry; behavioral biology; evolution. Primarily for sophomores. Enrollment limited to prospective and declared biological sciences majors. Prerequisite: prior or concurrent enrollment in Biology core.

1 unit, Aut, Win, Spr (Snapp, Staff) Th 12:15

31, 32, 33. Principles of Biology—Comprehensive study of the principles of modern biological sciences, taken in sequence, preferably in the sophomore year. Prerequisites: Chemistry 31, 33, 35. Math. 19, 20, and 21 or 41 and 42.

Students who have taken all or part of the Biology core 40 series should see the Student Services office for information.

31. Biochemistry, Genetics, and Molecular Biology—Core lecture dealing with the biochemical and structural basis of cell function, emphasizing macromolecules (proteins, lipids, carbohydrates, and nucleic acids) and how their structure relates to function and to higher order assembly. Topics: enzyme structure, activity and kinetics, metabolism, hormone control, structural genetics, molecular basis of heredity including nucleic acid and chromosome structure and function, mutagenesis and repair of DNA, and regulation of gene expression. Prerequisites: see above.

5 units, Aut (Long, Simoni) MTWThF 10 plus optional discussion sections

32. Cell, Developmental, and Physiologic Biology—Core lecture covering cell biology, development, and animal physiology. Topics: cell structure and function; basic concepts in determination, differentiation, and morphogenesis; the principles underlying the exchanges of mass and energy between organisms and their environments; and organ and organ system specializations which utilize these principles in adapting organisms to different environments. A major theme is the mechanisms by which the functions of each system are controlled and regulated. Prerequisites: see above.

5 units, Win (Sapolsky, Jones, Walbot) MTWThF 10 plus optional discussion sections
33. Plant and Population Biology—Core lecture covering plant physiology and development, biological diversity, evolution, and ecology. Topics: the control and transmission of variation; evolutionary genetics; physiological, population, community, and ecosystem ecology; and evolution over long time scales. Prerequisites: see above.

5 units, Spr (Vitousek, Watt)

MTWThF 10 plus discussion sections

44X,Y. Core Experimental Laboratory—Two quarters of laboratory projects provide students with a working familiarity with the concepts, organisms, and techniques of modern biological research. Emphasis is on experimental design, critical analysis of data, and written presentation of the experiments. Prerequisites: Chemistry 31 and 33. Recommended: take 44X,Y concurrently with, or subsequent to, Biology or Human Biology core courses. Satisfactory/No Credit only.

44X. 4 units, Win (Watt, Yelton)
labs W, Th, or F 12:30-5:30

44Y. 3 units, Spr (Watt, Yelton)
labs W, Th, or F 12:30-5:30

45. Research Biology—Designed for those who have taken 44X and 44Y to pursue specific experiments in greater detail. Also, a possible entry into an honors project.

3 units, Aut (Woodward) discussion
Th 2-4 or by arrangement

50A,B. Biology and the Oceans—Introduction to life in the sea. Aspects of organismal diversity, ecology, biogeography, biological and physical oceanography. A broad background for those interested in pursuing studies in the marine sciences, and a general overview of the subject for non-majors. (DR:7)

50A. Lectures only.
3 units (Denny, Staff) alternate years, given 1991-92

50B. Lectures and two weekend field trips to Hopkins Marine Station. The latter provide "hands on" experience with the marine world: may include collecting trips to the Monterey submarine canyon and the intertidal zone of the Big Sur coast; whale observations on Monterey Bay; laboratories dealing with fertilization of sea urchin eggs, octopus behavior, wave dynamics, etc.; a tour of the Monterey Bay Aquarium. Accommodations provided by Hopkins Marine Station. Enrollment limited to 40.

4 units (Denny, Staff) alternate years, given 1991-92

67/167. Biological and Social Perspectives on Tobacco—(Same as Human Biology 122; undergraduate Biological Sciences majors enroll in 67, law and graduate students in 167; not an upper division elective course for the Biological Sciences major.) Tobacco as an instructive example of how biology and culture interact. Tobacco and tobacco use from the perspectives of biology, medicine, history, economics, psychology, and law. Enrollment limited to 50.

3 units, Spr (Long, Greely)

96A,B. Jasper Ridge Biological Preserve Docent Training Program—Two-quarter preparation for students to serve as docents in the Jasper Ridge Biological Preserve. Aspects of natural history of plants and animals, ecology, archaeology, geology, meteorology, etc., are presented by a variety of faculty and staff. Satisfactory/No Credit only. Prerequisite: consent of the Jasper Ridge program coordinator. Apply before November 15.

2 units, Win, Spr (Vitousek) Th 1:30-5

ADVANCED UNDERGRADUATE AND GRADUATE

102. Biology of Marine Communities—Treats a set of marine communities by considering physical environment, resident species, their biology and interactions, population and community structure and dynamics, and selected topics related to those communities. Emphasis on local coastal communities. Provides a background in the natural history of marine systems and the issues confronted by marine research. Prerequisite: 33, or equivalent.

3 units, Win (Baxter) MT 3:15-4:30 alternate years, not given 1991-92

105. Biological Circadian Rhythms—Biological clocks that sense daily cycles are analyzed in a variety of organisms. Physiological, genetic, and biochemical approaches to understanding mechanisms of the oscillator and its blue light photoreceptor. Learning how organisms track time. Prerequisite: Biology or Human Biology core.

3 units, Spr (Woodward) TTh 11 alternate years, not given 1991-92

105H. Subtidal Communities—Lectures, laboratory, and field trips treating shallow water marine communities. Emphasis on local habitats and the introduction of 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. Taught at Hopkins Marine Station. Apply to Hopkins.

6 units, Sum (Staff)
107. Theory of Development—Theories which account for the progression of the cell through its cycle and for the progression of the embryo through its development. Unsolved problems of the origin of form and pattern are addressed from a biophysical perspective. Prerequisites: 31, 32, or equivalent. Recommended: some interest in physics and/or mathematics.

3 units, Spr (Green) MWF 2:15

108. Developmental Biology—The principles of developmental biology and their application to the major processes responsible for the development of multicellular animals, particularly vertebrates. Topics: the regulation of gene activity in early development and the differentiation and morphogenesis of selected organ systems (limb, sex, eye, etc.). Critical analysis of the experimental foundations of our current knowledge of developmental biology. Prerequisite: Biology or Human Biology core. Limited enrollment.

4 units (Staff)

110. Vertebrate Biology with Lab—The evolution, structure, function, and behavior of vertebrates. Prerequisite: Biology or Human Biology core. Limited enrollment.

5 units (Staff)

111. Evolutionary Genetics—Genetics as related to the processes of organic evolution. Theoretical and empirical treatment of population genetics, consideration of field, human genetic studies, aspects of molecular evolution, and coevolution.

3 units, Spr (Ehrlich, Watt) alternate years, not given 1991-92

112. Human Physiology—The functioning of organ systems, emphasizing mechanisms of control and regulation. Topics: structure and function of endocrine and central nervous systems, cardiovascular physiology, respiration, salt and water balance, exercise and gastrointestinal physiology. Lectures and discussion. Prerequisite: Biology or Human Biology core. Enrollment limited to 120.

4-5 units, Win (Heller, Lawry) MWF 9

113H. Introduction to Oceanic Biology—The ocean as an environment: its major categories of inhabitants, producer and consumer, benthic and pelagic, invertebrate and vertebrate; and the functioning of the oceanic ecosystem. Taught at Hopkins Marine Station. Apply to Hopkins.

6 units, Sum (Staff)

114. Scientific Philosophy and Bioethics—The philosophy of science analyzed from various perspectives (philosophy, science, politics, society), and treated from historical and contemporary considerations. Emphasis on 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

115. Evolutionary Ecology—(Same as Human Biology 102.) The fundamental concepts of evolutionary ecology, including population growth equations, foraging, reproductive and life history strategies, predator/prey, and competitive and mutualistic interactions among species. Prerequisites: Human Biology 2A, or Biology 33, or equivalent; Math. 20 or 41, or equivalent; or consent of instructor.

4 units, Aut (Boggs) MWF 1:15

117. Biology and Global Change—Biological causes and consequences of anthropogenic and natural changes in the atmosphere, oceans, and terrestrial and freshwater ecosystems. Topics: glacial cycles and marine circulation, greenhouse gases and climate change, tropical deforestation and species extinctions, and human population growth and resource use. Prerequisites: Biology or Human Biology core or graduate standing in any department.

3 units, Win (Vitousek, Mooney) MWF 1

118. Genetics—Basic genetic principles as developed in and applied to eukaryotes and to prokaryotes and their viruses. Transmission of genetic factors, methods of genetic mapping, and recombination. Prerequisites: Biology core.

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


3 units, Win (Schimke, Yanofsky)

120. General Botany—The diversity of plant groups plus an introduction to the structure, development, physiology, and ecology of higher plants. Prerequisites: Biology or Human Biology core, or permission of instructor.

5 units, Aut (Fultz, Ray) MWF 11 lab T 2:15-5:05 plus discussion

121. Cell Biology—A molecular approach to the study of cellular structure and function. Topics: evolution and assembly of cell structures and organelles; bi membranes; cytoskeleton and motility, cell growth and differentiation; cell-cell interactions, signal transduction, and role of oncogenes. Emphasis is on an experimental perspective focusing on the design of experiments and critical analysis of data. Pre-
132. Replication of DNA—Modes of DNA replication and their control in prokaryotic and eukaryotic systems. Critical review of current literature in seminar format. Prerequisite: 31 and/or consent of instructor.
3 units, Aut (Hanawalt) TTh 4:15-5:30
alternate years, not given 1991-92

136H. Cell Biology of Early Development—Five-week workshop on cellular phenomena seen during early embryonic development, properties of sperm and egg, fertilization, mitosis and cell division, early morphogenesis of the embryo, and determination and polarity. Gametes of marine organisms are utilized emphasizing experimentation and observation of living cells, including their microscopy, micromanipulation, and chemistry. Post-graduate level course but advanced undergraduates considered. Taught at Hopkins Marine Station. Apply to Hopkins.
6 units, Sum (Epel, Mazia)

137. Maize Genetics—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: Biology core, 118, or consent of instructor.
2-3 units, Spr (Walbot) MW
alternate years, not given 1991-92

138H. Biomechanics of Intertidal Organisms—Introduction to the mechanical design of waveswept organisms, emphasizing the ecological implications of wave forces. The basic theories of water waves, fluid dynamics and solid mechanics, and the applications of theory to understanding the design of materials, structures, whole organisms, and communities. Laboratory work on the various techniques of intertidal biomechanics. Each student completes an individual research project. Recommended: background in invertebrate zoology, algology, or intertidal ecology; also basic physics and calculus. Taught at Hopkins Marine Station. Apply to Hopkins.
6 units, Sum (Denny)
alternate years, not given 1991-92

141. Biostatistics—Introduction to the statistical analysis of biological data. Lectures, discussion, and student exercises. (DR:6)
4-5 units (Feldman) given 1991-92

142H. Ecophysiology and Molecular Biology of Marine Macrophytes—The rich marine environments at Hopkins Marine Station introduce taxonomy and distribution of marine
algae and seagrasses; characteristics of the intertidal and subtidal regions; and physiological, cellular, and molecular bases of adaptation by marine macrophytes. Individuals or teams of students conduct research and report results of projects researched during the last two weeks.

6 units, Sum (Staff) by arrangement

149. Neural Basis of Sleep and Circadian Rhythms—Review of current research. The phenomenon of sleep from neurophysiological, neurochemical, and neuroendocrinological aspects. The pathology of sleep, thermoregulation and sleep, hibernation, and the interactions between sleep pattern and circadian rhythms. Prerequisite: 32, Human Biology 4A, or equivalent. Enrollment limited to 20.

3 units, Aut (Heller) MWF 9-10:30

153. Introduction to the Nervous System: Cell Signaling and Behavior—(Same as Psychology 107.) A survey of neural mechanisms and interactions underlying behavior. Recommended: 32 or Human Biology 4A.

4 units (Wine)

alternate years, given 1991-92

154/254. Cellular and Molecular Neurobiology—(Graduate students enroll in 254.) The function of the nervous system at the cellular and molecular level. Membrane biophysics, synaptic transmission, axonal transport, biochemistry and molecular genetics of neuronal function, and their relationship to behavior. Prerequisites: 32 and 153 (Psychology 107), or consent of instructor.

3 units (Scheller, Schulman)

alternate years, given 1991-92

155/255. The Molecular Basis of Learning and Memory—(Same as Pharmacology 211; graduate students enroll in 255.) Signal transduction mechanisms. Receptors, channels, second messengers and protein kinases in the context of learning and memory paradigms. Prerequisites: 32, 153.

3 units, Spr (Scheller, Schulman)

TTh 1:15-2:30

alternate years, not given 1991-92

156. Plant Physiology—Physiological functions of land plants from analytical and quantitative points of view; photosynthetic energy and gas exchange; water and photosynthetic long-distance transport; mineral nutrient ion uptake and transport; growth at cellular and organismal levels, and its hormonal regulation; responses to light, gravity, temperature, etc. Prerequisites: Biology core.

4 units (Ray, Briggs)

alternate years, given 1991-92

157. Plant Biochemistry—Biomechanical basis of plant structure and function: mechanisms of photosynthesis and plant respiration; mineral metabolism, including N₂ fixation; special features of plant nuclear and organelle genome; cell wall polymers; protein and polysaccharide biosynthesis and its regulation; formation and mobilization of storage reserves; biosynthetic pathways for hormones, pigments, and other secondary products. Prerequisites: Biology core or permission of instructor. Recommended: 120 and Biochemistry 200.

3 units, Win (Long, Ray, Grossman, Berry) MWF 10

alternate years, not given 1991-92

158/258. Developmental Neurobiology—(Graduate students enroll in 258; same as Neurobiology 209.) Lecture seminar for advanced undergraduates and graduate students. Principles of nervous system development from the molecular control of development and the role of cell-cell interactions and trophic factors, to the level of neural systems and the role of experience in influencing brain structure and function. Topics: cell lineage, neurogenesis, neuronal migration, axon pathfinding and elongation, synaptic stabilization, and critical periods in development. Prerequisite: 32 or equivalent; 153, Neurobiology 200, or consent of instructors.

3 units, Spr (McConnell, Shatz, Skene)

TTh lectures, Th evening graduate seminar

alternate years, not given 1991-92

158H. Problems in Marine Ecology—Group and individual research projects dealing with local marine habitats. Focus varies each summer to exploit current opportunities or interests. Students develop background and research interests during 105H or 113H or have equivalent experience and plan and carry out research in interaction with faculty. Results are prepared as a scientific paper and presented at a course symposium.

6 units (Baxter) by arrangement

163/263. Human Behavioral Biology—(Same as Human Biology 109; graduate students enroll in 263.) The biological bases of normal and abnormal human behavior are examined to train students in approaching complex behaviors in a multidisciplinary way. Relevant disparate disciplines: sociobiology, ethology, neuroscience, and endocrinology are integrated in examining behaviors such as aggression, sexual behavior, language use, mental illness.

5 units (Sapolsky)

alternate years, given 1991-92
3 units, Aut (Staff) MWF 10 and discussion section F 12

168. Vegetation and Fire—The past and present role of fire in the evolution and maintenance of vegetation types, with reference to the diverse California flora. Prerequisite: consent of instructor.
3 units, Win (J. Thomas) W 2:15-4:05 alternate years, not given 1991-92

170. Microscopy for Biologists—Broad survey of methods which use light and other radiation (electrons, x-rays) for analysis of cells in biological and medical research. Topics range from cell sorters and holography through polarized light and electron microscopy. Lectures cover the physical principles. The laboratory involves partial assembly and extensive use of pertinent instruments. Prerequisites: 31, 32 and 44X, 44Y.
3 units, Aut (Green) TTh 1:15

175H. Problems in Marine Biology—Lectures, laboratory work, field studies, and individual problems. Designed primarily to engage advanced graduates in research. Spring Quarter is in residence at the Marine Station, Pacific Grove. See pamphlet Hopkins Marine Station. Prerequisites: junior or senior standing in biological sciences, and permission of instructors.
15 units, Spr (Baxter, Denny, Epel, Gilly, Powers, S. Thompson)

3 units, Win (Roughgarden) TTh 10

178. Biology of Natural Populations—Introduction to independent study of natural populations. Jasper Ridge Biological Preserve serves as an outdoor laboratory. Prerequisite: consent of instructor.
4 units, Spr (Mooney) by arrangement alternate years, not given 1991-92

180. Conservation Biology—Introduction to the science of preserving biological diversity, its principles, policy, and application. Topics: biology of small populations, extinction, minimum viable population analysis, habitat fragmentation, reserve design and management, the endangered species act, and conflict mediation. Case studies illustrate topics. Prerequisites: 33, Human Biology 2A, or consent of instructor.
3 units, Win (Boggs)

180L. Conservation Biology Laboratory—Introduction to the practice of conservation biology: preparation of biological portions of EIRS, field trips highlighting local conservation issues, computer exploration of population dynamics, techniques of data analysis, small projects with direct application of scientific principles to solve problems in conservation biology. Corequisite: 180. Prerequisites: 33 or Human Biology 2A.
2 units, Win (Boggs)

183. Colloquium on Population Studies—A series of talks by distinguished speakers, introducing a wide variety of topics in population studies.
1 unit, Win (Feldman, Arthur) W 4:10-5:30 alternate years, given 1991-92

184. Biology of Insects—Introduction to the functional biology of insects. Insect anatomy, biochemistry, behavior, ecology, physiology and systematics, and more specialized topics illustrating or emphasizing unusual features of insects which make them attractive as objects of research. Prerequisite: Biology core or consent of instructor.
3-5 units (Watt) alternate years, given 1991-92

188. Ecosystems of the Tropics—Tropical ecosystems ranging from lowland rainforest to savanna, from shifting cultivation to high-elevation ecosystems. Emphasis on regulation of ecosystem structure and function. Half lecture, half seminar; specific content depends in part upon student participation. Prerequisite: Biology, Human Biology, or Engineering cores.
2-3 units (Vitousek) alternate years, given 1991-92

189. Biology of Birds—The ways birds interact with their environments and each other; emphasis on studies that had broad impact in the fields of population biology, community ecology, and evolution. Field trips introduce students to local bird communities and emphasize bird identification and behavior. One-hour lecture and a three-hour lecture/field trip per week. Prerequisites: 33 or equivalent, and consent of instructor. Limited to 20 students.
3 units, Spr (Ehrlich) M 10 Th 8-12 alternate years, not given 1991-92

190. Population Biology of Butterflies—Lectures on field studies of the dynamics and genetics
of butterfly populations, life histories, and resource utilization. Also, the evolution and taxonomy of this group of insects, which has become a key research tool in population biology. Lab includes field work on *Euphydryas* populations now under study on campus and elsewhere in California. Students must register both quarters for field work credit. Prerequisites: 33 and consent of instructor.

2-3 units, Win (Ehrlich) TTh 1:15-3:05
2-5 units, Spr alternate years, not given 1991-92

191. Research in Bird Biology—Semi-independent field research in ornithology, emphasizing ecological relationships. Projects complement on-going research, planned and carried out by the student in consultation with the instructor. Results are written in publication format. Prerequisites: 33 or 115, concurrent or subsequent enrollment in 189, and consent of instructor. Enrollment limited.

3 units, Win, Spr (Ehrlich) 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, Field, J. Thomas, Vitousek) by arrangement

198. Directed Instruction/Reading—May be taken as a prelude to research for one quarter only and may also involve participation in a laboratory or research group seminar and/or library research. Credit for work arranged with out-of-department instructors restricted to Biological Sciences majors and requires departmental approval. (See Undergraduate Research Coordinator before enrolling.)

199. Undergraduate Research—Individual research taken by arrangement with in-department or out-of-department instructors. Credit for work arranged with out-of-department instructors restricted to Biological Sciences majors and requires departmental approval. (See Undergraduate Research Coordinator before enrolling.) Completion of 10 units of 199 may be applied toward graduation with departmental honors. See description of honors program above.

PRIMARILY FOR GRADUATE STUDENTS

205. DNA Repair and Mutagenesis—(Same as Radiation Oncology 205, Pathology 292.) 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: 31, 118, and 119, or consent of instructor.

3 units, Spr (Hanawalt, Smith) TTh 1:15 alternate years, not given 1991-92

209. Advanced Neurosciences Laboratory—The use of equipment and techniques required to record and analyze extracellular and intracellular neural activity in vertebrates and invertebrates. In-depth training in a subset of these techniques as applied to a specific research project. Prerequisites: Biological Sciences or Human Biology core sequence and core lab (44 or equivalent). Recommended: some advanced coursework in neurobiology. Enrollment limited to 10; admission by application (available in Herrin T23 and Herrin R07). Satisfactory/No Credit only.

4 units, Spr (Heller, Gilly) W 1:15-5:05 and by arrangement

212. Advanced Topics in Cell Biology and Physiology—The organization, assembly, and dynamics of eukaryotic cells. Topics vary each year but may include: membrane receptors and signal transduction, cell-cell contacts, transport of ions and solutes, interaction with the extracellular matrix, organelle and membrane biogenesis. Emphasis on process rather than structure, i.e., mechanisms and significance of cell-cell and cell-substratum interaction, and intracellular transport of organelles. Lectures/reading stress classical and current research literature. Prerequisites: Biochemistry 200 and 201, or consent of instructor.

3 units (Kopito) alternate years, given 1991-92


3 units, Win (Campbell) MWF 9

215. Biochemical Evolution—Lectures/discussion covering biochemical viewpoints on diverse aspects of the evolutionary process. Topics: 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: Biological core or substantial equivalent.

3 units, Win (Watt) MWF 10

228. Advanced Plant Systematics—Individual study of various aspects of the systematics of
vascular plants, depending upon the interests of students. Prerequisite: consent of instructor.  
2-5 units, Aut, Win, Spr (J. Thomas)  
by arrangement

230. Topics in Immunology—Basic elements of the immune system: structure and functions of antibody molecules; cellular basis of immunity and its regulation; molecular biology of antigen recognition structures, genetics of immunity and disease susceptibility. For graduate students and advanced undergraduates. Prerequisite (for undergraduates): Biology core or consent of instructor.  
4 units, Aut (Jones) MWF 10

237H. Air and Water: The Physics of Life’s Media—Introduction to the physics of air and water and how they have affected the evolution of plants and animals. Lectures and student discussions on topics including: density, viscosity, sound conduction and reception, thermal effects, discussion, surface tension, waves, optical and electrical properties. Prerequisite: consent of instructor.  
2 units, Aut (Denny) by arrangement

4 units (Schimke)  
alternate years, given 1991-92

250H. Video Microscopy and Image Processing—Advanced study of principles and confocal laser microscopy applications of digital image processing for observation of biological material. The goal is hands-on experience with a wide range of commercially available equipment. The laboratory is staffed by manufacturers’ representatives. Guest lecturers discuss application of the methods to cell biology. Offered to graduate and postdoctoral students and faculty. Taught at Hopkins Marine Station. Apply to Hopkins.  
6 units, Sum (Thompson)  
by arrangement

252. Gene Action—Lectures and seminars on aspects of gene structure and function, and regulation of gene expression in microorganisms. Prerequisite: Biochemistry 201 or equivalent.  
3 units (Yanofsky)  
alternate years, given 1991-92

3-4 units, Win (F. Thomas)  
by arrangement

3 units (Karlin, Feldman)  
alternate years, given 1991-92

283. Theoretical Population Genetics—Detailed survey of models in population genetics. Includes 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 (Feldman)  
alternate years, given 1991-92

290. Teaching of Biological Science—Practical experience in teaching laboratory biology or serving as an assistant in a lecture course. Open to upper division and graduate students.  
Aut, Win, Spr (Staff) by arrangement

291. Teaching of Biological Science Core Laboratories—Preparation for teaching the core laboratories courses (44X and 44Y). Must be taken prior to taking 290 and teaching either of the above courses. Prerequisite: permission of instructor. Satisfactory/No Credit only.  
1 unit, Aut, Win (Watt, Yelton) T 4-6 p.m.

300. Research—Individual research at the graduate level taken by arrangement with in-department or out-of-department instructors. For coterminal master’s students: credit for work with out-of-department instructors requires a
300H. Research—To be used for graduate research done under supervision of Hopkins Marine Station faculty.

301. Current Topics in Biology—Lectures in areas of the faculty’s current research interests. Enrollment limited to Biological Sciences Ph.D. students in the first year of graduate study. Satisfactory/No Credit only.
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.
1-3 units, Aut, Win, Spr (Mooney) by arrangement

305. Seminar in DNA Repair and Genetic Toxicology—Literature review and discussion of current research, emphasizing experimental approaches for studying DNA damage processing in bacteria and mammalian cells. Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Hanausakul) F 10-12

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

333H. Molecular Approaches to Ion Channels—Advanced treatment of the function and regulation of ion channels and molecular-level methods of study. Daily lectures and intensive laboratory provide a working knowledge of whole cell/single channel patch clamp, voltage clamp of oocytes in conjunction with microinjection and expression of mRNA, and biochemical analysis of channel synthesis and processing. Emphasis on biophysical analysis of channel gating, identification of channel subtypes and routes to their production, and spatial localization of channels on living cells. Taught at Hopkins Marine Station. Apply to Hopkins.
6 units, Sum (Gilly) by arrangement

335. Seminar in Immunobiology and Immunogenetics—Literature review of current topics in immunology. Prerequisites: introductory immunology course and consent of instructor.
1-2 units, Aut, Win Spr (Jones) M 12:15

341. Plant Developmental and Cell Biology—Principles of plant development including clonal analysis, growth analysis, and meristem function. Lectures, discussion, and laboratory.
3 units, Aut (Green, Walbot) MWF 9 alternate years, not given 1991-92

342. Plant Biology Seminar—Topics announced at the beginning of each quarter. In depth coverage of the current literature.
1 unit, Spr (Berry, Bjorkman, Briggs, Grossman, Long, Ray, Vitousek, Walbot) T 5

343. Plant Molecular Biology—Review of genome structure, transposable elements and transformation techniques of higher plants followed by in-depth analysis of current literature on plant gene expression. Lectures and discussion section.
3 units (Walbot, Hoffman, Long, Grossman) alternate years, given 1991-92

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, Long, Simoni, Walbot, Woodward, Yanofsky) M 12

346. Seminar in Regulatory Biology—Literature review of selected topics in eukaryotic regulatory biology. Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Schimke) T 12

349. Seminar in Population Ecology—Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Ehrlich) by arrangement

354. Seminar in Population Biology—Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Ehrlich, Roughgarden, J. Thomas, Vitousek, 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.
1-3 units (Feldman) given 1991-92

384. Seminar in Theoretical Ecology—Discussions of recent and classical research papers in ecology, and presentation of work in progress by seminar participants. Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Roughgarden) by arrangement
DIVISION OF MARINE BIOLOGY HOPKINS MARINE STATION

Emeriti: (Professors) Isabella A. Abbott, Arthur C. Ciese, Daniel Mazia, John H. Phillips, Jr., Colin S. Pittendrigh
Director: Dennis A. Powers
Professors: David Epel, Dennis A. Powers, Jonathan Roughgarden
Associate Professors: Mark W. Denny, William F. Gilly, Stuart H. Thompson
Courtesy Professor: Irving L. Weissman
Senior Lecturer: Charles H. Baxter

The Hopkins Marine Station is at Pacific Grove, on the south side of Monterey Bay, 90 miles from the main University campus. The 11-acre grounds, on the main portion of Cabrillo Point, include a sheltered landing place and storage for small boats. Buildings include the Lawrence Blinks Laboratory, the Alexander Agassiz Laboratory, the Jacques Loeb Laboratory, the Harold A. Miller Library, the Monterey Boat Works, 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 pamphlet Hopkins Marine Station, or write Hopkins Marine Station, Pacific Grove, CA 93950.

SUMMER PROGRAM

The summer program is open to all advanced undergraduate, graduate, postdoctoral students, and teachers whose biological backgrounds, teaching or research activities can benefit from a summer's study of marine life. Application blanks and further information may be obtained by writing to Hopkins Marine Station, Pacific Grove, CA 93950. Completed applications should be submitted by March 31. Applications received later are considered if space is still available.

The Summer Quarter is divided into two terms of five weeks each. It is possible to register for either term, or for the full quarter. Registration is possible for only one course during each five-week session.

COURSES
AUTUMN, WINTER, AND SPRING

175H. Problems in Marine Biology—Lectures, laboratory work, field studies, and individual problems. Designed primarily to engage advanced undergraduates in research. Spring Quarter is in residence at the Marine Station, Pacific Grove. See the pamphlet, Hopkins Marine Station. Prerequisites: junior or senior standing in biology, and permission of instructors.
15 units, Spr (Baxter, Denny, Epel, Gilly, Powers, Thompson) by arrangement

199H. Undergraduate Research—For experience in biological research, qualified undergraduate students may undertake individual work in the fields listed under 300H. Preference to Stanford students who have already completed 175H and wish to continue their studies, and to Stanford biology students enrolled in the Coterminal M.S. Program. Arrangements must be made by consultation or correspondence. (Staff) by arrangement

237H. Air and Water: The Physics of Life's Media—Introduction to the physics of air and water and how they have affected the evolution of plants and animals. Lectures, discussions on: density, viscosity, sound conduction and reception, thermal effects, diffusion, surface tension, waves, optical and electrical properties. Prerequisite: consent of instructor.
2 units, Aut (Denny) by arrangement

300H. Research—Graduate study involving original work may be undertaken with members of the staff in the fields indicated:
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: Membrane physiology of nerve and muscle cells; control of sodium and calcium ion channels and of excitation-contraction coupling. Comparative neuromuscular physiology of marine invertebrates.
D. Mazia: Cell Reproduction—Mitosis, cell division, and cell cycles in eggs of marine invertebrates.
D. Powers: Adaptational Biochemistry and Molecular Evolution.
D. Powers: Adaptational Biochemistry and Molecular Evolution.


S. Thompson: Neurophysiology—Neuronal control of behavior and mechanisms of ion permeation in membranes.

SUMMER

FIRST TERM

105H. Subtidal Communities—Lectures, laboratory, and field trips treating shallow water marine communities. Emphasis on local habitats and the introduction of 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

136H. Cell and Molecular Biology of Early Development—Five-week workshop on cellular phenomena seen during early embryonic development, properties of sperm and egg, fertilization, mitosis and cell division, early morphogenesis of the embryo, and determination and polarity. Gametes of marine organisms are utilized; emphasis on experimentation and observation of living cells, including their microscopy, micromanipulation, and chemistry. Post-graduate level course but advanced undergraduates considered.

6 units (Epel, Mazia) by arrangement

138H. Biomechanics of Intertidal Organisms—Introduction to the mechanical design of wave-swept organisms emphasizing the ecological implications of wave forces. The basic theories of water waves, fluid dynamics and solid mechanics, and the applications of theory to understanding the design of materials, structures, whole organisms, and communities. Laboratory work on the various techniques of intertidal biomechanics. Each student completes an individual research project. Recommended: background in invertebrate zoology, algology, or intertidal ecology; also basic physics and calculus.

6 units (Denny) by arrangement, alternate years, not given 1991-92

142H. Ecophysiology and Molecular Biology of Marine Macrophytes—The rich marine environments at Hopkins Marine Station introduce taxonomy and distribution of marine algae and seagrasses; characteristics of the intertidal and subtidal regions; and physiological, cellular, and molecular bases of adaptation by marine macrophytes. Individuals or teams conduct and report results of research during the last two weeks.

6 units (Staff) by arrangement

199H. Undergraduate Research—(See 199H above, Autumn, Winter, and Spring Quarters.)

300H. Research—(See 300H above, Autumn, Winter, and Spring Quarters.)

SECOND TERM

113H. Introduction to Oceanic Biology—The ocean as an environment: its major categories of inhabitants, producer and consumer, benthic and pelagic, invertebrate and vertebrate; and the functioning of the oceanic ecosystem. Prerequisite: introductory biology or general zoology.

6 units (Staff) by arrangement

158H. Problems in Marine Ecology—Group and individual research projects dealing with local marine habitats. Focus varies each summer to exploit current opportunities or interests. Students develop background and research interests during 105H or 113H or have equivalent experience, and plan and carry out research in interaction with faculty.

6 units (Baxter) by arrangement

250H. Video Microscopy and Image Processing—Advanced study of principles and confocal laser microscopy applications of digital image processing for observation of biological material. The goal is hands-on experience with a wide range of commercially available equipment. The laboratory is staffed by manufacturers’ representatives. Guest lecturers discuss application of the methods to cell biology. Offered to graduate and postdoctoral students and faculty.

6 units (Thompson) by arrangement

286H. Theoretical Ecology—The evolution of marine life histories, beginning with a review of terrestrial life history and the evidence relating to that theory. Phenomena that a marine life history theory should explain. New theoretical formulations appropriate to marine organisms. Prerequisites: course in ecology and evolutionary biology, and one year of calculus.

6 units (Roughgarden) by arrangement, alternate years, not given 1991-92

300H. Research—(See above 300H, Autumn, Winter, and Spring Quarters.)

333H. Molecular Approaches to Ion Channels—Advanced treatment of the function and regulation of ion channels and molecular-level methods of study. Daily lectures and intensive laboratory provide working knowledge of whole cell/single channel patch clamp, voltage clamp of oocytes in conjunction with microinjection and expression of mRNA, and biochemical analysis of channel synthesis and processing. Emphasis on biophysical analysis of channel gating, identification of channel subtypes and routes to
my production, and spatial localization of channels on living cells.
6 units (Gilly) by arrangement

COMMITTEE ON BLACK PERFORMING ARTS

Director: To be announced
Committee in Charge: Keith Archuleta (Black Community Services Center), Rachel Bagby (Martin Luther King, Jr. Papers Project), Harry Elam (Drama), Anna Deavere Smith (Drama), Halifu Osumare (Dance), John Rickford (Linguistics). Also student representatives from the Kuumba Arts/Kuumba Dance Ensemble.

The Committee on Black Performing Arts is an interdisciplinary program supporting the presence of Black art forms at Stanford. Started as a student project in 1968, the committee became an official University program in 1972. It functions as a (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 cultural tradition. 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 basis 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 5.) The development of Black drama in the U.S. from 1858 to the present.
4 units, Aut (Elam)

29. Theater Performance: Acting—(Enroll in Drama 29.) Students cast in committee productions may receive credit for their participation as actors.
1-3 units, any quarter (Staff)

39A, B, C. Theater Performance: Crew—(Enroll in Drama 39A, B, C.) Students receive credit for participation in the design and technical areas of departmental productions.
1-3 units, any quarter (Staff)

59A, B, C. Dance Theater Production—(Enroll in African and Afro-American Studies 59.) Students may receive credit for technical and dance performance in committee productions.
1-5 units, Aut, Win, Spr (Osumare)

105. Introduction to African and Afro-American Studies—(Enroll in African and Afro-American Studies 105, Anthropology 105.) Lectures explore interdisciplinary interpretations of several representative aspects of African and Afro-American social and cultural institutions. Topics: retained Africanisms, slavery, the Black family, Afro-American artists, and Afro-American identity. (DR:5*)
5 units, Win (Wynter)

154N. American Drama: 1920s to the 1960s—(Enroll in Drama 154N.) Survey focusing on the development of American drama through an analysis of representative works and stylistic devices. (DR:2)
4 units, Win (Elam)

157N. Contemporary Black Playwrights—(Enroll in Drama 157N.) The dramaturgy (thematic issues, styles, and aesthetics) of contemporary playwrights in the U.S., the Caribbean, and Africa. The concept of an African Diaspora or cultural continuity between Africa and the Americas is the premise; also explores diversity among the various societies represented. (DR:2)
4 units, Spr (Elam)

5 units, Aut (Drake)

182. Jazz Dance II—(Enroll in Dance 182.) Intermediate level emphasizing alignment, control, rhythmic coordination, and the learning of movement combinations. Prerequisite: 81 or equivalent.
1 unit, Aut, Win, Spr (Osumare)

183. Jazz Dance III—(Enroll in Dance 183.) Advanced; emphasizes jazz performance techniques. Prerequisite: audition second day of class.
1 unit, Win (Osumare)

185. African-Caribbean Roots of American Jazz Dance—(Enroll in Dance 185.) Traditional African and Caribbean dance forms and their influences on American concert Jazz dance, and American social dance forms. Some live drumming accompaniment. Reading materials and lectures support a dance historical approach.
2 units, Aut (Osumare)

186. African-Caribbean Dance Techniques—(Enroll in Dance 186.) Based on the Katherine
Dunham technique, which utilizes traditional African diasporic dance forms and contemporary modern dance. Warmups include the Dunham barre exercises and across-the-floor progressions. Traditional dances are taught as a part of the anthropological source material for the technique. Four lecture classes and reading materials are required.

2 units, Spr (Osumare)

CHEMISTRY*

Chairman: Harden M. McConnell
Professors: Hans C. Andersen, Steven G. Boxer, John I. Brauman, James P. Collman, Carl Djerassi, Michael D. Fayer, Keith O. Hodgson, Wray H. Huestis, Harden M. McConnell, Robert Pecora, John Ross, Edward I. Solomon, Barry Trost, Paul A. Wender, Richard N. Zare; (by Courtesy) Michael J. Boudart, Robert J. Madix
Assistant Professors: Wesley D. Allen, Dale G. Drueckhammer, Steven M. George, John H. Griffin, Lisa A. McElwee-White, Robert M. Waymouth

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

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.

MINIMUM REQUIREMENTS

University writing and distribution requirements: Mathematics 19, 20, 21, 43; 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, 175, 176, 178. 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. 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 Satisfactory/No Credit basis.

TYPICAL SCHEDULE FOUR-YEAR PROGRAM

FIRST YEAR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 31. Chemical Principles</td>
<td>A W S 5</td>
</tr>
<tr>
<td>Chem. 33. Structure and Reactivity</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 35. Monofunctional Compounds</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 36. Chemical Separations</td>
<td>3</td>
</tr>
<tr>
<td>Math. 19, 20, 21. Calculus and Analytic Geometry</td>
<td>3 3 3</td>
</tr>
<tr>
<td>Writing and Distribution Requirements</td>
<td>8 8 8</td>
</tr>
<tr>
<td>or Electives</td>
<td>15 15 15</td>
</tr>
</tbody>
</table>

SECOND YEAR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 131. Polymolecular Compounds</td>
<td>A W S 5</td>
</tr>
<tr>
<td>Chem. 132. Qualitative Organic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 133. Special Topics in Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Chem. 134. Theory and Practice of Quantitative Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Chem. 135. Synthesis Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>Math. 43. Analytic Geometry and Calculus</td>
<td>5</td>
</tr>
<tr>
<td>Physics 51, 53-54. Mechanics, Sound, Electricity</td>
<td>4 5</td>
</tr>
<tr>
<td>Electives (see Note below)</td>
<td>3 6 7</td>
</tr>
<tr>
<td>Totals</td>
<td>16 18 15</td>
</tr>
</tbody>
</table>

THIRD YEAR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Qtr. and Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 151, 153. Inorganic Chemistry</td>
<td>A W S 5</td>
</tr>
<tr>
<td>Chem. 171, 173, 175. Physical Chemistry</td>
<td>3 3 3</td>
</tr>
</tbody>
</table>

* The curriculum leading to the B.S. degree in Chemical Engineering is described in the "School of Engineering" section in this bulletin.
CHEMISTRY 313

CHEM. 176 Physical Chemistry
Laboratory 3
Physics 55-58 5 4

Totals 8 10 9

FOURTH YEAR

Chem. 178
Electives (see Note below) 15 11 15

Note—Elective courses must be used to complete the University Writing, Distribution, and Language Requirements. They may also be used to broaden one'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: Biochem. 200, 201; Biol. Sci. 31, 32, 35; Chem. Engr. 20, 120, 130; Civ. Engr. 170; Comp. Sci. 106; Econ. 1; English 191; Engr. 50; Geol. 1, 278; Math 44, 106, 113, 130, 131, 132; Mat. Sci. & Engr. 50; Microbio. & Immun. 101; Physics 110, 111, 132; Stat. 40, 110, 116.

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 6 units from Chemistry 136 and/or 190; and at least 3 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 German or Russian is strongly recommended.

HONORS PROGRAM

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 receive the degree of Bachelor of Science in Chemistry with Honors.

Admission to the program requires a letter grade indicator (LGI) of at least "B" in all coursework in the University. In addition to the minimum requirements for the B.S. degree, the student must complete 9 units of Chemistry 190 to be taken 3 units per quarter for three quarters; and 9 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 or higher; Geology 278, or other advanced courses approved by the student's advisor, and by the supervisor of his or her work in Chemistry 190. An overall LGI of 3.3 in mathematics, physics, and chemistry is required for a degree with honors.

Students who wish to be admitted to the honors program should register in the department office at the beginning of the senior year. Those who do not meet all of the above formal requirements may petition the department for admission.

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 dissertation research and to continue work for an advanced degree. Students on full-time fellowships may complete all requirements for the Ph.D. degree in nine quarters. Students on research or teaching assistantships may complete their requirements in three or four 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 is granted.

Candidates for advanced degrees must have a minimum letter grade indicator 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 Satisfactory/No Credit option. All students are expected to give full time to graduate work once they have begun dissertation research. All prospective Ph.D. candidates, regardless of the source of financial support, are required to gain teaching experience as an integral part of graduate training. During the period in which a dissertation is being read by members of the faculty, candidates must be available for personal consultation until the dissertation has had final departmental approval. In 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 consist of three written exams of two hours each, in the fields of inorganic, organic, and physical chemistry, and 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 Quarter are advised to repeat them during the first week of the Winter Quarter. All qualifying examinations are given September 20, 21, and 22, 1990 and must be taken at that time.

MASTER OF SCIENCE

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 as well as an M.S. thesis. Of the 39 units, approximately two-thirds must be in the department and must include at least 12 units of advanced coursework in chemistry exclusive of the thesis. Of the 12 units, at least 3 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 the degree of Master of Arts in Teaching (Chemistry). This degree is for candidates who have a teaching credential and who wish 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 under the "School of Education, Master of Arts in Teaching" section in this bulletin.

DOCTOR OF PHILOSOPHY

The graduate student is eligible to become a formal candidate for the Ph.D. degree after he or she has passed the department qualifying examinations, has satisfactorily completed most of the formal lecture course requirements, and has begun and shown satisfactory progress on a dissertation research project. The student then files for admission to candidacy for the Ph.D. degree to the University Committee on Graduate Studies. This filing must be done before June of the second year of graduate registration.

After passing the department qualifying examinations, students select research advisors by first interviewing at least 10 members of the Chemistry faculty about their research. Students then file an Application to Start Research form with the Chemistry Department Graduate Program Committee and begin research on their Ph.D. dissertation under the supervision of an advisor. All students in good standing are required to start research by the end of the Winter Quarter of the first year of graduate registration.

The foreign language requirement for the Ph.D. in organic chemistry must be met in German. The foreign language requirement in physical, biophysical, or inorganic chemistry may be met in either French, Japanese, German, or Russian. The requirement may be met by completing one year (two semesters or three quarters) of the given language at the college level by receipt of a passing grade in a college level intensive reading course (e.g., German 10), or by successful completion of a reading test in the language given by the Chemistry Department.

Candidates for the Ph.D. degree are required to participate continually in the department seminar (Chemistry 300), and in the division seminar of the major subject. In addition, continuous enrollment in Chemistry 301 is expected after the student has passed the qualifying examinations and chosen a research supervisor. As part of graduate training, Ph.D. candidates are required to gain experience as teaching assistants.

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 is found in the Directory of Graduate Research published by the American Chemical Society.

COURSE REQUIREMENTS

Students may major in Inorganic, Organic, Physical, or Biophysical Chemistry. All graduate students are required to take six graduate-level courses (course numbers greater than 199) of at least 3 units each in chemistry or related disciplines (e.g., physics, mathematics, electrical engineering, biochemistry, pharmacology, etc.), to be selected in consultation with their research advisor and the Graduate Study Committee. At least two of these courses must be taken in the Autumn Quarter of the first year. In addition, students majoring in Organic Chemistry must...
take 3 units in Chemistry 233 in the second and third year.

CHEMICAL PHYSICS
Students with an exceptionally strong background in physics and mathematics may, upon special arrangement, pursue a program of studies in chemical physics.

Ph.D. MINOR
Candidates for the degree of Doctor of Philosophy in other departments who wish a minor in chemistry must complete, with a letter grade indicator of "B" or better, 20 units, including 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 several departmental fellowships in chemistry. The Edna Craft Fellowship, Edward Curtis Franklin Fellowship, Florence Thompson Kress Fellowship, Evelyn McBain Fellowship, James W. McBain Memorial Fellowship, Franklin Veatch Fellowship, Ephraim and Amelia Weiss Fellowship, and the Frederick P. Whittaker Fellowship, Robert M. and Katherine F. Loeser Scholarship, David L. and Lavinia E. Sloan Memorial Scholarship, William H. and Myrtle B. Sloan Scholarship, John Mason Stillman Scholarship are granted only to graduate students. The William H. Nichols Scholarships are open to graduates and undergraduates; the Frank Card Scholarship and Eastman Kodak Scholarships are for undergraduates only.

Teaching assistantships and research assistantships are open to advanced students. Application forms for fellowships, scholarships, and teaching assistantships may be obtained from the Department of Chemistry.

COURSES

Note—Laboratory fees, against which charges are made for breakage, are a minimum of $35 per quarter.

UNDERGRADUATE

30. Introduction to Chemistry—Preparation for Chemistry 31. For students with limited background in chemistry and mathematics. Introduction to chemical principles: moles, valence, stoichiometry, definitions, problem solving, quantitative skills.
3 units, Aut (Andersen) MWF 9

31. Chemical Principles—For students with substantial chemistry background. 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. Recommended: high school chemistry and physics. (DR:7)
4 units, Aut (George) lec MWF 9
Win (Boxer) MWF 1:15
one recitation by arrangement

32. The Frontiers of Chemical Science—For students with AP Chemistry scores of 4 or 5 who wish to develop a deeper understanding. Intended to complement a previous rigorous introduction to chemistry; encompasses structure and reactivity, cuts across the traditional subdivisions of chemistry. Recent advances in structures, analytical methodologies, catalysis, redox phenomena, organometallic, and bio-inorganic chemistry. (DR:7)
4 units, Aut (Collman, Zare) MWF 11

33. Structure and Reactivity—Organic chemistry, functional groups, hydrocarbons, stereochemistry, thermochemistry, kinetics, chemical equilibria. Prerequisite: 31, 32, or an AP Chemistry score of 4 or 5. Pre-register in Chemistry Department. (DR:7)
4 units, Win (Wender, Trost) lec (1)
MWF 9; lec (2) MWF 11,
one recitation by arrangement
Spr (Brauman) MWF 1:15

35. Organic Monofunctional Compounds—Organic chemistry of oxygen, nitrogen aliphatic and aromatic compounds. Prerequisite: 33; pre-register in Chemistry Department.
4 units, Aut (Waymouth) MWF 1:15-2:30
Spr (Huestis) MWF 9
one recitation by arrangement

36. Chemical Separations—Techniques for separations of compounds; distillation, crystallization, extraction, and various chromatographic procedures. The lecture treats the theory while the laboratory provides practice. Prerequisites: 33 and concurrent or previous enrollment in 35; preregister in Chemistry Department.
3 units, Spr (McElwee-White) lec T 1:15
lab T 2:15-6:05 or MWTh 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 (Drueckhammer) lec TTh 9
lab MTW or Th 1:15-5:05
3 units, Aut (Huestis) lec TTh 11-12:15
Win (Griffin) 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. Pre-requisites: 35, 36, and concurrent registration in 131.
5 units, Aut (Drueckhammer) lec TTh 8lab MW 1:15-5:05 or TTh 1:15-5:05

3 units (Staff) not given 1990-91

5 units, Win (Waymouth) lec TTh 8:30-9:50 lab MW 1:15-4:05 or TTh 1:15-4:05

135. Physical Chemical Principles—Terminal physical chemistry for non-chemistry majors. Emphasis on 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 (Pecora) TTh 11-12:15
Spr (Ross) TTh 1:15-2:30

136. Synthesis Laboratory—Advanced synthetic methods in organic and inorganic laboratory chemistry.
3 units, Spr (Griffin) lab MW or TTh 1:15-5

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. A critical evaluation of logistic aspects of human fertility control. Limited to 45 with at least junior standing. Application for admission in Human Biology office.
6 units (Djerassi) not given 1990-91

151. Inorganic Chemistry I—Systematic introduction to theories of electronic structure, stereochemistry, and symmetry properties of inorganic and organometallic molecules. Topics include ionic and covalent interactions, electron-deficient bonding, and elementary ligand field and molecular orbital theories. Emphasis on the chemistry of the metallic elements. Prerequisites: 35 and 171.
3 units, Win (Collman) 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) MW 1:15-2:30

171. Physical Chemistry—Chemical thermodynamics; fundamental principles, Gibbsian equations, equilibrium conditions, phase rule, systematic deduction of equations, gases, solutions. Prerequisites: 35, Math. 19, 20, 21 (or equivalent); and Physics 51, 53, 54 and previous or concurrent registration in Physics 55.
3 units, Aut (Ross) MW 11-12:15

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 (Zare) MWF 11

3 units, Spr (Pecora) MWF 11-12:15

176. Physical Chemistry Laboratory—Use of chemical instrumentation to study fundamental areas of physical chemical concern with focus on time-dependent processes. Experiments include gas-phase kinetics, fluorimetry, and nuclear magnetic resonance spectroscopy. Prerequisites: 173 and previous or concurrent enrollment in 175.
3 units, Spr (George) lec TTh 9 lab T or W 1:15-4:05

178. Physical Chemistry Laboratory—Molecular spectroscopy. Experiments include rotational-
vibrational, laser Raman, and visible spectroscopy; an introduction to integrated circuit electronics; and computer data acquisition of chemiluminescence in stopped-flow kinetic studies. Lectures treat theory pertaining to molecular spectroscopy: laser systems, group theory, the quantum mechanics of vibration and rotation of diatomic and polyatomic molecules, the interaction of radiation and matter, selection rules, and transition probabilities. Prerequisites: 173 and Math. 43. Concurrent registration in 173 may be sufficient with consent of instructor. Recommended: familiarity with linear algebra on the level of Math. 113.

4 units, Win (Allen) lec TTh 10-11:15
lab MW 2:35-5:25 or TF 1:15-4:05

Chemistry and the Life Sciences in Historical and Philosophical Perspective—(Enroll in VTSS 145.) Traces the development of some selected problems involving interrelations between chemically and biologically based sciences and society.

4 units (Clayton) given 1991-92

GRADUATE

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 (McElwee-White) TTh 9-10:30

223. Advanced Organic Chemistry—Continuation of 221 with emphasis on physical methods. Prerequisite: 221 or consent of instructor.

3 units, Win (Trost) ThF 8:30-10

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 10-12

227. Selected Topics in Organic Chemistry—May be repeated for credit. Possible topics include synthetic organic chemistry, photochemistry, inorganic-organic chemistry, bio-organic chemistry, reaction mechanisms, stereochemistry, structural chemistry of organic and biological molecules. Prerequisite: 225 or consent of instructor.

3 units, Aut, Spr (Staff) MWF 9

229. Organic Chemistry Seminar—Attendance is 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 is practiced and criticized, with the student using his own research as a vehicle. Required of all second- and third-year Ph.D. candidates.

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

251. Selected Topics in Advanced Inorganic Chemistry—May be repeated for credit. Prerequisites: one year of physical chemistry, consent of instructor.

3 units, Aut, Win, Spr (Staff) TTh 11

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 field 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 is assumed.

3 units, Win (Solomon) MW 9:30-11


3 units, not given 1990-91

257. Research Proposals in Inorganic Chemistry—Research progress reports (Autumn) and research proposals (Winter and Spring) are presented in oral and written form. Writing ability, oral defense, and scientific content is criticized. Required of all second-year students in inorganic chemistry.

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

259. Inorganic Chemistry Seminar—Attendance required of all graduate students majoring in inorganic chemistry.

1 unit, Aut, Win Spr (Staff) 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 (Fayer) MWF 10

273. Advanced Physical Chemistry—Topics in advanced quantum mechanics: vibrations and rotations of polyatomic molecules (normal modes, anharmonicity, wavefunctions and energy levels of rigid rotations, vibration-rotation interaction), \textit{ab initio} electronic structure theory (Hartree-Fock, configuration interaction, multiconfiguration self-consistent-field, and many-body perturbation theory techniques), angular momentum theory (operators and wavefunctions, Clebsch-Gordan coefficients, rotation matrices), time-dependent quantum mechanics (time evolution operator, Feynman path integrals, scattering theory, Born approximation, Lipmann-Schwinger equation, correlation functions), interaction of radiation and matter (semiclassical and quantum theories of radiation, transition probabilities, selection rules.) Prerequisite: 271 or Physics 230.

3 units, Win (Allen) MWF 10

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—Possible topics: structure elucidation using diffraction techniques, advanced statistical mechanics, crystal field theory, advanced quantum mechanics, magnetic relaxation, advanced thermodynamics, chemical applications of group theory. May be repeated for credit. Prerequisite: 275 or consent of instructor.

3 units (Staff) by arrangement

283. Research Proposals in Physical Chemistry—Students 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 of a related area in physical chemistry. Written form, oral presentation, and scientific merit is 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—The theoretical and experimental aspects of biophysical phenomena emphasizing membrane biophysics and membrane biology. Prerequisites: previous or concurrent registration in 171 and 173, or the equivalent.

3 units, Spr (Staff)

289. Biophysical Chemistry—Experimental methods in biophysics. Emphasis on spectroscopic techniques including magnetic resonance and optical methods. Prerequisite: 287.

3 units, Win (Staff)

291. Biophysical Chemistry—Special topics in biophysical chemistry. Prerequisites: previous or concurrent registration in 171 and 173, or the equivalent.

3 units, Win (Staff)

293. Structural Inorganic Chemistry—Structural biophysical chemistry, x-ray crystallography, and related techniques as used in biophysical research. Electron and optical microscopy and neutron diffraction. Prerequisite: 291 or consent of instructor.

3 units (Hodgson) not given 1990-91

295. Biophysical Chemistry—Physical-inorganic and bio-inorganic chemistry for inorganic chemists. Introduction to metallo-enzymes as unique inorganic complexes. Ligand field theory and applications to spectroscopic and magnetic techniques. Metalloenzymes containing copper, iron, and molybdenum active sites. No background in biochemistry is necessary. Group theory and a basic understanding of quantum mechanics and molecular orbital theory is assumed.

3 units (Solomon) MW 9:30-11

299. Teaching of Chemistry—Techniques of teaching chemistry by means of lectures and laboratories. All teaching assistants in chemistry are required to register.

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 (Staff) 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. 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 advanced laboratory work along lines not covered by listed courses, under the direction of a member of the teaching staff. For research and special work, students 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
(UNDERGRADUATE STUDIES ON MEXICAN SOCIETY AND CULTURE IN THE UNITED STATES)

Visiting Associate Professor: Luis Leobardo Arroyo
Teaching Fellows: Susan Marie Dever, Victor Ortiz

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 studies programs. Since 1971, by sponsoring the Chicano Fellows Program, the School of Humanities and Sciences at Stanford has affirmed the educational necessity of providing academic opportunities for undergraduates to learn about Mexican society and culture in the U.S.

Since its inception, the Chicano Fellows Program has had a dual purpose: to offer courses on the Mexican experience in this country; and to provide a teaching-mentorship opportunity to advanced Stanford graduate students. The program also offers a selected undergraduate scholar the opportunity to work closely with the Graduate Teaching Fellows and the Visiting Professor to prepare a thesis in a Chicano-related field. The program also offers courses designed especially for undergraduates, which are taught by visiting faculty and graduate fellows in various disciplines. These offerings are often innovative and experimental; they are usually given as seminars rather than as lecture courses.

As in the eight previous years, a scholar of outstanding national reputation will be appointed to teach three courses of special interest to students wanting to develop a scholarly understanding of the nation’s second largest minority, a minority which by the year 2030 is expected to become the largest population in California.

The program’s annual offerings supplement and complement a small selection of outstanding courses on diverse aspects of Mexican society and culture in the U.S. taught by regular members of the Stanford faculty.

COURSES

The 1990-91 Chicano Fellows Courses pamphlet may be obtained from the Program Administrator, Chicano Fellows Program, Bldg. 590, Rm. L (El Centro); telephone (415) 723-3091.

110. Introduction to Chicano Life and Culture—(Same as Anthropology 110, History 64.) Interdisciplinary focus on the history and culture of Mexican Americans from the settling of the Spanish borderlands to today. Historical perspectives are balanced with anthropological and literary views of the cultural diversity of Mexicans in the U.S. (DR:5)

5 units, Win (Rosaldo, Arroyo)

125. Fiction and Film in the Forties: The Mexican Connection—The connections in film and literature between Mexico City and Hollywood, Chicano and Mexican film audiences, and Latinos and other people responding from a multiplicity of perspectives to the Golden Age of Mexican fiction and film. Participatory workshop tests the hypothesis that readers and spectators can resist being passively socialized by Hollywood and Mexico City’s monolithic myth-making. The process of talking back to the movies is examined through an analysis of film theory, literary strategies, and our own experience with Mexican, Chicano and Hollywood film.

3 units, Spr (Dever)

155. Mexican American Politics and Organizations—(Same as History 155.) Examination of Chicano participation in the American political system and civic life. Theories of ethnic/racial minority politics and race relations to illuminate topics such as the impact of conquest; creation of peace structure; 19th-century electoral politics; historical and contemporary styles and strategies for political action; the Latino electorate; Chicano and Hispanic leadership; contemporary civic organizations; key policy issues for Chicanos and Latinos in the 1980s.

5 units, Spr (Ortiz) MWF 10

166. The Mexican-U.S. Border: The Myth and Its Realities—The socio-political and economic dimensions of the border phenomenon within a historical understanding of current events. Topics: its ecology, economy, immigration, interethnic relations, and the different conceptualizations and representations of the region.

3 units, Spr (Ortiz)
170S. Undergraduate Colloquium: Mexican Immigration and the Corrido—(Same as Spanish 170.) Traces Mexican immigration to the U.S. (1848-1990) through the lyrics of Mexican/Chicano corridos (ballads). Traditional historical sources and corrido texts are read in order to more fully comprehend the Mexican immigrant experience.

3-5 units, Win (Herrera-Sobek)

284. Chicana Writers—(Same as Spanish 284.) Examines works of Chicana writers from various theoretical, critical approaches (feminist, semiotic, structural, anthropological, etc.) Authors: Villanueva, De Cervantes, Cisneros, Viramontes, Portillo-Trambley, Corpi, and Vigil.

3-5 units, Spr (Herrera-Sobek)

384. Methods of Research in Latin American Literature, Popular Culture, and Chicano Studies—(Same as Spanish 384.) Introduction to bibliographic sources and archival research, oral history techniques, and field work methodologies in Latin American, popular culture, and Chicano Studies research. Students select an individualized project to be developed using strategies and techniques discussed.

3-5 units, Aut (Herrera-Sobek)

DEPARTMENTAL

ENGLISH

162B. Chicano Literature: Creative Writing for Bilingual Students.

5 units (Islas) not given 1990-91

SPANISH

11B. Second-Year Spanish for Bilingual Students—Designed for students of Hispanic background. Intensive study of grammar with emphasis on written Spanish. Short readings by and about Hispanics in the U.S. Prerequisite: pass Bilingual Placement Test.

5 units, Aut (Staff)

12B. Second-Year Spanish for Bilingual Students—Introduction to various Hispanic dialects, with emphasis on Chicano Spanish and bilingualism in speech and literature.

5 units, Win (Staff)


5 units, Spr (Staff)

131B. Hispanic American Cultural Readings—Includes selected grammatical problems with emphasis on oral expression.

3-5 units, Win (Staff)

CLASSICS

Emeriti: (Professors) Michael H. Jameson, Antony E. Raubitschek, Edward W. Spofford
Chairman: Marsh H. McCall, Jr
Professors: George Brown (English and, by courtesy, Classics), Edward Courtney, N. Gregson Davis (Classics and Comparative Literature, on leave), Andrew M. Devine (on leave Autumn), Kenneth J. Dover, Mark W. Edwards (on leave Winter, Spring), Edwin M. Good (Religious Studies and, by courtesy, Classics), Robert C. Gregg (Religious Studies and by courtesy, Classics), Wilbur Knox, Classics, Philosophy and History of Science, Marsh H. McCall, Jr., Julius Moravcsik (Philosophy and, by courtesy, Classics), Susan A. Stephens, Susan Treggiari (Classics and, by courtesy, History, on leave)
Associate Professors: Jody Maxmin (Art History and Classics), Michael Wigodsky
Assistant Professors: Mark H. Munn, Andrea Wilson Nightingale
Lecturers: Robert Hamerton-Kelley, John Heath, Mary Lou Munn, Evangelia Prionas Visiting Professor: Donald A. M. F. Russell (Autumn) Visiting Assistant Professor: David A. Cherry
Webster Visiting Professor: P. Walcott

The Department of Classics offers work in the Greek and Latin languages and literature (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 Cultures, Ideas, and Values 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 to develop: 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 in students who wish to do their major work in Classics and in students who wish to relate Classics to work in other departments such 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.
ADMISSION

Those 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 is generally required, and those with no previous knowledge of Latin (or Greek) should begin the study of the language in the freshman year, or as early as possible in the sophomore year. Prospective majors in classical studies normally enroll not later than the beginning of the junior year, but are urged to discuss their plans with a member of the department as early as possible.

BACHELOR OF ARTS

The degree of Bachelor of Arts in Classics may be taken in the following alternative ways:

1. **Greek and Latin**
   - At least 27 units in Greek courses and the same number in Latin, all at the 100 level or higher. If possible, students should complete the sequence of third-year courses (111, 112, 113) before taking courses in the fourth-year sequences (141-9, 151-9, 161-9, offered in successive years), and it is recommended that they 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 (it is recommended that one of these courses be Greek 175), two courses in ancient history, and one 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 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 (it is recommended that one of these courses be Latin 175), two courses in ancient history, and one course in 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, and Humanities, or in 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**
   - The 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, Greek, or Latin. The Classical Studies 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 graduate school in classics.

   Requirement: At least 55 units including (a) 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 or an equivalent approved by the department; (b) at least one course in the department from each of the following
groups: literature in translation, philosophy and political theory; ancient history; religion and mythology; art and archaeology. A second course in ancient history is strongly recommended. In some cases courses in other departments may satisfy one or more of the above groups with permission of the Undergraduate Advisor.

For all majors, a summer at Stanford-in-Greece or a semester at the Rome Classical Center is strongly recommended.

**Note 1**—University units earned by placement tests or advanced placement work in secondary school are not counted towards any major program in the department; work done in other universities or colleges is subject to departmental evaluation.

**Note 2**—A letter grade is required in all courses taken for the major. No course receiving a letter grade indicator lower than "C" may be counted toward fulfilling major requirements.

**Note 3**—Students contemplating graduate work in classics, or careers as teachers of Greek and Latin, might suitably follow either program 1 or 2. Program 3 covers a wider field, and may be recommended particularly to students who look towards graduate work in other humanistic subjects, e.g., history, philosophy, or some field of literature other than the classical.

**HONORS PROGRAMS**

**CLASSICS**

Students who wish to be considered for honors in Classics must complete the bachelor's degree program in one of the above ways. In addition, at the beginning of the senior year they must submit to the department a proposal for an honors essay of about 40-50 pages, which should normally arise from the subject-matter of a course previously taken within the department: the department will in any case wish to assure itself that at the time of application the student has a sufficient basis of knowledge derived from departmental coursework in the general area (literature, history, philosophy, etc.) with which the essay is concerned. If the proposal is approved, the student takes Greek, Latin, or Classical Studies 199 during one or two quarters of the senior year for a maximum of 6 units of credit per quarter, up to an overall total of 10 units, and writes the essay under supervision of a member of the department. Honors are awarded on the basis of the essay and the student's entire program in the department.

**HUMANITIES**

For majors in classics with appropriate interests, an Honors Program in Humanities is offered, a description of which is found under the "Humanities Special Programs" section of this bulletin.

**ROME CLASSICAL CENTER**

Classics majors are 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. 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. Students planning to apply to the center should note that they are normally expected to have prepared themselves by taking at least one Roman history course. The center's brochure is available at the department office.

**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 a program operated by Stanford. Both programs are study tours, and the Stanford program usually includes archaeological fieldwork. The American School program is recommended principally for classics majors. The Stanford program is open to both classics and non-classics majors. Applicants to either program are required to take Classics 108, Topography and Monuments of Greece, and, after acceptance, Classics 31, Beginning Modern Greek. Students are encouraged to prepare themselves by taking other courses in Greek archaeology (especially Classics 127, Archaeological Practicum), Greek history, and Greek art. 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, or Master of Arts in Classics, field of Greek or Latin, and may expect to complete the program in 12 months (usually three quarters of coursework plus three 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, or written work accepted by the graduate committee as an equivalent.

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 is waived provided that they have completed some work beyond the course requirements listed under (2) and (3) above.

DOCTOR OF PHILOSOPHY

University for the Ph.D. are discussed in the "Degrees" section of this bulletin. All candidates for the Ph.D. degree in Classics must fulfill the following requirements:

1. Completion of 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 Ph.D. program is available in brochure form in the Classics Department office.

2. Candidates are 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), and also from sight.
   c) Three general written examinations; a supplementary general oral examination.
   d) The University oral examination on the candidate's dissertation, subject, and on two attinging areas, to be defined in consultation with the candidate.

   The examination in translation from Greek and Latin authors and from sight is normally taken in the second year of graduate work, the general written and oral examinations in the third year, the dissertation oral examination in the fourth year. The period between the translation and general examinations is devoted largely to seminar work and to an intensive preparation for the latter examinations, during the course of which candidates are 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 translation examinations. Except in very special circumstances, candidates may not take the general examinations until the modern language requirements have been successfully completed.

3. Each candidate (not later than the end of the third year) should submit to the chairman of the department a statement of the dissertation topic as approved by the dissertation committee. This committee is normally 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 is appointed as the candidate's advisor and thereafter supervises writing of the dissertation. An acceptable dissertation must be a genuine contribution to classical scholarship and must be written in an acceptable style. All dissertations are to be written in English.

4. All students are required to undertake the equivalent of three one-quarter courses of teaching under department supervision.

Ph.D. MINOR

For a graduate minor, the department recommends at least 20 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. 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 is normally 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:

**First Year**—Coursework, almost entirely in classics. One translation exam possibly taken in June. One or both modern language exams taken.

**Second Year**—Coursework, both in classics and the minor field. Translation exams completed. French and German exams completed.

**Third Year**—Coursework, both in classics and the minor field. General examinations in classics.

**Fourth Year**—Remaining coursework, both in classics and the minor field. General examination in the minor field. Preparation for dissertation.

**Fifth 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 studies 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 "Humanities Special Programs" section in this bulletin.

**COMPARATIVE LITERATURE**

The Classics Department cooperates closely with the graduate program in the Department of Comparative Literature. Interested students should consult the chairman of the department.

---

**COURSES**

**GREEK**

**INTRODUCTORY**

Those who have not studied Greek may begin 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 52. During the first year some Xenophon or Plato is 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 Quarters 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 Greek should consult their departmental advisors to determine required courses, but most departments will be satisfied if part of the series 101, 102, 103 is completed.

The intensive Greek course (Greek 10) offered in Summer Quarter also prepares students to enter Greek 101 in Autumn Quarter.

All language courses at the 101 level and higher require a term paper.

Courses in Greek all have department prefix 373.

1. **First-Year Greek**—For beginners.
   5 units, Aut (Hersey) MTWThF 9

2. **First-Year Greek**—Continuation of 1.
   5 units, Win (Reed)

3. **First-Year Greek**—Continuation of 2.
   5 units, Spr (Spencer)

4. **Intensive First-Year Greek**—Intensive beginning Greek equivalent to 1, 2, 3, or 51, 52. The goal is the reading of easy classical or New Testament Greek by the end of the Summer Quarter. Short readings in philosophical Greek are included.
   8-9 units, Sum (Staff) MTWThF

51. **First-Year Greek**—Accelerated.
   6 units, Win (Taylor) MTWThF 1:15

52. **First-Year Greek**—Continuation of 51.
   6 units, Spr (Chapman) MTWThF 1:15

**INTERMEDIATE**

Students are admitted to these courses by completing Greek 3 or 52 or on the basis of previous work done in secondary school or elsewhere. Usually three years in secondary school Greek qualifies a student for 101, three or four years for 111. New students should determine for which course they are best fitted by consultation with the department's undergraduate advisor.

101. **Second-Year Greek**—Reading of selections from Plato.
   5 units, Aut (McCall) review session by arrangement
102. Second-Year Greek—Euripides, one play.
   5 units, Win (Nightingale) MWF

103. Second-Year Greek—Homer, Odyssey.
   5 units, Spr (Nightingale) MWF

   2-3 units, Aut (Hamerton-Kelly) Th 1-3:05

111. Sophocles—One play.
   4 units, not given 1990-91

113. Attic Prose.
   4 units, Aut (Veit) TTh 10:30-12

ADVANCED

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.

151. Herodotus.
   4 units, not given 1990-91

154. Hesiod and Lyric.
   4 units, Spr (Munn)

   4 units, Win (Nightingale)

160. Individual Work—For department majors only.
   by arrangement

199. Undergraduate Thesis.
   by arrangement

UNDERGRADUATE AND GRADUATE

175A,B. Greek Style and Syntax—The nuances of Greek syntax and style. Stylistic analysis of selected prose authors, techniques of sight-translation, and the writing of idiomatic Greek prose. Designed for the major, but all enrollees in Greek language courses are encouraged to take 175A as soon as possible after the completion of 103.
   4 units, Aut (Stephens) TTh 1:15-2:45
   2 units, Win (Stephens)

GRADUATE

202A,B. Tutorial in Greek Poetry.
   3 units, Aut, Win (Edwards) MW 9-10:30
   Spr (Raubitschek) TTh 10:30-12

205A,B. Greek Language and Style.
   2 units, Win (Stephens) TTh 2:15-3:35
   4 units, Spr (Russell) Th 2:15-3:35

The above courses are offered every year. Other courses alternate or vary each year. (See also seminars listed under Latin, literature, philosophy, ancient history, religion and mythology, art and archaeology, Indo-European linguistics, and history of science.)

360. Directed Reading.
   by arrangement

370. Greek Prose or Verse Composition.
   by arrangement

Some of the courses listed above may be continued in the following quarter by arrangement with the instructor. This usually requires the writing of an extended research paper based on work directly related to the course.

431. Homer and the Homeric Hymns—An attempt to determine how far characteristic features of Homeric diction and narrative style are represented in the longer Hymns.
   4 units, Win (Edwards)

432. Euripides—Seminar on four plays of Euripides, concentrating on close philological study of the texts and on large issues of Euripidean themes and problems.
   4 units, Spr (McCall)

   4 units, Win (Doer)

461. Plato: Symposium and Phaedrus—Focuses on literary and philosophical aspects. Emphasis on methodological questions: Why did Plato write in dialogue form? What are the rhetorical/philosophical strategies that Plato employs in these texts? What sort of interpretative problems do these texts generate, and how have scholars approached these problems?
   5 units, Aut (Nightingale) T 2:15-4:05

MODERN GREEK

31. Beginning Modern Greek.
   3 units, Spr (Prionas)

For other courses in Modern Greek, see the Linguistics Department's Special Language Program.

LATIN

INTRODUCTORY

Those who have not studied Latin may begin with either Latin 1 or 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 covers the same ground at a more rapid pace, so that the series 101, 102, 103 forms a sequel equally to Latin 3 and 52. During the first year some Caesar or other simple Latin prose is read to prepare the students for Cicero, Virgil, Ovid, and other authors in the following year. These courses all form part of a series, but qualified students may be admitted to the class in Winter or Spring Quarter 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 are required, but most departments will be satisfied if part of the series 101, 102, 103 is completed.

The intensive Latin course (Latin 10) offered in Summer Quarter also prepares students to enter Latin 101 in Autumn Quarter. All language courses at level III and higher require a term paper.

Courses in Latin have department prefix 375.

1. First-Year Latin—For beginners.
   5 units, Aut (Greaves) MWThF 9

2. First-Year Latin—Continuation of 1.
   5 units, Win (Frueh)

3. First-Year Latin—Continuation of 2.
   5 units, Spr (Larimer)

10. Intensive First-Year Latin—Intensive beginning Latin equivalent to Latin 1, 2, 3 or 51, 52. The goal is the reading of easy Latin prose and poetry by the end of the Summer Quarter.
   8 units, Sum (Staff) MTWThF

51. First-Year Latin—Accelerated.
   6 units, Win (Devine) MTWThF 1:15

52. First-Year Latin—Continuation of 51.
   6 units, Spr (Devine) MTWThF 1:15

INTERMEDIATE

Students are admitted to these courses by completing Latin 3 or 52 or on the basis of previous work done in secondary school or elsewhere. Usually two years in 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 consultation with the department’s undergraduate advisor.

   5 units, Aut (Courtney) MWF 11
   review session by arrangement

   5 units, Win (Wigodsky) MWF 11
   review session by arrangement

103. Second-Year Latin—Selections from Virgil, Aeneid.
   5 units, Spr (Courtney) MWF 11
   review session by arrangement

111. Horace, Odes.
   4 units, Aut (Wigodsky) MW 2:15

113. Latin Elegy.
   4 units, not given 1990-91

118. Post-Classical Latin—(Same as English 118) Careful reading of Latin texts of graded difficulty, including late pagan writers, patristic writings, medieval literature, and Latin of the Renaissance.
   4 units, Aut (Brown) MTWThF 1:15

ADVANCED

154. Roman Historiography.
   4 units Win (Heath)

155. Cicero Pro Caelio.
   4 units, Spr (Wigodsky)

160. Individual Work—For department major only.
   by arrangement

199. Undergraduate Theses.
   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 interests of each class.

UNDERGRADUATE AND GRADUATE

175A,B. Latin Style and Syntax—The nuances of Latin syntax and style. Stylistic analysis of selected prose authors, the techniques of sight-translation, and the writing of idiomatic Latin prose. Designed for the major, but all enrollees are encouraged to take 175A as soon as possible after the completion of 103.
   4 units, Aut (Cherry) TTh 10-11:30
   4 units, Win (Cherry) MW 10-11:30

177. Introduction to Paleography and Codicology—(Same as English 209.) Introduction to antique and medieval manuscripts in Latin, medieval Latin and vernacular scripts, and the materials and composition of the medieval book.
   5 units, Spr (Brown) TTh 1:15

GRADUATE

   3 units, Aut (Courtney) MW 1:15-2:35
   Win (Wigodsky) MW 1:15-2:35

205A,B. Latin Language and Style.
   2 units, Win (Courtney) MW 10:30-12
   4 units, Spr (Courtney) MW 10:30-12

The above courses are offered every year. Other courses alternate or vary each year. (See also seminars listed under Greek, literature, philosophy, ancient history, religion and mythology, art and archaeology, Indo-European linguistics, and history of science.

260. Directed Reading.
   1-15 units, by arrangement
330. The *Post Reditum Speeches* of Cicero—
Seminar on the detailed exposition of these
speeches—verbal, stylistic, textual and historical.
Presentations by the participants consist of ex-
positions of a portion of the speeches, required
paper.
5 units, Win (Courtney)

1-15 units, any quarter (Staff)
by arrangement

370. Latin Prose or Verse Composition.
by arrangement

442 Horace's *Ars Poetica*—The development of
ancient poetics and rhetoric.
4 units, Spr (Russell)

Some of the above courses may be continued
on the following quarter by arrangement with
the instructor. This usually requires the writing
of an extended research paper based on work
directly related to the course.

**GENERAL**

Knowledge of Greek or Latin is not required
for these courses, except for those at the 200
level. Most are suitable for those who have taken
a Cultures, Ideas, and Values (CIV) sequence
and desire more thorough knowledge of the
ancient world, and for those who are currently
in the CIV Program.

**NON-LANGUAGE UNDERGRADUATE**

**CLASSICS, ART/ARCHAEOLOGY (372)**

20. Introduction to Classical Archaeology.

105. Topography and Monuments of Greece.

120. Greek Vase Painting.

127. Archaeological Practicum.


**CLASSICS, HISTORY (371)**


102. Greek and Roman History from Alexander
to Caesar.

103. History of the Roman Empire.

104. Early Christianity.

105. History and Culture of Egypt.

117. Greek Religion and Society.

175. Athens 403-350 B.C.: Athens in the Age
of Plato.

176. Athens in the Age of Demosthenes and
Alexander.

181. Roman Society in the Age of Cicero and
Augustus.

182. Rebuilding the Republic.

183. Law and Life in Rome.

185. The Roman Army and Frontiers.

**CLASSICS, GENERAL (378)**

3. Democracy and Imperialism.

8. Political Philosophy in Classical Antiquity.

11. Age of Heroes.

12. Greek Tragedy.


18. Greek Mythology.


65. Greek Philosophy.

115. Greek Attitudes, Values, Beliefs.

135A,B,C. Introduction to Cosmology.

140. Topics in History of Mathematics.

165. Hellenistic Philosophy.

172. Classical Influences in Modern Literature.

176. Senior Seminar.

199. Undergraduate Thesis.

201. Introduction to Classical Scholarship.

**ANCIENT HISTORY**

These courses are accepted by the History
Department for credit toward a major in history.
Courses in Ancient History have department
prefix 371.

101. History of Greece—A survey of the history
of ancient Greece from the Bronze Age through
the Age of Pericles to the death of Alexander
the Great (323 B.C.). (DR:5)
4-5 units, Aut (Munn) MTWTh 1:15

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 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 (Cherry) MTWTh 1:15

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 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 (Cherry) MTWTh 1:15

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 (Cherry) MTWTh 1:15

104. Early Christianity—(Same as Religious
Studies 142.) The Christian movement to 500
emergent beliefs/practices as these distinguished Christians from other groups, and as they varied among Christians. Study of primary documents (ancient texts in translation) and surviving art-architecture examines early Christianity's modes of community organization, debates about orthodox and heretical teaching, and interactions with other religions. Thematic interest concerns deployment of "holy power" in people, places, objects. (DR:5)

5 units, Aut (Gregg) TTth 8:30-9:50

105. History and Culture of Egypt—A survey of Egypt from the Old Kingdom through the Roman period with emphasis on religious, social and political development. (DR:5*)

3-4 units, Spr (Stephens)

160. Individual Work in Ancient History.
by arrangement

Courses at the 200 level are mainly for graduate students.

187/387. Law and Society in the Roman Empire—Roman private law and social practice from Augustus to Constantine (c.30 B.C. to A.D. 330). Introduction to the Roman law of persons, with close reading (in translation) of Gaius' Institutes, parts of the Digest, and other legal documents. Emphasis on the sociology of law, and on the relationship between law and behavior in the empire, with particular attention to family law.

5 units, Aut (Cherry) W 1:15-3:05

261. Individual Work in Greek History.
by arrangement

262. Individual Work in Roman History.
by arrangement

1-15 units, any quarter (Staff)
by arrangement

ART AND ARCHAEOLOGY

Classical Art and Archaeology have department prefix 372.

See also Art 5, 100A,B.

14. Classical Athletics—(Same as Athletics, Recreation, and Physical Education 107.) Origins and history of competitive sport in the ancient world, from the funeral games for Patroclus (Homer) to chariot races in the Hippodrome of Constantinople, based on the literary and monumental evidence. Emphasis on the spirit of competition apart from athletics. Lectures (illustrated) and discussion groups. (DR:5)

2-3 or 5 units, Spr (Raubitschek)

MW 1:15

20. Introduction to Classical Archaeology—Slide-illustrated examination of the archaeology of Greece from the Stone Age through the Age of Alexander the Great. The great monuments and enduring art of ancient Greece. The discipline of archaeology. What does archaeology reveal about the prehistoric past of Greece? Do the heroic legends of the Greeks cloud or enrich our understanding of the Minoan and Mycenaean cultures? What does archaeology contribute to our understanding of Classical Greece, which is otherwise so eloquently preserved to us through its literature? Current archaeological research in Greece. (DR:5)

4 units, Win (M. L. Munn)

108. Topography and Monuments of Greece—Survey of the principal cities, sanctuaries, and historical places from the Mycenaean era to the Roman period. Familiarizes students with the physical setting of Greek history and culture, and prepares students for travel and study in Greece.

3-4 units, Win (Munn)

120. Greek Vase-Painting—(Same as Art 102/202.) Survey of Greek vases and their painters from the Protogeometric period onwards. Emphasis on the masters of Athenian black-figure and red-figure painting, and to the problems involved in distinguishing individual hands.

4 units, Aut (Maxmin) MW 1-2:15

127. Archaeological Practicum—Hands-on, taught in the Archaeology Reserve of the Stanford Museum of Art. Lectures on aspects of Greek archaeology, during which students study and handle Greek artifacts, with student participation in the restoration and classification of ancient vases.

2 units, Aut, Win, Spr (Munn) F 2:15-4:05

160. Individual Work in Archaeology.
by arrangement

Courses at the 200 level are mainly for graduate students.

201. Colloquium: Pots and Politics in 6th-Century Athens—(Enroll in Art 201.)

4 units, Spr (Maxmin)

260. Individual Work in Archaeology.
by arrangement

1-15 units, any quarter (Staff)
by arrangement

HISTORY OF SCIENCE

The Classics Department participates in the History of Science Program, described in that program's section in this bulletin.

Courses in this area have department prefix 378.

138A,B,C. Introduction to Cosmology—(Same as History 138A, B, C; History of Science

138A. Ancient Period—(DR:3; satisfies Area 6 when taken in sequence with 138B or 138C.) 4 units, Aut (Knorr) MWF 2:15

138B. Middle Ages to Newton—(DR:3; satisfies Area 6 when taken in sequence with 138A.) 4 units, Win (Knorr)

138C. Newton to Einstein—(DR:3; satisfies Area 6 when taken in sequence with 138A.) 4 units, Spr (Knorr)

140. Topics in the History of Mathematics: From Antiquity to the 17th Century—(Enroll in History of Science 140, History 138D, Philosophy 140.) 3 units, Win (Knorr) TTh 2:30-3:45

INDO-EUROPEAN LINGUISTICS

Courses in this area have department prefix 378.

340. Introductory Sanskrit. 4 units, Spr (Devine)

353. Comparative Grammar of Greek and Latin. 5 units, not given 1990-91

LITERATURE

Courses in this area have department prefix 378.

12. Greek Tragedy: Aeschylus, Sophocles, Euripides—(Same as Drama 153.) Intensive reading of 12 to 15 tragedies. Emphasis on placing the plays in their 5th-century Athenian context and on problems of staging and audience expectations. (DR:2) 3-5 units, Win (McCall)

115. Greek Attitudes, Values, Beliefs—Focus is on Herodotus's Histories I; Sophocles's Antigone; Plato's Republic I. (DR:3) 2-3 units, Win (Dover)

160. Individual Work—For department majors only, by arrangement

176. Senior Seminar. 4 units, Spr, by arrangement

201. Introduction to Classical Scholarship. 1 unit each, Aut, Win, Spr (Wigodsky) W 12

260. Directed Reading. 1-15 units, by arrangement

PHILOSOPHY AND POLITICAL THEORY

Courses in this area have department prefix 378.

See also Philosophy 117.

3. Democracy and Imperialism—In 100 years, 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, the oligarchical states, formed around Sparta and Corinth, and after a long war Athens was defeated. Translated original sources show the development and inter-relationships of democracy and imperialism, identifying the universal principles involved. (DR:3)

3 units, not given 1990-91

8. Political Philosophy in Classical Antiquity—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) 2-3 units, not given 1990-91

65. Greek Philosophy—(Same as Philosophy 100.) The philosophies of Plato and Aristotle with some pre-Socratic background. (DR:3) 4 units, Aut (Judson) MWF 1:15

169. Introduction to the Ethics of Socrates, Plato, and Aristotle—The ethical thought of Socrates, Plato, and Aristotle as represented by Plato's Apology, Laches, Corgias, Meno, Republic and Aristotle's Nicomachean Ethics. 2-3 units, Aut (Nightingale) MW 2:15-3:35

RELIGION AND MYTHOLOGY

Courses in this area have department prefix 378.

18. Greek Mythology—Cosmogony, the Heraclites legend, the Underworld, Platonic myth-making, modern survivals, and the nature of myth itself. Readings are supplemented with material drawn from Greek art and modern Greek folklore. (DR:3) 3-4 units, Spr (Heath)

GRADUATE SEMINARS

Graduate seminars vary each year The following are offered this year.

ANCIENT HISTORY (371)

187/387. Law and Society in the Roman Empire.

ART AND ARCHAEOLOGY (372)

CLASSICS, GENERAL (378)

340. Introductory Sanskrit.

GREEK (373)

431. Homer and the Homeric Hymns
432. Euripides.

LATIN (375)

442. Horace’s Ars Poetica.

COMMUNICATION

Emeriti: (Professors) Nathan Maccoby, Lyle M. Nelson, William Rivers; (Professor Teaching) Ronald Alexander; (Adjunct Professor) Julian Blaustein; (Lecturer) Jules Dundes
Chairman: Donald F. Roberts
Director, Institute for Communication Research: Byron B. Reeves
Director, John S. Knight Fellowships for Professional Journalists: James V. Risser
Director, Mass Media Institute: Henry Breitrose
Professors: Elie Abel (on leave Winter, Spring), Henry S. Breitrose, Steven H. Chaffee (on leave Autumn), Byron B. Reeves, Donald F. Roberts; (by Courtesy) Richard A. Brody, Michael L. Ray, Eugene J. Webb
Associate Professors: Jeremy Cohen (on leave Spring), Theodore L. Glasser
Assistant Professors: June Flora, Clifford Nass
Professors (Teaching): Jan Krawitz, Marion Lewenstein, James V. Risser, Kristine Samuelson

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 journalism or documentary film. The Ph.D. degree leads to careers in teaching and research or other related specialties.

The Institute for Communication Research offers research experience primarily to advanced Ph.D. students.

The John S. Knight Fellowship Program brings promising mid-career professional journalists to the University to study for nine months in a non-degree program. Twelve U.S. journalists are joined by six International Fellows sponsored by Reuter Foundation, the German Marshall Fund of the United States, the Knight Foundation, and others.

ADMISSION

Prospective Undergraduate Students—Write to the University’s Office of Admissions, Stanford University, Stanford, California 94305.

Prospective Graduate Students—Write to the Graduate Admissions Office.

The department requires that applications for graduate admission include verbal and quantitative scores from the Graduate Record Examination.

UNDERGRADUATE PROGRAM

BACHELOR OF ARTS

The undergraduate curriculum is intended for liberal arts students who wish to build a fundamental knowledge of the communication function in society. Majors take a core group of seven courses within the Communication Department, plus a section of elective courses. In addition, undergraduates take one class in statistics and one class in elementary computer science programming, both offered in other departments. A student may be exempt from the computer sciences class if its equivalent has been taken in high school.

The core group includes both practicum and theory courses in media and society, print and broadcast journalism, visual communication (film/videotape), and communication research. Through electives, including an optional senior project, students may choose to build greater depth in any of these areas.

To be recommended for the Bachelor of Arts degree in Communication, students must complete at least 50 units and preferably no more than 60 units within the Communication Department, plus statistics and computer science (unless exempt from the latter). Not more than 12 units of transfer credit or Summer Session credit may be applied to meet departmental requirements. The seven core courses equal 33 units. An additional 17 elective units must be taken within the Communication Department. In addition, a statistics course offered in the Psychology, Statistics, or Human Biology Department is 5 units and the computer science course is 4 units.

The statistics and computer science courses may be taken for Satisfactory/No Credit. All Communication Department courses required to fulfill departmental requirements must be taken for a letter grade unless offered only for Satisfactory/No Credit.
COMMUNICATION 331

CURRICULUM

1. Students should declare the major during either the sophomore or junior year. Prior to, or concurrent with, declaring a major in communication, students must have completed:
   a) Communication 1, Mass Communication and Society (core course) and have completed, or be enrolled in:
   b) Psychology 60 or Statistics 60 or Statistics 70 or equivalent course.
   c) Computer Science 105A or equivalent. These three courses are prerequisites, in varying combinations, for the remaining six core courses, which may be taken in any sequence (as long as additional prerequisites for certain courses are also met):

2. a) 104, Reporting and Writing the News (prerequisites: 1; statistics; Computer Science 1)
   b) 106, Research Methods (prerequisite: 1; statistics)
   c) 108, Mass Communication Theory (prerequisites: 1; statistics; computer science)
   d) 110, Communication and Law (prerequisite: 1)
   e) 114, Introduction to Film and Video (prerequisites: 1 and 104, or consent of instructor)
   f) 140, History of Journalism; or 141, History of Film (prerequisite: 1).

Seniors interested in working one-on-one with a faculty advisor may apply to faculty of their choice for a senior project (190, 5 units). If accepted, a mutually agreeable research project is fashioned, including literature review and analysis on a selected topic or an experimental research project; or production of a finished piece of work in print or broadcast journalism, or in film. It may be possible, under some limited circumstances, to combine the senior project with an internship.

GRADUATE PROGRAMS

MASTER OF ARTS

The Master of Arts degree is awarded by the department in the fields of Journalism or Documentary Film Production. The Master of Arts programs are terminal degree programs designed to train practitioners. Students interested in the doctoral program 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 are considered together with all other doctoral applicants.

Candidates must earn at least 45 units in graduate residence at Stanford, and they must maintain a high academic performance during the entire program of study. At least 35 of the 45 units must be in courses numbered 200 or higher. A master project (on occasion a thesis) under the direction of a major professor must be undertaken. A report of the project must be made to the professor directing the project. Completion of the entire program normally takes three to five quarters depending on the nature of the project, although it is typical that film students spend a longer time on complex projects. Master's students are expected to finish within one academic year (three quarters). Students who have completed the course and residence requirements may register in Terminal Graduate Registration status to complete the project.

Students in the Documentary Film master's program are required to take Communication 223A, B, C and 224A, B, C. Additional courses in film aesthetics, history, and criticism are offered. Students may select other relevant courses, in consultation with their advisors, from within or outside the department.

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 $1,700 for the three quarters.

Students in the Journalism master's program are required to take Communication 204, 205, 216, 225, 275, and 290. A minimum of three additional courses are taken in consultation with the academic advisor, including courses in the study of mass communication and one taken outside the department.

DOCTOR OF PHILOSOPHY

The department offers the Ph.D. in Communication Theory and Research. Students are required in their first year to complete a core program in communication theory and research, research methods, and statistics; these core courses are grounded in the social science literature. Following completion of the core program, students take advanced courses and seminars in communication and related departments. Each student builds several research specialties relating communication to the study of campaigns, children, health, law, ethics, politics and voting, psychological processing, and technology and work. 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.
2. Pass general qualifying examinations by the beginning of the second academic year of study and two specialized area examinations by the end of the third academic year of study.
3. Demonstrate proficiency in tools required in the area of specialization. Chosen with the advice of the faculty, such tools may include foreign languages, statistics, computer programming, etc.
4. Complete 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. Complete a dissertation satisfactory to an advisory committee of three or more faculty members.
7. Pass the University oral examination, which is a defense of the dissertation.

Students are expected to complete departmental examinations and a first-year project by the end of the second year of study, after which they must apply for admission to candidacy. 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 coursework followed by 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 "core" courses required of all students.

All Ph.D. students must fulfill the following departmental course requirements:

311A. Theory of Communication I
311B. Theory of Communication II
313. Computer Analysis of Communication Research Data
317. Doctoral Research Methods I
318. Doctoral Research Methods II
319. Doctoral Research Methods III

One of the following two-quarter statistics sequences should be completed by the end of Winter Quarter of the first year:

1. Psychology 60, Statistical Methods
3. Education 250A and B, Statistical Analysis in Educational Research
4. Any two equivalent courses

Students must also complete a third course that advances their knowledge in a broad area of statistics, preferably in multivariate analysis. Any of the following would satisfy the requirement:

Education 250C, Statistical Analysis in Educational Research II
Education 250D, Statistical Analysis in Educational Research II
Psychology 152, Analysis of Data
Statistics 201, Introduction to Data Analysis Statistics 205, Introduction to Nonparametric Statistics
Statistics 206, Applied Multivariate Analysis

Any equivalent course agreed to by the department

In addition, students must complete a minimum of four other advanced Communication Theory courses (numbered 370 and higher). Specification of these courses depends on (1) individual student needs to prepare for preliminary and area examinations, and (2) 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:

Communication 397, First-year Research Project
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 Graduate Studies. Reapplication requires re-examination.

Ph.D. MINOR

Candidates for the degree of Doctor of Philosophy in other departments who elect a minor in communication are 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 are examined by a representative of this department. The balance among communication theory, methods, and applications courses are determined by the candidate and his or her advisor.
THE INSTITUTE FOR COMMUNICATION RESEARCH

This institute operates as an office of project research for the faculties of the Department of Communication on grants from foundations, communication media, and other agencies. Research assistantships are often available to qualified Ph.D. students in communication.

MASS MEDIA INSTITUTE

During Summer Quarter, the Department of Communication conducts a series of eight-week workshop production courses in Film, Radio/Television, Broadcast News, 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 in Film Aesthetics, Media Law, and Mass Communication 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 Director, Mass Media Institute, Department of Communication, Stanford University, Stanford, CA 94305-2050.

COURSES

PRIMARILY FOR UNDERGRADUATES

(*Core Courses)

1. Mass Communication and Society—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 (Cohen)
sections by arrangement

101. Film Aesthetics—(Graduate students register for 201.) A theoretical, historical examination of the nature of the film medium. Emphasis on the problems of aesthetics and communication from the viewpoints of the practitioner, the critic, and the audience.

3-4 units (Breitrose, Staff) given 1991-92

104. Reporting and Writing the News—A reporting and writing course emphasizing various forms of journalism: news, broadcast, interpretation, features, opinion. Detailed criticism of writing. Prerequisites: statistics; Computer Science 1; typing speed of 35 words per minute.

*5 units, Aut, Win, Spr (Staff)

104S. Reporting and Writing the News—Workshop emphasizing spot news, news features, news interpretation, and analysis.

6 units, Sum (Staff)

106. Communication Research Methods—(Graduate students register for 206.) Formulation of research problems, research design, sampling, data collection, and analysis. A variety of studies are critically evaluated. The class designs and conducts a small communication study. Prerequisites: 1; statistics, computer science.

*4 units, Win (Nass)

107S. Editing the News—Copy editing, headline writing, news displays, and picture cropping. Lab includes wire services, news evaluation, and page make-up.

3 units, Sum (Staff)


*5 units, Spr (Reeves)

109. Communication and Law—(Graduate students register for 210.) The interactions among freedom of expression, communication, and law. Issues such as privacy and freedom of speech are used to introduce the application of communication research to law and policy formation. Students consider assumptions about communication found in law and the effects of law and communication on each other.

*5 units, Win (Cohen)

114. Introduction to Film and Video—Preparation of visual media from conceptualization to completion of various super-8 and video assignments. Written preproduction of media projects is emphasized in conjunction with the practical visual and aural techniques necessary for executing ideas on film and tape. Prerequisites: 1 and 104, or consent of instructor.

*5 units, Aut (Walton)
Spr (Samuelson)

117. 16mm Film Production—A practical, hands-on course for those interested in a career in motion picture production. Provides thorough grounding through production of a short 16mm non-synchronous film with multiple soundtracks. Prerequisites: successful completion of 114 and consent of instructor. Lab fee to be announced.

5 units, Win (Krawitz)

120. Media, Policy, and Law—Introduction to legal issues relevant to journalists. Topics: privacy and libel law, newspaper joint operating agreements, broadcast licensing, the fairness doctrine, and cable regulation.

3 units, Sum (Cohen)
122. Documentary Film—(Graduate students register for 222.) Analysis of the techniques and strategies of films designed to effect attitudinal and behavioral change. Prerequisite: consent of instructor.
4 units, Aut (Breitrose)

125. Perspectives on Journalism—(Graduate students register for 225.) Survey of issues, ideas, and concepts in the development of American journalism, with emphasis on role of the press in society, meaning and nature of news, and professional norms that influence conduct in and outside of the newsroom. Prerequisite: 1 or junior standing.
5 units, Aut (Glasser)

131. Press Ethics and Responsibility—(Graduate students register for 231.) The development of professionalism among American journalists, with emphasis on the emergence of objectivity as a professional and epistemological norm. An applied ethics course where questions of power, freedom, and truth autonomy are treated normatively so as to foster critical thinking about the origins and implications of commonly accepted standards of responsible journalism.
4 units, Spr (Glasser)

136. Broadcast Journalism—(Graduate students register for 236.) A survey of broadcast journalism focusing on commercial and public broadcast news outlets. Not a pre-professional skills course; students are introduced to broadcast newswriting and prepare tapes for radio news broadcast. Additional lab. Prerequisite: 104 or 204.
5 units, Win (Staff)

138. Film Images of African-American Culture—(Same as Anthropology 130, Afro-American Studies 122.) The nature of images of African-Americans and African-American culture as portrayed on film. The sources of those images (including sources of African-American culture itself), their variations, and how they have changed over time. Historical trends are related to changes in African-Americans' self-conceptions, in their status and power in American society, in their role in the film industry, and changes in overall American race relations and American popular culture, including the film media. (DR:5)
5 units, Spr (Gibbs)

139. Literature of the Press—(Graduate students register for 239.) Readings from journalists, their lives and work. Several basic readings for all; additional readings by individual students for the purpose of leading seminar discussions on: the journalist in historical perspective; as initiator or follower of political and social trends; as propagandist; as mediator of popular culture. Enrollment limited to 12.
4 units (Lewenstein) not given 1990-91

140. History of American Journalism—(Graduate students register for 240.) Evolution of the democratic mass media in its social, political, economic, technological, and professional aspects. (DR:5)
*4 units, Spr (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 (Breitrose)

4 units (Breitrose) given 1991-92

150. Magazine Writing—(Graduate students register for 250.) Practice in writing magazine articles, with emphasis on marketing manuscripts. Conferences. Prerequisite: 104.
4 units, Spr (Rivers)

157. Public Information Programs—(Gradual students register for 257.) Emphasizes health information programs and their effects on public knowledge, attitude, and behavior; also information programs concerned with energy conservation, environmental protection, educational and occupational opportunity, consumerism, etc. The interplay of research and fieldwork is analyzed in case studies of successful programs.
3 units, Aut (Flora)

160. Seminar: Political Communication—(Same as Political Science 194C; graduate students register for 260.) Analysis of the role of mass media and other channels of communication in political and electoral processes.
4 units (Chaffee) given 1991-92

163. Seminar: The President, the Press, the Public, and Politics—(Same as Political Science 191.) The interactions between the American President, the media, and the public in contemporary American politics. Standard and new conceptions of the sources of presidential power in policy making. Whether the evidence justifies the new conceptions of the role of President in the politics of policy making.
5 units, Spr (Brody)

169. Communication, Technology, and Society—(Same as Sociology 149, VTSS 162; graduate students register for 269.) Methods for analyzing and addressing the question: Does technology drive societal change or does society drive tech
nological change? Examples focus on the relationship between information and information-processing technologies since 1850 and on mass society, the information economy, and the self.

4 units, Aut (Nass)

170. Communication and Children I—(Graduate students register for 270.) A developmental approach to how children come to use the mass media, what information they obtain, and how their behavior is influenced by the media. Prerequisite: 1, Psychology 1, or Sociology 1. (DR:4) 4 units, Spr (Roberts)

171. Communication and Children II—(Graduate students register for 271.) Research practicum; limited enrollment; consent of instructor. Prerequisite: 170. 3 units (Roberts) given 1991-92

173. Communication and Health—(Graduate students register for 273.) Seminar on campaigns designed to change information attitudes and behavior, particularly health. 4 units (Flora) not given 1990-91

175. Reporting of Public Affairs—(Graduate students register for 275.) Coverage of traditional news beats: police, city hall, education, courts, and issue-oriented coverage of policy area beats. Prerequisite: 104. 5 units (Risser) not given 1990-91

177. Specialized Workshops—(Graduate students register for 277.) One or more classes are offered in specializations such as science writing, sports writing, or other areas. Organized around writing projects oriented toward the field of specialization.

4 units, Aut (Abel)

177A. Opinion Writing—(Graduate students register for 277A.) 4 units, spr (Abel)

177B. Science Writing—(Graduate students register for 277B.) 4 units, Spr (Lewenstein)

177C. Advanced Reporting—(Graduate students register for 277C.) 4 units, Spr (Chaffee, Glasser)

178. Media Management—The management and financial aspects of media organization. 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. The interplay between editorial and business decisions.

4 units (Lewenstein) not given 1990-91

190. Film Criticism—(Graduate students register for 280.) A critical view of film. Readings/discussion consider models of artistic and literary criticism as points of comparison. The journalistic, psychoanalytical, Marxist, structuralist, and semiological approaches. Weekly reviews stress the meaning of the films and a lucid writing style. Prerequisites: 104, and 101 or 141. 4 units, Spr (Breitrose)

195. Internship Experience—Professional experience in the media. Open only to Communication majors.

Aut, Win, Spr (Lewenstein) by arrangement

199. Individual Work—Major students with high academic standings are permitted to undertake individual work.

1-4 units, any quarter (Staff) by arrangement

PRIMARILY FOR A.M. STUDENTS

200S. Film Production Workshop—Introduction to film writing and production techniques, covering the basics of cinematography, sound, and editing. Students do one or two short super 8 projects, using this as a sketchbook for 16mm, with each student producing, shooting, and editing a 2-minute, black and white film with mixed sound track.

9 units, Sum (Staff)

201. Film Aesthetics—(Graduate section; see 101.)

202. Graduate Colloquium in Film and Television—Topics in film and television focusing mainly on production-related issues. Enrollment limited to A.M. students in film and television program.

1 unit, Aut, Win, Spr (Staff)

204. Reporting and Writing and News—(For graduate students.) A reporting and writing course emphasizing various forms of journalism: news, interpretation, features. Detailed criticism of writing.

5 units, Aut (Abel)
205. Editing the News—Copy editing, headline writing, news display, and photo cropping. Laboratory includes editing copy, Associated Press, news evaluation, and page make-up.
   4 units, Win (Lanson)

   9 units, Sum (Hale)

206. Communication Research Methods—(Graduate section; see 106.)

208. Mass Communication Theory—(Graduate section; see 108.)

209S. Broadcast News Workshop—News production techniques and a laboratory emphasizing reporting techniques. Training in producing, directing, writing, and delivering television newscasts.
   9 units, Sum (Staff)

210. Communication and Law—(Graduate section. See 110.)

210S. Television Production Workshop—Studies in television production theory and techniques in studio and remote locations. Mini-documentaries, public service programs, and program promotion are emphasized.
   9 units, Sum (Staff)

   5 units, Aut (Cohen)

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. Does not substitute for 1.
   3 units, Sum (Staff)

222. Documentary Film—(Graduate section; see 122.)

222A. Documentary Film/Video Directing I—(For graduate students.) Emphasis on conceptualizing and executing ideas for the production work done jointly with 224A. All aspects of pre-production at an introductory level are covered. Prerequisite: consent of instructor.
   5 units, Aut (Lowe)

222B. Documentary Film/Video Directing II—(For graduate students.) Further professional training in pre-production and producing for motion pictures and television. Interview skills and other documentary directing techniques are developed utilizing video. Taken concurrently with 224B. Prerequisite: 223A.
   5 units, Win (Samuelson)

222C. Documentary Film/Video Directing III—(For graduate students.) Further examination of structure with emphasis on writing and directing the documentary. Practical training in fundraising and distribution. Taken concurrently with 224C. Prerequisite: 223B.
   5 units, Spr (Samuelson)

224A. Film Production I—(For graduate students.) First of a three-quarter sequence leading to professional training in motion picture production. 16mm exercises and a short 16mm non-synchronous film with multiple sound tracks and sound effects. Corequisite: concurrent registration in 223A.
   5 units, Win (Krawitz)

224B. Film Production II—(For graduate students.) Produce a short 16mm film exercise in color utilizing synchronous sound with emphasis on observational filming techniques. Prerequisite: successful completion of 223A and 224A and concurrent registration in 223B.
   5 units, Win (Krawitz)

224C. Film Production III—(For graduate students.) Final quarter of professional training in motion picture production. A five-to-seven-minute, 16mm film utilizing all skills acquired in 224A and 224B. Issues of documentary form and content. Prerequisites: successful completion of 224B and concurrent registration in 223C.
   5 units, Spr (Krawitz)

225. Perspectives on Journalism—(Graduate section; see 125.)

236. Broadcast Journalism—(Graduate section; see 136.)

239. Literature of the Press—(Graduate section; see 139.)

240. History of American Journalism—(Graduate section; see 140.)

241. History of Film—(Graduate section; see 141.)

242. Broadcasting in America—(Graduate section; see 142.)

   4 units, Win (Breitrose)

250. Magazine Writing—(Graduate section; see 150.)
   4 units (Staff) given 1991-92
257. Public Information Programs—(Graduate section; see 157.)

260. Seminar: Political Communication—(Graduate section; see 160.)

269. Communication, Technology, and Society—(Graduate section; see 169.)

270. Communication and Children I—(Graduate section; see 170.)

271. Communication and Children II—(Graduate section; see 171.)

273. Communication and Health—(Graduate section; see 173.)

275. Reporting of Public Affairs—(For graduate students.) Coverage of traditional news beats, such as police city hall, education and courts as well as issue-oriented coverage of policy area beats. Prerequisite: 204.

5 units, Win (Leventstein)

276. International Communication: Structures and Issues—(Graduate section; see 176.)

277. Specialized Workshops—(Graduate sections; see 177.)

277A. Opinion Writing.

277B. Science Writing.

277C. Advanced Reporting.

278. Media Management—(Graduate section; see 178.)

290. A.M. Project.

4-8 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

PRIMARILY FOR Ph.D. STUDENTS

301. Mass Media and Society—Emphasis on pedagogical and other substantive issues involved in media and society curriculum development.

1-3 units, Aut (Cohen)

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 (Flora, Roberts)

311B. Theory of Communication—Continuation of 311A with emphasis on communication theory. Prerequisite: 311A.

4-5 units, Win (Reeves, Nass)

311C. Theory of Communication—Continuation of 311B. Prerequisites: 311A, 311B.

4-5 units, Spr (Chaffee, Glasser)

313. Introduction to the Use of the Computer—Specifically for science data analysis. A brief discussion of computing concepts, followed by use of Wylbur and Edit, text editors on SCIP and LOTS systems; SPSS; and data storage.

1-3 units, Win (Staff)

317. Doctoral Research Methods I—Application of scientific method to communication research. Logic of inquiry; conceptualization of variables: design of experiments, quasi-experiments, and nonexperiments. Previous or concurrent enrollment in statistics required.

4 units, Aut (Reeves)

318. Doctoral Research Methods II—Continuation of 317. Sampling questionnaire design, attitude scale construction, survey administration, computer analysis of data.

4 units, Win (Flora, Roberts)

319. Doctoral Research Methods III—Continuation of 318. Project-oriented approach to relationship between theory and data analysis; advanced topics in data analysis.

4 units, Spr (Nass)

370. Advanced Communication Theory and Method Seminar I—May be repeated for credit. Topic and instructor change each year. Prerequisites: 311A, 319.

3 units (Staff) not given 1990-91

371. Advanced Communication Theory and Method Seminar II—May be repeated for credit. Topic and instructor change each year. Prerequisites: 311A, 319.

3 units, Win, sec. 1 (Chaffee) sec. 2 (Reeves)

372. Advanced Communication Theory and Method Seminar III—May be repeated for credit. Topic and instructor change each year. Prerequisites: 311A, 319.

3 units, Spr, sec. 1 (Nass) sec. 2 (Chaffee)

373. Topics in Communication, Technology, and Society—(Same as VTSS 271.) Interdisciplinary seminar discussing the relationship between dimensions of technology and the economy, work and organizations, mass society, culture, and the self. Emphasis on classic books rather than recent papers.

4 units (Nass) given 1991-92

374. Structure and Control of Communication—Analysis of the political economy of mass media, emphasizing the social, cultural, and political implications of contemporary patterns of ownership, organization, and control of the major media industries in the U.S. and elsewhere.

4 units, Spr (Glasser)
378 SCHOOL OF HUMANITIES AND SCIENCES

375. Communication Theory Review Seminar—Limited to Ph.D. students. Prerequisite: 311A, 311B.
3 units, Spr (Reeves) by arrangement

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. Individual Work.
1-8 units, Aut, Win, Spr (Staff)

400. Dissertation Research.
6-10 units, Aut, Win, Spr (Staff)
by arrangement

COMPARATIVE LITERATURE

Emeritus: (Professor) Joseph Frank (Slavic Languages and Comparative Literature)
Chairman: Hans Ulrich Gumbrecht
Professors: John Bender (English and Comparative Literature), John Freccero (Italian and Comparative Literature), René Girard (French and Comparative Literature), Hans Ulrich Gumbrecht (French and Italian, and Comparative Literature), Herbert Lindenberger (English and Comparative Literature), Patricia Parker (English and Comparative Literature), Mary Pratt (Spanish and Portuguese, and Comparative Literature), David Wellbery (German Studies and Comparative Literature)
Associate Professors: Thomas Hare (Japanese and Comparative Literature), Jeffrey T. Schnapp (Italian and Comparative Literature)
Assistant Professor: David Palumbo-Liu (Comparative Literature)

Undergraduate 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 a 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 is assigned an advisor representing the Department of 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 fourth 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 Cultures, Ideas, and Values Requirement—15 units, freshman year, with a letter grade indicator (LGI) of at least "B" and an "A" or better in at least one quarter of the sequence.
2. Humanities 90—5 units, sophomore year.
3. Two seminars drawn from the series Humanities 191-196, of which one must be 194.
4. Course distribution should be designed so that students develop an extensive background (six courses covering a broad range of periods) in a single national literature read in the original language. This requirement is fulfilled through work either in the English Department or in one of the language departments.
5. Course distribution should also provide a background (at least three courses) in a second national literature read in the original language. This requirement pertains whether the main literature (section 4) is English or foreign. When the main literature is English, one additional course—preferably a literature...
course—in a second foreign language is also required. When the main literature is a foreign one for which conditions of linguistic preparation may be complex (Asian languages, for example), students should consult their advisors with regard to coursework in a second literature.

6. 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.

7. 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.

8. Honors Essay—an essay in literary criticism (2 units, Spring Quarter, junior year; 5 units, Autumn Quarter, and 5 units, Winter Quarter, senior year). An LCI of at least "B" is required on the essay for graduation with honors in Humanities.

9. Two courses related to the student’s total program, but drawn from disciplines outside literature.

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 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.

Before starting graduate work at Stanford, students should have completed an undergraduate program with a strong background in one literature and some work in a second literature studied in the original language. Since the program demands an advanced knowledge of two foreign languages and a reading knowledge of a third foreign language, students should at the time of application have a sufficiently advanced knowledge of one foreign language to enable them to take graduate level courses in that language when they enter the program. They should also be making sufficient progress in the study of a second foreign language so that they are able to take graduate courses in that language not later than the beginning of the second year, and earlier if possible. Applicants are expected to take an intensive course in the third foreign language before entrance.

A considerable part of a student’s work consists 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 as Comparative Literature Fellows under a plan which attempts to integrate financial support and completion of residence requirements with their training as prospective university teachers. Tenure as a fellow, assuming satisfactory academic progress, is 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 work to be spread over five years. Students in the fifth year ordinarily apply for outside fellowships or for part-time teaching positions in language and literature departments at Stanford.

APPLICATION PROCEDURES

Competition for entrance into the program is keen. The program is kept small so that students have as much opportunity as possible to work in individual projects under faculty supervision throughout the period of study. No more than 16 students are in residence at any one time. The department does not plan to admit more than three or four new students for the class entering in September. Completed applications are due January 1. Because of the special nature of comparative literature studies, the statement of purpose included in the application for admission should contain the following information besides the general plan for graduate work called for on the application:

1. A detailed description of the applicant’s present degree of proficiency in each of the languages studied, indicating the languages in which the applicant is prepared to do graduate work at present and outlining plans to meet additional language requirements of the program.

2. A description of the applicant’s area of interest (for instance, theoretical problems, genres, periods) within literary study and the reasons for finding comparative literature more suitable to his or her needs than the study of a single literature. Applicants should also in-
clude what they think will be their primary field.

All applicants should arrange to have the results of the general section of the Graduate Record Examination sent to the Graduate Admissions Office. Those who consider English or American literature a major field of study should take the subject test on "Literature in English."

Recommendations should, if possible, come from faculty in at least two of the literatures in which the student proposes to work.

Applicants must submit a copy of an undergraduate term paper which they consider representative of their best work.

DEGREE REQUIREMENTS

Residence—A candidate for the Ph. D. degree must complete three years (nine quarters) of full-time work, or the equivalent, in graduate study beyond the Bachelor of Arts degree. The student is expected to offer at least 72 units of graduate work in addition to the doctoral dissertation. At least three consecutive quarters of coursework 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. Foreign language preparation must be sufficient before entrance so that a graduate-level course in at least one language can be taken during the first year and in the second language 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. One of the student's three literatures is 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 half time and one quarter at quarter time. Fellows must complete whatever pedagogy courses are required by the departments in which they teach.

Minimum Course Requirements—

1. Comparative Literature 369 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 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 have sufficient opportunity to seek out new areas of interest. A "course" is an offering of 3-5 units.

Examinations—Three examinations are required. The third and last section is the University oral examination. Each student's reading list for the examination must be approved by an examination committee. The examinations consist of the following, 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. The 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. The 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 period of at least a century in three or more literatures. The reading list 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 concepts of periods in general. Students whose coursework combines an ancient literature, have the option of dividing the period sections into two wholly separate periods. The examination, which normally is taken during the last quarter of the student's third year, serves 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 take place during the quarter in which the student takes the first Ph.D. examination. Ordinarily this is 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 the first part of Ph.D. examination as well as 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 recommends him or her for admission to candidacy for the Ph.D. At this time the student is also 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 presents a dissertation proposal as part of the University oral examination. Successful completion of the examination constitutes approval of the proposal. Members of the dissertation reading committee ordinarily are drawn from the University oral examining committee.

**Ph.D. MINOR**

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 Department offerings. Students must have:

1. A knowledge of at least two foreign languages, one of them sufficient to qualify for graduate-level courses in that language, the second sufficient to read a major author in the original language.
2. A minimum of six graduate courses, of which three must be in the department of the second literature and three in the Department of 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.

**COURSES**

Courses primarily of a comparative nature are listed below. Check departmental listings for DR notations.

12. Greek Tragedy: Aeschylus, Sophocles, Euripides—(Enroll in Classics 12, Drama 153.) Intensive reading of 12 to 15 tragedies. Emphasis on placing the plays in their 5th-century Athenian context and on problems of staging and audience expectations. (DR:2)

3-5 units, Win (McCall)

14. Classical Athletics—(Enroll in Classics 14; Athletics, Recreation, and Physical Education 107.) Origins and history of competitive sport in the ancient world, from the funeral games for Patroclus (Homer) to chariot races in the Hippodrome of Constantinople, based on the literary and monumental evidence. Emphasis on the spirit of competition apart from athletics. Lectures (illustrated) and discussion groups.

2-3 units (Raubitschek)

18. Greek Mythology—(Enroll in Classics 18) Cosmology, the Herakles legend, the Underworld, Platonic myth-making, modern survivals, and the nature of myth itself. Readings supplemented with material drawn from Greek art and modern Greek folklore. (DR:3)

3-4 units, not given 1990-91

30. The Novel—(Enroll in English 30; if taking 5 units register for 130.) Introduction to how a close, sympathetic reading of the construction, narrative technique, and human values of a variety of major novels can increase the student's appreciation of a significant literary genre. (DR:2)

3 units, Aut (Packer)

50. Poetry and Poetics—(Enroll in English 50; if taking 5 units register for 150.) Introduction to reading poetry through a variety of poems, emphasizing the ways the meanings are shaped through diction, imagery, figurative language, and technical elements of verse. (DR:2)

3 units, Aut (Lindenberger)

Win (Middlebrook)

Spr (Felstiner)

61,62,63. Literature and the History of Ideas—Introduction to fundamental ideas of the past.
Emphasis is on the interconnection of literature, the arts, and philosophical and social thought in shaping the cultural traditions from the ancient to the contemporary world.

61. The Ancient Near East, Greece, and Rome—(Enroll in Humanities 61.) The Epic of Gilgamesh, the Bible, Homer, Sappho, Aeschylus, Sophocles, Euripides, Plato, Aristotle, Cicero, Epictetus, Vergil. (DR:1; three-quarter sequence)
5 units, Aut (Edwards, Staff) MTW II plus 2 hours by arrangement

62. The Middle Ages and the Renaissance—(Enroll in Humanities 62.) St. Augustine, Boethius, Beowulf, Marie de France, Icelantic Sagas, Dante, Chaucer, Machiavelli, Montaigne, Shakespeare, Cervantes, Milton, Moliere. (DR:1; three-quarter sequence)
5 units, Win (Evans, Staff) MTW II plus 2 hours by arrangement

63. The Enlightenment to the Present—(Enroll in Humanities 63.) Voltaire, Rousseau, Kierkegaard, Wordsworth, Tocqueville, Marx, Nietzsche, Freud, Dostoevsky, Proust, Virginia Woolf, Weil, T. S. Eliot. (DR:1; three-quarter sequence)
5 units, Spr (Lindenberger, Staff) MTW II plus two hours by arrangement

90. Introduction to the Humanities Honors Program—(Enroll in Humanities 90.) Basic themes and issues of the humanities as treated in important works from various humanistic disciplines. Prerequisites: completion of the CIV requirement and enrollment in the Humanities Honors program. Enrollment restricted to students in the Humanities Honors program.
5 units, Aut (Yearley) MW 3:15-5:05
Win (Mueller-Vollmer)

91. Traditional East Asian Civilization: China—(Enroll in Asian Languages 91.) Introduction to Chinese culture in a historical context. (DR:2*)
5 units, Aut (Van Zoeren)

92. Traditional East Asian Civilization: Japan—(Enroll in Asian Languages 92.) Introduction to traditional Japanese culture, emphasizing the relation between intellectual currents and the arts from the 8th-18th centuries. (DR:5*)
5 units, Win (Hare)

100. Literature and the Institution of Literary Study—(Same as English 265B, French and Italian 106, German Studies 179D, Spanish and Portuguese 209.) Overview of the emergence of the phenomenon of literature, of the institution of literary study in general, and of theoretical approaches to literature in particular. From ancient Greek rhetorical and poetical theory, tracks the changing shapes of ideas of literature and literary study from the Middle Ages through the present. Topics: the material culture of literary study and production (scribal vs. print vs. media cultures); the emergence of the concept of "national" literatures by the Romantic period, its institutionalization in the contemporary university and progressive decline (as in Stanford "Western Culture" debate and in the recurrent crises of literary theory from Russian formalism to deconstruction.
5 units, Win (Gumbrecht, Schnapp)

101. Nietzsche and the Politics of Post-Structuralism—(Same as German Studies 179Z.) Rigorous introduction to Nietzsche's semiotics of power and its influence on post-structuralist discourse (Foucault and Derrida). The politics of style, truth, knowledge, value, morality, subjectivity, and art through Thus Spoke Zarathustra. Limited to 15 students.
5 units, Spr (Brown, Franke)

102. Returning the Gaze: Reading Pornographic Culture—(Same as English 169A.) Examines what has been at stake in preserving pornography as freedom of speech and studies pornography's power to define us—how distinctions between high and popular culture, reading and acting, autonomy and domination become as difficult to recognize as they have seemed crucial to maintain in art and under the law. Uses feminist literary and legal theory to analyze pornography in a number of texts, including written narratives, film, and magazines, and to propose redefinitions. Limited to 15 students.
5 units, Aut (Cheek, Coopan) TTh 3:15-4:45

4 units, Win (Cohn)

131-133. German Culture and Civilization I-III—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. Students may enroll in any part of the series.

131. Central Europe: Geography, Institutions, and Society—(Enroll in German 131.) A survey of geography, people, and institutions of the German-speaking areas of Central Europe—contemporary situation and historical origins. Topics: governmental structure of the BRD, the DDR, Austria, and Switzerland; population; stability and migration; social structure of E. and W. Germany; the educational system; communications systems;
urbanization and its consequences since WWII.

4 units, Aut (Lohnes)

132. The Culture of Modernism in Austria and Germany—(Enroll in German Studies 132.) The birth of modernism in Vienna at the turn of the century, and in the Weimar Republic, emphasizing literature, music, painting, and architecture. The connections to broad intellectual and historical developments. The works of Hofmannsthал, Mahler, Freud, Schёnberg, Kandinsky, Gropius, Brecht, and Mann. (DR:2)

4 units, Win (Schmidt-Dengier)

133. Democracy, Protest, and Political Culture in German-Speaking Europe—(Enroll in German Studies 133.) 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)

4 units, Spr (Schlossbauer)

131A. Chinese Poetry in Translation—(Enroll in Asian Languages 131.) Readings in traditional poetry and poetics with emphasis on genre, theme, and style. (DR:2*)

4 units, Aut (Van Zoeren)

132A. Chinese Fiction and Drama in Translation—(Enroll in Asian Languages 132.) Survey of Chinese fiction, and drama from early times to the 19th century emphasizing literary and thematic discussions of major representative works available in English translation. (DR:2*)

4 units, Win (Staff)

132B. Mexican and Chicano Cultural Readings—(Enroll in Spanish 132B.) (DR:2)

4-5 units, Spr (Staff)

133A. Modern Chinese Literature in Translation—(Enroll in Asian Languages 133.) Readings in representative 20th-century works of fiction, drama, and poetry. (DR:2*)

4 units, Spr (Lyell)

150N. Major Dramatic Texts I: Greek and Roman—(Enroll in Drama 150N.) Selected texts from Aeschylus, Sophocles, Euripides, Aristophanes, Plautus, Terence, Seneca. (DR:2)

4 units, MWF 9 (Rayner)

151. Major Dramatic Texts II: Renaissance to Romantic—(Enroll in Drama 151.) Selected texts from Shakespeare, Corneille, Goldsmith, Hugo, Racine, Kleist, Moliere, Wycherley, Congreve, Sheridan, Schiller, Buechner. (DR:2)

4 units, MWF 9 (Rayner)

151A. Fyodor Dostoevsky—(Enroll in Slavic Languages 151.) Major works in English translation with reference to related developments in Russian and European culture and intellectual history. Open to graduates, seniors, and juniors. Lectures and discussion section. (DR:2)

4 units, Spr (Frank)

152N. Major Dramatic Texts III: Early Realistic to the Present—(Enroll in Drama 152N.) Selected texts from Ibsen, Chekhov, Brecht, Shaw, O'Neill, Williams, Miller, Shepard, Beckett, Ionesco, Genet, Weiss, Osborne, Pinter, Bond, Brenton, Churchill, Kennedy. (DR:2)

4 units, Spr (Lyons)

160. Theaters and Staging: Ancient to the 18th Century—(Enroll in Drama 160.) The Stylistic

135A. The Other Europe—(Enroll in Slavic Languages 135.) The sociocultural experience of contemporary Eastern Europe through 20th-century Polish, Czech, and Yugoslav writers: Schultze, Milosz, Kundera, Havel, Andric, Kis, and Pavic. Readings in English translation. (DR:2*)

4 units, Win (Wachtel)


4 units, Win (Levy)

137. Japanese Fiction in Translation—(Enroll in Asian Languages 137.) Introduction to major works of prose narrative from pre-modern Japan (7th through mid-19th centuries), emphasizing the historical, intellectual, and cultural context in which they were written. Read in English translation. Works vary each year; course may be repeated for credit with the instructor's permission. (DR:2*)

4 units, Win (Hare)

150N. Major Dramatic Texts I: Greek and Roman—(Enroll in Drama 150N.) Selected texts from Aeschylus, Sophocles, Euripides, Aristophanes, Plautus, Terence, Seneca. (DR:2)

4 units, MWF 9 (Rayner)

151. Major Dramatic Texts II: Renaissance to Romantic—(Enroll in Drama 151.) Selected texts from Shakespeare, Corneille, Goldsmith, Hugo, Racine, Kleist, Moliere, Wycherley, Congreve, Sheridan, Schiller, Buechner. (DR:2)

4 units, MWF 9 (Rayner)

151A. Fyodor Dostoevsky—(Enroll in Slavic Languages 151.) Major works in English translation with reference to related developments in Russian and European culture and intellectual history. Open to graduates, seniors, and juniors. Lectures and discussion section. (DR:2)

4 units, Spr (Frank)

152N. Major Dramatic Texts III: Early Realistic to the Present—(Enroll in Drama 152N.) Selected texts from Ibsen, Chekhov, Brecht, Shaw, O'Neill, Williams, Miller, Shepard, Beckett, Ionesco, Genet, Weiss, Osborne, Pinter, Bond, Brenton, Churchill, Kennedy. (DR:2)

4 units, Spr (Lyons)

160. Theaters and Staging: Ancient to the 18th Century—(Enroll in Drama 160.) The Stylistic
evolution of theater architecture and staging. The focus is primarily European; parts deal with Africa and Asia. Emphasis on the ways in which theaters and staging reflect their own cultural and spatial environments.

4 units, Aut (Eddelman) MWF 10


5 units, Aut (Drake)

162. French Films: Eric Rohmer—Fables of Love and Light—(Enroll in French 62.) Films from all periods of the director's work, including several of the Six Moral Tales and the recent meditations of desire, culture and individuality. Emphasis on the extreme subtlety of Rohmer's mise en scène and the camera's physical relation to nascent personalities. (Films subtitled, discussion in English and French).

4 units, Win (Winchell)

163. Naturalism to the Present—(Enroll in German Studies 163.) Introduction to major literary trends since the end of the 19th century, emphasizing the changing status of the author; Naturalism and Aestheticism, Expressionism, Dadaism, etc. Literature in the Weimar Republic; the impact of National-Socialism (1933-1945); exile culture. Developments after WWII. Contemporary authors, especially women, are discussed.

4 units, Spr (Schmidt-Dengler)

165A. Medieval Culture: An Interdisciplinary Introduction—(Enroll in English 165A, Medieval Studies 165.) Introduction to the development of medieval culture through religious, philosophical, literary, artistic, social, and political sources, emphasizing interrelationships among them. Lectures by faculty from various departments. (DR:2)

5 units, Spr (Brown, Staff)

165D. Medieval Epic and Romance—(Enroll in English 165D.)

5 units, Aut (Stork)


2-3 units, Spr (Nightingale)

169B. Readings in the Asian-American Novel—(Same as English 169B.) Asian-American novels from the perspectives of culture, history, and ideology. How do these works evince the workings of America upon the ethnic subject's notions of self-representation?

5 units, Aut (Palumbo-Liu) MTW '11

169C. A Question of Nature: The Lyric in Classical China and the English Romantic Age—(Same as English 169C, Asian Languages 169.) Comparison of the uses of nature as constitutive of lyric voice—how do poets from these varied traditions see themselves in, and through, their idea of Nature?

5 units, Win (Palumbo-Liu) MW 11-12:30

169D. Readings in Asian-American Short Fiction—(Same as English 169D.) Works of Asian-American short fiction from the perspectives of culture, history and ideology. How do these texts evince the workings of America upon the ethnic subject's notions of self-representation? Comparison of the short story and novel form in terms of genre and expression. A continuation of some topics in 169B.

5 units, Spr (Palumbo-Liu) MTW 11

169E. Making Sense of the Other—Examination of texts that seek to (re)present the "Other" to understanding. Focuses on the convergence of aesthetics and ideology.

5 units, Win (Palumbo-Liu) TTh 11-12:30

170. Mexican Immigration and the Corrido—(Enroll in Spanish 170.)

4-5 units, Win (Herrera)

170A. Brecht and Modern German Drama—(Enroll in German Studies 170A.) Plays by Austrian, Swiss, E. and W. German authors, concentrating on their contribution to contemporary political and cultural debates, and on their innovations and dramaturgy. Texts by Wedekind, Brecht, Dürrenmatt, Weiss, H. Müller, Bernhard, and others. Readings and discussions in English.

3-5 units, Win (Schlossbauer)


4 units (Matisoff) not given 1990-91


5 units, Spr (Apostolidès)
194. Literature and the Humanities—(Enroll in Humanities 194.)
5 units, Win (Brooks)
Spr (Winchett)

195C/295C. Semiotics of Film—(Enroll in Slavic Languages 195C/295C.)
3 units (I. Ivanov) not given 1990-91

206. Post-Classical Latin—(Enroll in English 206, Classics/Latin 118.) Careful reading of Latin texts of graded difficulty, including late pagan writers, the Vulgate Bible, patristic writings, medieval prose and poetry.
5 units, Aut (Brown)

209. Introduction to Paleography and Codicology—(Enroll in English 209, Classics 177.) Introduction to late antique and medieval manuscripts in Latin, medieval Latin and vernacular scripts, and the materials and composition of the medieval book.
5 units, Spr (Brown)

210. Theories of Literature and Culture in Latin America—(Enroll in Spanish 210.)
4-5 units, Spr (Rufinelli)

212. Psychiatry and Literature—(Same as Psychiatry 212; Modern Thought and Literature 212.)
2-3 units, Win (Van Natta)

4 units (Freidin) not given 1990-91

230A. Russian Formalism and Structuralism—(Enroll in Slavic Languages 230A.) 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. Knowledge of Russian not required.
4 units (Brown) not given 1990-91

241-243. The history of German thought from 1750 to the present and its significance for an understanding of modern culture. Authors: Herder, Hegel, Schiller, Marx, Nietzsche, Freud, Husserl, Wittgenstein, Marcuse, and Adorno. Given in German alternate years.

241. Deutsche Geistesgeschichte I—(Enroll in German Studies 241.) From Leibniz to Romanticism. Delineates major intellectual shifts of the 18th century: the concept of human knowledge, of religion, of history, of the nature of man, and of art were revolutionized and given a new basis. Centered on readings and detailed interpretations of texts by Lessing, Kant, Herder, Schiller, Fichte, Schlegel, and others.
3-5 units, Aut (Schlossbauer)

242. Deutsche Geistesgeschichte II—(Enroll in German Studies 242.) A study of key texts by Hegel, Marx, Nietzsche, and Weber.
3-5 units, Win (Staff)

3-5 units, Spr (Mueller-Vollmer)

4-5 units, Win (Corral)

245. Survey of Russian Literature in English Translation I: The Age of Experiment—(Enroll in Slavic Languages 245.) Part I of a three-quarter survey of the Russian prose tradition covers the first 40 years of the 19th century, emphasizing the formative period of Russian prose, the lesser known contributions of poets, and Romantic and popular writers. Recognized “classics,” Pushkin’s Eugene Onegin, The Belkin Tales, The Captain’s Daughter; Lermontov’s Hero of Our Time; Gogol’s Petersburg Tales and Dead Souls, are considered in the context of “local” literary and stylistic developments and of contemporary European trends.
4 units, Aut (Wachtel)

246. Survey of Russian Literature in English Translation II: The Age of Realism—(Enroll in Slavic Languages 246.) Selected novels and short fictions by Turgenev, Dostoevsky, Tolstoy, and Chekhov. A continuation of 245 but may be taken independently.
4 units, Win (Hunt)

247. Survey of Russian Literature in English Translation after 1917: Invention of Tradition—(Enroll in Slavic Languages 247.) Major works of Russian fiction and selected poetry, including the emigre and samizdat writings, in their literary and historical context (Bely, Blok, Maykovsky, Babel, Zoshchenko, Katav, Scholokhov, Nabokov, Olesha, Pasternak, Grossman, Solzhenitsyn, Siniavsky, and Brodsky, etc.) Attention to the way poets and novelists have constituted the post-revolutionary “historical
experience" of the Russians. A continuation of 245 and 246, but may be taken independently.

4 units, Spr (Brown)

4-5 units, Aut (Wynter)

253. Leo Tolstoy—(Enroll in Slavic Languages 253.) Tolstoy's literary work and thought in the context of Russian and European culture and intellectual history. Readings: *Childhood, War and Peace, A Confession, Father Sergius, The Living Corpse,* and *Hadji Murat.* Knowledge of Russian not required.
4 units, Win (Wachtel)

255. Methodology of Reading Poetry: Poesia de Amor—(Enroll in Spanish 255.)
4-5 units, Win (Ruffinelli)

256. Literature, Aesthetics, and the Process of Civilization—(Enroll in German Studies 256.) Pursues a new approach to literature, using Norbert Elias' theory of the process of civilization as its framework. Major changes in the perception and norms regulating the body, in the emotional, psychic, and intellectual constitution of the self in terms of their impact on literary aesthetics. Focuses on 16th- and 18th-century texts and the issues of Grobianismus, grotesque, high-low-opposition, the ugly, the controversy about imagination and the fantastic, the structural composition of literary texts, and the changing limits of poetic license.
3-5 units, Win (Schlossbauer)

263. The Origins of the New Latin American Novel—(Enroll in Spanish 263.)
3-5 units, Aut (Ruffinelli)

265. Introduction to Literary Theory—(Enroll in English 265.) For seniors and co-term students doing graduate work in literature and for those who want to have a basic course in theory. The major contemporary developments from Russian Formalism to Deconstruction to "Cultural Studies," with emphasis less on coverage than on the development of the student's own theoretical position. All read the same literary text (to be chosen). How the different approaches work in relationship to it.
5 units, Win (Perloff)

267. The Poetics of Post-Modernism—(Enroll in English 267.) Asks: What is "postmodern" poetry? How has the term "postmodern" been used and what is the relationship of Postmodern to Modern, to avant-garde? The "situation of poetry" in the immediate post-war years and the 1960s; the issue of Black Mountain, the Objectivists, and the New York poets vis-a-vis more mainstream work. Part 1 or a two-quarter sequence.
5 units, Win (Perloff)

268A. Hesse, Kafka, Mann—(Enroll in German Studies 268A.) The three major prose writers of German modernism best-known internationally. Their differences and resemblances, artistic heritages, major themes, styles, and contributions to the age of "myth and psychology." Readings: selected short stories and the novels *Steppenwolf,* *Buddenbrooks,* *Felix Krull,* and *The Trial.*
3-5 units, Aut (Gillespie)

269C. The Poet and the Painter in American Modernism—(Enroll in English 269C.) Study of modernist poets—Pound, Stevens, Williams, and Crane—whose poetry and poetics have developed through an engagement with modern painting.
5 units, Win (Gelpi)

277. French Critical Theory: Complexity and Self-Reference in the Humanities and the Social Sciences—(Enroll in French 277.) Undecidability, infinite deferment, structural incompleteness, bifurcation and structural stability, the text as a machine, etc. Interdisciplinary approach for students in the humanities and sciences to explore conceptual foundations of modern critical theory. Topics: deconstruction of structuralism, the logic of mimetic desire. Readings from Lacan, Derrida, Levy-Strauss, Girard. (In English.)
2-3 units, Win (Dupuy)

284A. Joyce, Proust, Mann I—(Enroll in German Studies 284A.)
3-5 units (Gillespie) given 1991-92

284F. Politics and Literature—(Enroll in French 284F.)
2 units, Aut (Glucksman)

288A. Limits of Economic Rationality I: The Nature of the Social Bond—(Enroll in French 288A.) Confrontation of three ways to account for society in an individualistic framework: the social contract (Hobbes, Rousseau); the "invisible hand" of the market (Smith, Walras); society as a crowd (Tarde, Freud, Keynes.) Comparison with the Durkheimian tradition. (In English.)
2-3 units, Spr (Dupuy)
290. Brazilian Cinema—(Enroll in Portuguese 290.)
4-5 units, Aut (Lopes)

3-5 units, Spr (Wynter)

293. Verse Translation Workshop—(Enroll in English 293.) Students pursue and present work in progress, discuss practical and theoretical questions. Consult instructor during previous quarter.
5 units, Spr (Felstiner)

297. Images of Women in Modern Japanese Literature—(Enroll in Asian Languages 297.) Reading and discussion of selected literary works illuminating various aspects of female experience in modern Japan. Prerequisite: 213 or equivalent.
4 units (Ueda) not given 1990-91

298. Translation Workshop—(Enroll in Asian Languages 298.) Discussion of problems involved in translating Japanese into English. Each student produces an original translation of a literary or documentary work from their field of interest.
4 units, Aut (Ueda)

298A. Undergraduate Colloquium: Visions of Utopia, Travellers to China—(Enroll in History 298A.)
5 units, Aut (Kahn)

298D. Literature, Folklore, and Mythology—(Enroll in Slavic Languages 298D.) The relation between early written literary texts and folklore mythopoetic traditions studied in the light of ancient Oriental, Greek, and Slavic texts. The different role of collective and individual creation in relation to genres of oral and written literature. Structure of mythopoetic narration and its transformation in later literature. The use of archaic motifs and images of mythology in different European traditions is analyzed in the material of classical and avant garde literature. Links between Russian symbolist and postsymbolist (futurist, imagist, and akmeist) poetry and folklore.
4 units, Aut (Ivanov)

298E. Modern Literature and Science—(Enroll in Slavic Languages 298E.) The relation between modern avant garde art and literature in Russian writers Andrej Bely, Velimir Khlebnikov, and artists Sergei Eisenstein, and parallel figures in French and other traditions. New concepts of space, time, language, sign as notions common to the science and art (including verbal art) 1900-1925. The rise of Russian formalist school in the light of its link to Russian avant garde poetry and prose.
4 units, Spr (Ivanov)

300. Contemporary Theoretical/Structures in the Analysis of Drama—(Enroll in Drama 300.)
5 units, Aut (Lyons) MW 10-12

301. Seminar: Foucault and Contemporary Critique—(Same as English 301.) The major works of Michel Foucault in relation to developments in contemporary literary theory and cultural critique.
5 units, Spr (Parker) M 6:15-9:05 p.m.

302. Colloquium: Feminism, Formalism, New Historicism: Rereading the Renaissance—(Same as English 302.) Contemporary critical issues in relation to canonical and non-canonical Renaissance texts.
5 units, Spr (Parker) W 3:15-6:05

5 units, Win (Bender) TTh 1:15-3:05

305. Colloquium: Literature and Institutions—(Same as English 305.) Theoretical investigation, with practical examples from various historical periods, of authorship, readership, evaluation, and the production and dissemination of literary texts.
5 units, Aut (Lindenburger)

5 units, Spr (Heath)

309. Criticism and Colonialism—(Enroll in Spanish 309.) Examines a range of critical approaches to literature and the study of literature and culture in relation to colonialism, neocolonialism, and the postcolonial world. Topics: representations and hegemony; dynamics of transculturation; cultural dimensions of decolonization and resistance; psychoanalysis and colonial subjects; ideologies of masculinity and the feminine; the colonial discourse movement; nationalism and the first world/third world distinction; popular culture and syncretism. Readings from European, North American, Latin
American, African, and Caribbean scholars. In English.

3-5 units, Aut (Pratt)

309C. Colloquium: Multicultural Readings in American Literature—(Enroll in English 309C.) Intensive study of the fiction and poetry written by "marginalized" writers in the U.S.; Erdrich, Baldwin and Hurston, Momaday, Hong Kingston, Arias and Chavez, Holleran and Moraga.

5 units, Win (Islas)


5 units, Spr (Lerer)

315. Fiction (Re)ality: The Theory of Fiction and/as the Phantomatics of the Real—Seminar traces important stages of the distinctions between reality and fiction in the context of empiricist and constructivist philosophy, of literary media differentiation (drama, opera, novel) and (post) modern technology (as reflected, e.g., in the work of Lem and Baudrillard).

2 units, Win (Pfeiffer) T 7-9 p.m. (2/12/91-3/12/91)

333. Dante’s Divine Comedy—(Enroll in Italian 333F.) (In Florence.) The success of Dante’s poem, at the end of the Middle Ages, established Florence as the center of culture in Europe and Tuscan as the language of the Italian peninsula. Survey Dante’s poem, studying it not as a literary artifact but rather as an “event” of great cultural and linguistic importance, the first great Florentine “chronicle”.

4 units, Aut (Freccero)

339A. The Body on the Stage: Theater in France, Spain, and Italy from 1600 to 1650—(Same as French 339A, Spanish 392.) The first half of the 17th-century in Paris and Madrid marks the moment for the emergence of nationally specific (“canonized”) forms of dramatic writing and theatrical institutions under the strong influence of the Italian tradition of commedia dell’arte. The Italian artistic culture of body-performance was “domesticated” in highly divergent ways on the French and Spanish stages. Theater in France, Spain, and Italy between 1600 and 1650 is seen as a historical key-paradigm for the branching of European culture into separate “national traditions,” and for the theoretical problem of a phenomenology of “the body on the stage.” (In English.)

3-5 units, Aut (Gumbrecht)

341. Writing and Re-Writing: Colonial Literature in Contemporary Narrative—(Enroll in Spanish 341.) The intertextual use of the chronicles of discovery. Conquest examined in contemporary narrative as an aesthetic and ideological vehicle that questions historical knowledge and language as a means of expression. The notions of repetition, imitation, and dependency are studied in Columbus, Carpentier, Sarduy, Posse, and Saer.

3-5 units, Spr (Corral)

349B. Colloquium on Baroque World Theater—(Enroll in German Studies 349B.) Late Renaissance drama embodying characteristic Baroque experiments and concerns, e.g., theater of theater, dream structures, verbal magic, unveiling otherness, totalization. Works from Shakespeare, Lope, Calderón, Corneille, Rotrou, Tristan, Vondel, Gryphius, Lohenstein. For 3 units must be able to read original texts in English and Dutch, French, German, or Spanish; for 5 units two languages besides English.

3-5 units, Win (Mueller-Vollmer)

352. Seminar: Comedy—(Enroll in Drama 352.)

5 units, Aut (Rayner) MW 1:15-3:05

354A. Seminar: Aesthetic Currents in European Theater—(Enroll in Drama 354A.) Contemporary postwar aesthetic theories and developments that have created innovative scenography and directorial viewpoints in continental theater. Slides and films.

5 units, Spr (Apostolidès, Eddelman, Weber) MW 2:15-4:05

360A. Seminar: The History of Literary Theory—(Enroll in English 360A.)

5 units, Aut (Trimpi)

362. Seminar: Representing Sappho—The Literature of Lesbianism 1749-1936—(Enroll in English 362.) British, American, and French literary representations of feminism from the early 18th-century to the mid 20th-century. The changing status of “lesbianism” as a literary and cultural topic—how female-female desire...
defined, the rhetorical and ideological difficulties involved in its representation, the social aesthetic and psychological meanings attached to it by authors in different literary periods. General theoretical topics: the nature of taboo, the difference (if any) between male and female representations of lesbian desire, lesbianism as a "symbolist", "decadent", "modernist", and "utopian" literary motif, the changing moral and political valuations according lesbian characters in fiction from the 18th to the 20th-century. Readings: Fielding, Charlotte Charke, Diderot, Anne Lister, Balzac, James, Radclyffe Hall, Djuna Barnes, Colette, Woolf, Sylvia Townsend Warner.

5 units, Spr (Castle)

363B. Seminar: Biography and Psychoanalysis—(Enroll in English 363B.) Graduate seminar on the application of psychoanalytic insights to biography, especially literary biography. Compares and contrasts the narrative conventions and methodologies governing the presentation of cases in psychoanalysis and in biography. Readings: representative biographies and influential theoretical and critical writings, including Freud, anthropological writings, and literary theory and criticism on biography. Substantial attention to gender issues.

5 units, Win (Ginsberg, Middlebrook, Staff)

369. Expression and Interpretation Variations of a Theoretical Motive—(Same as English 369, French and Italian 279A, and German Studies 342.) The concept "expression" bears overlooked implications which have only recently been seen as a specific feature of Western culture. This has opened a new reading of theories of language, discourse, and literature. Seminar focuses on different theories as variations of a motive. Topics: the romantic origins of academic literary criticism, Hermeneutics, New Criticism, psychoanalytical interpretation, Russian Formalism, deconstruction, and New Historicism.

5 units, Aut (Gumbrecht) Th 3:15-5:30

371. Seminar in Chinese Narrative—(Enroll in Asian Languages 371.) Readings in traditional Chinese commentaries vis-a-vis relevant individual texts and current theories of narrative in the West. Prerequisite: 271 or consent of instructor.

5 units (Wang) not given 1990-91

384. Methods of Research in Latin American Literature, Popular Culture, and Chicano Studies—(Enroll in Chicano Studies 384, Spanish 384.) Introduction to bibliographic sources and archival research, oral history techniques, and field work methodologies in Latin American, popular culture, and Chicano Studies research. Students select an individualized project to be developed using strategies and techniques discussed.

3-5 units, Aut (Herrera-Sobek)


4 units, Spr (White)

457. Writing and Cookery: Towards a Literary Anthropology of Food—(Enroll in Italian 457.) Graduate research seminar tracks the literal and figurative overlap between the realms of writing and food. From Plato's dialogues which link cookery to Sophistry through the Greco-Roman cook's comedy to Roman satire (a genre rooted in a culinary analogy) and beyond. The role of food preparation, presentation, and consumption in a literary-anthropological light. Topics: Petronius's Banquet of Trimalchio, Goliardic song, devilry and cookery in Dante's Inferno, food in Rabelais and "Macaronic" literature (Folengo), Brillat-Savarin's La Physiognomie du Gout, Nietzsche's notions of diet, and Marinetti's Futurist Cookbook. Secondary readings: Levi Strauss, Bynum, Elias, Detienne and Vernant. In English. Enrollment limited to 12.

5 units, Aut (Schnapp)

462. Research Seminar on the Baroque—(Enroll in Italian 462.) Baroque poetics studied within the broad setting of the social and cultural history of the 17th century. Topics: counter-reformation cultural politics; the growing impact of academies on the arts; the evolution of rhetorics of wit (Gracian, Pelligrini, Tesauro); and Baroque conceptions of aesthetic awe and monstrosity (Longinus.) Authors and texts may include: Marino's L'Adone; Gongora's Soledades, Quevedo's Buscon, a play by Lope de Vega, and selected poems of John Donne. In English.

5 units, Win (Schnapp)
The Cultures, Ideas, and Values requirement is part of the system of Distribution Requirements instituted in 1980-81. Entering students must complete a three-quarter sequence, or track, expressly designed to introduce them to major works and historical movements in our heritage. Although the eight tracks that constitute the CIV Program are sponsored by different departments and programs, they share common readings, ensuring that all students are exposed to certain great works.

The sequences have different formats, but in addition to the common readings they share another important feature. Each sequence provides at least two hours per week of small group instruction with an experienced teacher.

Students are encouraged to fulfill the CIV requirement during the 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 CIV portion of the Distribution Requirements. The following courses are available in 1990-91 and are organized to accommodate all entering freshmen and transfer students. Every effort is made to assign students to the specific courses that they elect, but it is not possible to place all students in the courses they list as first choice.

### TRACKS

#### STRUCTURED LIBERAL EDUCATION

**Track Chair:** Mark Mancall (Professor of History)

The program in Structured Liberal Education is also designated as a CIV sequence. For details, see the "Program in Structured Liberal Education" section in this bulletin.

#### EUROPE AND THE AMERICAS

**Track Chair:** Mary L. Pratt, Professor of Spanish and Comparative Literature

This track studies a number of cultural traditions that have played a role in producing the contemporary cultures of the Americas. Materials come from Europe and the Mediterranean, North, South and Central America, the Caribbean, and to a lesser extent, Asia and Africa. Within the Americas, works are studied from Spanish American, Native American, Afro-American, Asian-American, Anglo-American, and Chicano cultural traditions. Readings include literary works, philosophy and social theory, ethnography, autobiography and testimony, religious texts, oral history, chronicles, and travel books. Some time is devoted to oral traditions, film, and visual arts. Two lectures a week, plus three hours of small group discussion in sections. Faculty are from the Departments of Comparative Literature, Anthropology, and History. (DR:1; three-quarter sequence)

5 units, Aut (Rosaldo) lecture TTh 10
Win (Jackson) lecture TTh 10
Spr (Pratt) lecture TTh 10
plus discussion seminar

### GREAT WORKS

**Track Chair:** Ronald Rebholz (Professor of English)

Students meet for four hours per week in classes of 18 or fewer to discuss great works of literature, philosophy, religion, and political theory. Discussions are led by faculty and instructors drawn from a variety of departmental and disciplinary backgrounds. Once a week a lecture by an outstanding scholar helps interpret these works by placing them in their historical and intellectual context.

1. **The Ancient World**—Writings from Hebrew, Greek, Roman, and early Christian cultures, juxtaposed with great works of ancient non-European cultures. (DR:1; three-quarter sequence)

5 units, Aut (Staff)

2. **From the Middle Ages to the Enlightenment**—Works of literature and religious (Christian and Islamic), philosophical, and political writings of the Medieval, Renaissance, Reformation, and Enlightenment periods. (DR:1; three-quarter sequence)

5 units, Win (Staff)

3. **From the Enlightenment to the Present**—Works of political and social theory, literature, and philosophy from the late 18th through the 20th centuries, emphasizing modern American responses to European and other traditions. (DR:1; three-quarter sequence)

5 units, Spr (Staff)

#### EUROPE: FROM THE MIDDLE AGES TO THE PRESENT

**Track Chair:** Judith Brown (Professor of History)

(Enroll in History 1,2,3.) This sequence examines works of literature, philosophy, and art in their social, political, and economic settings. The focus is on the origins and evolution of medieval Europe, the relationship between European and other cultures in the Middle Ages.
and the Renaissance, the consolidation of the European state system, the intellectual and social innovations that emerged in the Enlightenment and in modern industrial societies, the evolution of democracies, and the global consequences of European and American developments. Students meet three hours a week with lecturers from the regular History faculty and two hours a week in small discussion sections (17 or fewer) led by postdoctoral fellows. (DR: 1; three-quarter sequence)

5 units, Aut, Win, Spr, MTW 9 plus section

LITERATURE AND THE HISTORY OF IDEAS

Track Chair: Paul Robinson (Professor of History)

(Enroll in Humanities 61, 62, 63.) This sequence, offered by Humanities Special Programs, has been taught at Stanford continuously for more than 40 years. It emphasizes the interconnection of literature, the arts, philosophy, and social thought from the ancient to the contemporary world. Also examines non-European cultural traditions. Three lectures per week by regular faculty from various departments; students also attend one two-hour discussion seminar per week led by postdoctoral lecturers or advanced doctoral candidates in the Humanities Program. (DR: 1; three-quarter sequence)

5 units, Aut (Edwards, Staff) lecture MTW 11
Win (Evans, Staff) lecture MTW 11
Spr (Lindenberger, Staff) lecture MTW 11
plus 2-hour discussion seminar

PHILOSOPHY AND HUMAN NATURE

Track Chair: Wilbur Knorr (Professor of Philosophy)

(Enroll in Philosophy 5A, B, C.) This sequence, developed by the Philosophy Department, offers each week three large-group lectures by faculty and two-hour discussion sections taught by younger scholars to groups of fewer than 20 students. The sequence studies such ideas as justice, freedom, democracy, monotheism, God as a perfect being, and reason as a universal possession of mankind, examining not only their historical development but also their relationship to less exalted ideas and to historical realities: anti-Semitism, the debasement of women, slavery, and the conquest of the so-called “Third World.” Attention is given to ideas of male and female thought and their role in social attitudes toward women. By constructively criticizing the ideas that have shaped Western culture, students learn to scrutinize the ideas that have shaped their lives. (DR: 1; three-quarter sequence)

5 units, Aut, Win, Spr, MWF 10 plus section

TECHNOLOGY AND CULTURE

Track Chair: Barry Katz (Professor of History)

(Enroll in Values, Technology, Science, and Society 1, 2, 3.) This sequence, designed and taught by the interdisciplinary faculty of the VTSS Program, treats science and technology in their interaction with philosophy, literature, and the other domains in which human creativity unfolds across history. It does not focus narrowly on technology but views technical ideas and artifacts as essential parts of our common cultural heritage. The track begins with the prehistoric world and traces the inter-connections between intellectual, material, and societal values into the age of computers, nuclear weapons, and recombinant-DNA. Autumn Quarter: the cultures of antiquity—Greece and Rome, Egypt, Palestine, and China. Winter Quarter: the Chinese origin, Islamic transmission, and European exploitation of technical ideas in the Middle Ages, Renaissance, and Enlightenment. Spring Quarter: the Industrial Revolution to the present. Readings from the great works of philosophy, science, literature, and politics. (DR: 1; three-quarter sequence)

5 units, Aut, Win, Spr MTW 11 plus section

LITERATURE AND THE ARTS

Track Chair: Charles Fifer (Professor of English)

(Enroll in English 7, 8, 9.)—This sequence emphasizes literature, writing, and the creative imagination. Lectures explore literature in its cultural context and include sessions on art, architecture, music, and drama. Students meet three times for lectures, and three times to discuss text and work on writing. The sequence generally moves chronologically from antiquity to the present day, setting works in historical, intellectual, and generic perspective. All seminar instructors are experienced writing teachers, and student essays receive close attention. Autumn and Winter writing workshops use a careful reading of the CIV texts to help students understand the process of writing and to improve their own writing. In both quarters, students must be concurrently enrolled in the CIV and writing components of this course. Students with and without Advanced Placement credit may sign up for this sequence. (DR: 1; three-quarter sequence)

7, 7A. Antiquity and the Middle Ages—Begins with The Epic of Gilgamesh and the Hebrew Bible and continues to the dawn of the Renaissance, covering Homer, Sappho, Sophocles, Plato, Vergil, the New Testament, St. Au-
gustine, the Koran, the Beowulf poet, Dante, Marie de France, Lady Murasaki, Boccaccio, and Chaucer. Writing instruction concentrates on finding an appropriate thesis and on developing and organizing ideas. (DR:1)

8 units (5 for English 7; 3 for English 7A), Aut (Parker, Staff) lectures MTW 10 plus sections and workshops

8,8A. Renaissance and Enlightenment—Readings from the Renaissance to the Enlightenment, including works by Machiavelli, More, painters of the Italian Renaissance and the Northern Renaissance, Bach, Shakespeare, Donne, Milton, DeFoe, Swift, Mozart, Rousseau, Mary Wollstonecraft, Paine, Jefferson, and Madison. Writing instruction concentrates on style and diction and on preparing and writing a research paper. (DR:1)

8 units (5 for English 8; 3 for English 8A), Win (Riggs, Staff) lectures MTW 10 plus sections and workshops

9. The Modern World—Thought and literature from the French Revolution to contemporary times, including works by the English Romantics, Mary Shelley, Balzac, Zola, Goya, Dickens, Beethoven, the Impressionists, Darwin, Marx, Freud, Yeats, Woolf, Morrison, Garcia-Marquez, Atwood, modern poets, American jazz composers. (DR:1)

5 units, Spr (Paulson, Staff) lectures MTW 10 plus sections

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, design, or critical theory or may combine areas of emphasis. Examples of how students can structure coursework to take advantage of such an emphasis are available from the major advisor. Students are encouraged to declare a major in their sophomore year.

The core program required of all majors is:

1. Acting—Drama 120A or 120D, Fundamentals of Acting.
2. Literature and Criticism—Drama 50, Introduction to Drama; Drama 150N, 151, 152N, Major Dramatic Texts.
3. Theater History—Drama 160 or 161, History of the Theater.
5. Drama 170, Introduction to Directing, or 134, Stage Management.
6. Dance—Drama 60, Introduction to Dance.
7. Performance—Each major must complete a minimum of 8 units in laboratory courses in departmental theater productions to be divided as follows: a minimum of 2 units in Drama 29, 39A, 39B, and 39C.
8. Electives—A program of 15 units of elective courses to be worked out in consultation with the major advisor.

Two years of a college-level foreign language are strongly recommended.

HONORS PROGRAMS
DRAMA

For a limited number of students, the department offers a program leading to honors in Drama. Students accepted for this program, in addition to fulfilling the requirements for the major, complete an individually designed honors project. The work for this project normally begins in Spring Quarter of the junior year and is completed by the end of the senior year. To enter this program, the student must be a Drama major in good standing with an average letter grade indicator (LGI) of "B +" in the student's previous work in drama. The student may do an honors project in one of the following areas: Acting; Directing; Design or Technical Production; Literature, Criticism or Theater History, or an individually designed program.
An honors essay will be part of both creative and research projects.

Upon successful completion of the project, candidates for honors are awarded "Honors," "High Honors," or "Highest Honors."

Students interested in pursuing department honors should consult with the major advisor early in their junior year. In order to qualify, the student must meet the following requirements:

1. **Acting**—
   a) The student must have the approval of the performance faculty.
   b) The student must have completed six courses in acting with an LGI of "A-": Drama 120A, B, C, or 120D, E, F; two movement classes, and one additional class.
   c) The student must have appeared in a significant role or have prepared a special audition for the performance faculty.

2. **Directing**—
   a) The student must have the approval of the directing faculty.
   b) The student must have completed three courses in acting: Drama 170, Directing; Drama 30 and 134, Stage Management.
   c) The student must have completed at least 4 units of Drama 29 or 39A, B, or C, thereby participating in some aspect of at least two departmental productions.

3. **Design or Technical Production (D/TP)**—
   a) The student must have the approval of the D/TP faculty.
   b) The student must have completed six courses in Design or Technical Production with an LGI average of "A-": Drama 30, 31, 32, and two 130 level courses in the specific area of the project plus one other course in another area of D/TP.
   c) The student must have completed work on a significant design project on a Drama Department production or project, or given a special portfolio review by the D/TP faculty.

4. **Dramatic Literature, Criticism, or Theater History**—
   a) The student must have the approval of the dramatic literature faculty.
   b) The student must have taken three courses in dramatic literature at the 100 level, one of which may be from another department; one course in theater history; Drama 160; and Drama 50, Introduction to Drama, with an LGI of "A-" for these courses.
   c) The student must have completed at least 4 units of Drama 29 or 39A, B, or C thereby participating in some aspect of at least two departmental productions.

Students should propose the honors project and submit it through the Drama Department undergraduate advisor during the third quarter of the junior year. The proposal should include an outline of the courses taken and grades received in the area requirements. It should describe in detail the purpose and methods involved in the project, a bibliography if appropriate, and a one- to two-page abstract of the associated honors essay. This proposal should be a substantial document, prepared in consultation with the primary advisor, the subject being "Honors Proposal Preparation."

Upon acceptance into the honors program and approval of the proposal by the student's advisor and the Drama Department faculty, the student is formally admitted and is assigned a second reader. The project is accomplished under the guidance of the advisor during the senior year. For each quarter, the student should register in Drama 200, Senior Honors Project. All honors projects must extend over at least two academic quarters and receive no less than 8 units of academic credit, up to a maximum of 15 units.

In **Acting**—Once accepted into the honors program, the student receives the departmental University Resident Theater Association (URTA) recommendation and faculty support in preparing audition material. Upon recommendation of the faculty, the student is assigned a major role in a Drama Department production to be produced in the senior year. If no suitable production in the main season is available, it is the duty of the acting faculty to design a project or performance for the student and to coach him or her in it. In addition to performing the role, the student writes an honors paper on the role to be performed. This paper is read by the student's advisor and a second reader for approval.

In **Directing**—The student is assigned a production slot within the senior year. The student must submit for approval a production plan that includes play selection, budget, schedule, and staff assignments, and a brief statement of concept and casting procedures. An integral part of the directing project is to administer all aspects of the production. In order to properly prepare this production plan, the student should consult early and frequently with the Drama Department production manager. The department supplies materials, supervision, and staff, as available, to assist the mounting of the production. In addition to directing the production, the student must submit a copy of the prompt book and a paper supporting the honors project.
The paper should address the pre-production research, directorial concept, specific problems encountered during the rehearsal period, and a brief retrospective analysis. The paper is read by the student's advisor and a second reader.

In Design or Technical Production—Once the honors proposal and an honors project have been approved, the student receives the departmental URTA recommendation and faculty support in preparing a portfolio showing. Upon recommendation of the faculty, the student is assigned a design or production responsibility (lighting design, scenery design, costume design or technical director) for a major Drama Department production to be produced in the senior year. If no suitable production in the main season is available, it is the duty of the Design and Technical Production faculty to create an alternative opportunity. In addition to performing the design assignment, the student writes an honors paper on the project. The paper should critically address the pre-production research, design concept, and specific problems encountered in the production process. This paper is read by the student's advisor and a second reader for approval.

In Dramatic Literature, Criticism, or Theater History—In the Spring Quarter of the junior year, the student must submit a research proposal with the endorsement of an advisor from the drama faculty. The completed honors essay must be submitted for reading and approval to the advisor and a second reader no later than the first week of the final quarter before graduation.

HUMANITIES

An Honors Program in Humanities is available for Drama majors who wish to supplement their major with related and carefully guided studies. See the “Humanities Special Programs” section in this bulletin for a description of the honors program. Students who enroll in it may offer Humanities 61, 62, and 63 in fulfillment of the 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 “Humanities Special Programs” section in this bulletin.

DOCTOR OF PHILOSOPHY

All graduate study in the Department of Drama leads to the Ph.D. degree. Students in the graduate program are meant to integrate practical theater work with critical and historical study of dramatic literature and theory. All candidates are expected to function both as scholars and as artists. The curriculum offers practical concentration in directing and design, and all students are expected to demonstrate capacity in at least one area of theater practice. At the same time, each candidate studies theory, aesthetics, history, and literature in order to develop a thorough knowledge of the field of drama that leads to original and significant scholarly work. The typical course of study is outlined below under “Units and Course Requirements,” but, in consultation with a faculty advisor, students may design a program that integrates practical and critical or literary aspects in a way suitable to his or her own background and submit that plan to the department’s Graduate Studies Committee during the first year of study.

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. An interview, while not required, is strongly recommended. Graduate students in the Department of Drama begin study 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

DIRECTING/CRTICISM

1. A minimum of 72 units of graduate courses and seminars in support of the degree in addition to the doctoral dissertation.
2. Dramatic Critical Theory (300).
3. A minimum of six graduate seminars in dramatic literature, theater history, or critical theory. One of them must be in theater history, and one must be taken outside of the Department of Drama.
4. Two years in the series in directing. Students in criticism/directing must complete the first-year and second-year workshops in directing.
(370A, B, C; and 371A, B, C, D) and a third-year production project (372).

DESIGN/THEATER HISTORY

1. A minimum of 72 units of graduate courses in support of the degree in addition to the doctoral dissertation.
2. Dramatic Critical Theory (300).
3. Graduate Directing Workshop sequence (370A, B).
4. A minimum of six graduate seminars in dramatic literature, theater history, or critical theory. Two of them must be in theater history, one must be in dramatic literature, and one must be taken outside of the Department of Drama.
5. Graduate Design Workshop sequence: Design Tutorials (330A, B, C); Design Workshop (331A, B, C); two design projects, one in setting (332A) and one in either costume or lighting design (332B).

LANGUAGE REQUIREMENTS

The candidate must demonstrate reading knowledge of two foreign languages in 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 letter grade indicator 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.

COMPREHENSIVE EXAMINATIONS

Candidates must complete four examinations, three written and one oral, by the end of Winter Quarter of the third year. 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 selects 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).

DIRECTING/CRITICISM

Examinations are offered annually in each of the following periods of dramatic literature:
Classical
Medieval and Renaissance
Neoclassical
Romantic and Early Realistic
Modern, 1870-1956
Contemporary, 1956 to the present

Students in the criticism/directing program are required to take the examinations in Classical, Medieval and Renaissance, and Modern drama. For the fourth examination, a student may choose an additional period (Neoclassical, Romantic and Early Realistic, or Contemporary) or propose a cross-period study on the basis of genre, dramatic style, or the relationship between text and history.

DESIGN/THEATER HISTORY

Students in Design/Theater History are required to take two examinations in Theater History (Classical to 18th century; 1800 to present); one in dramatic literature in a period of their choice; and a theoretical design project examination.

APPLICATION FOR CANDIDACY

By the end of the second year of residence, the following requirements or appropriate equivalents must be completed:

1. Dramatic Critical Theory, four seminars, 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 certifies the student's qualifications for candidacy. Upon favorable action, the student files formal application for candidacy, as prescribed by the University, by the end of Summer Quarter.
UNIVERSITY ORAL EXAMINATION

A University oral examination is to be taken during Autumn Quarter of the fourth year. This examination covers (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.

DISSERTATION

Normally, the Ph.D. program is 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 within five years from the quarter in which candidacy is granted. A candidate taking more than five years is required to reinstate candidacy by re-passing the written examinations on dramatic literature.

FELLOWSHIPS

The Department of Drama awards a number of fellowships to students in the Ph.D. program. Procedures for applying are included in the admission packet. The appropriate financial aid application must be filed by January 1, 1991.

COURSES

A special brochure is available providing full details of courses given in the Summer Quarter.

INTRODUCTORY

2. Introduction to Theatrical Style—The development of theatrical style in the major periods of Western culture presented through slides, lectures, and discussions. (DR:2)

4 units, Aut (Russell) MWF 1:15

5. Introduction to Black American Drama—The development of Black drama in the U.S. from 1858 to the present.

4 units, Aut (Elam) MWF 11

20. Introduction to Acting—Exercises and improvisations to develop ease, freedom, and expressiveness on stage in preparation for the study of acting fundamentals. A weekly acting seminar taught by the performance faculty. One Autumn Quarter section is reserved for freshmen with serious interest in acting, with a guaranteed placement for those admitted by audition.

3 units, Aut, Win, Spr (Staff) MWF or MTTh 1:15-3:05

27A,B,C. Movement for Actors.

27A. Movement for Actors—(Same as Dance 64.)

2 units, Aut (Morris-Kramer) TTh 11-12:30

27B. Musical Theater Workshop—(Same as Dance 65.)

2 units, Win (Cashion) TTh 3:15-5:05

27C. Movement and Music for Actors—(Same as Dance 66.)

2 units, Spr (Morris-Kramer, Toenjes) TTh 11-12:30

28. Make-up for the Stage—The basic techniques of make-up application; aging, prosthetics, stylization, characterization, animals, and fantasy make-up.

2 units, Aut (Strayer) W 2:15-4:05

29. Theater Performance: Acting—Students cast in departmental productions receive credit for their participation as actors; 1-2 units for Graduate Directing Workshop projects and 1-3 units for major productions (units determined by instructor). May be repeated. No more than 10 units may be counted toward graduation requirements of 180 units. Prerequisite: consent of instructor.

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

30. Introduction to Scenic Design—Lecture/lab introducing basic skills of visual communication used in producing stage scenery. Covers design and construction methods.

3 units, Aut (Stewart, Wilson) MWF 11 plus lab by arrangement

31. Introduction to Stage Lighting—Lecture/lab introducing the basic theories of stage lighting. The material is approached from technical and aesthetic viewpoints.

3 units, Spr (Ramsaur) TTh 10-12

32. Introduction to Costume Design and Construction—Principles of design and construction of stage costume.

3 units, Win (Russell, Strayer) TTh 10-12

33. Drafting for the Theater—Lecture/lab introducing basic mechanical drawing techniques utilized by scenic and lighting designers. Basic pencil techniques through orthographic and isometric drawing, culminating with the technique of drop point perspective.

2 units, Spr (Stewart) TTh 2:15-4:05

34. Stage Management Techniques—Survey lecture introducing the production process and the wide variety of duties and responsibilities of a stage manager.

2 units, Aut (Stewart) MWF 10

35. Sound Design for the Stage—Lecture/laboratory exploring the realm of theater sound.
Introduction to basic recording and playback techniques, acoustics, and editing. Emphasizes analyzing, creating, and implementation of "theatrical" sound effects for the stage.

2 units (Stewart) alternate years, given 1991-92

36. Scenic Painting Techniques—Basic techniques used in the scenic studio to translate scaled designer's elevations into finished scenery. A "hands-on" practicum.

2 units (Wilson) alternate years, given 1991-92

37. Costume Construction—"Hands-on" pattern drafting, sewing costumes, millinery work, and the making of costume accessories.

2 units, Spr (Strayer) W 2:15-4:05

39A, B, C. Theater Performance: Crew—Participation in the design and technical areas of departmental productions. Students commit to a specific show, and credit is for preparation and construction as a member of "running crew" in a specific area. Normally 2 units; show with a three-week running crew commitment requires 10 hours of construction; show with two-week commitment requires 25 hours of construction. The Master Electrician is usually awarded one extra unit for the added time commitment. Majors must take 2 units to fulfill the requirement in each area.

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

39A. Scenery and/or Property.
39B. Lighting and/or Sound.
39C. Costumes and/or Make-up.

50. Introduction to Drama—(Same as English 40.) Current strategies for analyzing drama/performance by positioning a series of dramatic texts within different critical paradigms: Oedipus Tyrannos in its political-historical context; Hamlet and the idea of tragedy as a genre; The Way of the World as the idea of comedy as a genre; Phèdre and psychoanalytic theory; Hedda Gabler and Marxist theory; Saint Joan and the issues of Feminism; Waiting for Godot and the aesthetics of phenomenology. (DR:2)

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

59. Shakespeare—(Same as English 73.) Reading of representative comedies, histories, and tragedies. For the general student and the prospective English major. (DR:2)

3 units, Aut (Friedlander) MW 1:15-3:05

60. Introduction to Dance—(Same as Dance 60.) The contrasting movement styles and disciplines of dance as a non-verbal vehicle of cultural, artistic, and social expression. Technical and historical perspectives of modern and non-Western dance forms are presented.

1-2 units, Spr (Cashion) TTh 11-12:30

65. American Musical Theater—Survey of the development of the American musical theater as a unique and indigenous art form and as an expression of cultural changes in American society. Slides, recordings, and films.

4 units (Eddelman) alternate years, given 1991-92

70. Undergraduate Theater Workshop—Undergraduate directors present one-act plays in workshop performances. Prerequisite: consent of instructor.

4 units, Spr (Rehm) by arrangement

INTERMEDIATE

113. Group Communication—Focuses on interpersonal processes of communication as they relate to inter-group experience.

4 units, Win, Spr (Schrader) TTh 2:15-4:05

120A, B, C. Fundamentals of Acting—Provides the fundamental training of the actor as a theatrical instrument. Exercises and improvisation in basic activity, motivation, concentration, and imagination. Courses to be taken in sequence. Prerequisite: sophomore standing or consent of instructor.

120A. 4 units, Aut (Weber) TTh 10-12 or MW 10-12 or MW 10-12

120B. Prerequisite: 120A or consent of instructor.

4 units, Win (Weber) TTh 10-12 or MW 10-12

120C. Prerequisite: 120B or consent of instructor.

4 units, Spr (Weber) TTh 10-12

120D, E, F. Advanced Fundamentals of Acting—For those with a serious pre-professional interest in the study of acting. Provides the fundamental training of the actor as a theatrical instrument. Exercises and improvisation in basic activity, motivation, concentration, and imagination. Additional work in voice and movement. Courses to be taken in sequence. Prerequisite: sophomore standing or consent of instructor.

120D. 4 units, Aut (Ryan) MW 10-12

120E. Prerequisite: 120D or consent of instructor.

4 units, Win (Ryan) MW 10-12

120F. Prerequisite: 120E or consent of instructor.

4 units, Spr (Ryan) MW 10-12
121A, B, C. Acting Workshop—The following specialized courses are designed for students who have completed the 120 series (A, B, C or D, E, F), unless otherwise designated. May be repeated for credit.

121A. Improvisation—Explores and develops the creative imagination; games and exercises are taught which foster spontaneity and cooperation. No prerequisite.
4 units, Aut, Win (Ryan)
MWF 3:15-5:05

121B. Advanced Improvisation.
4 units, Spr (Ryan) MWF 3:15-5:05

121C. Special Studies in Performance: Beyond Stereotypes—Examination of the American character in relation to issues of race and gender.
4 units, Spr (Smith) MW 1:15-3:05

122. Audition Techniques—For the advanced actor. Preparation of monologues, cold readings, singing auditions, and preparation of resumes. Prerequisite: 120D, E, F or the equivalent.
4 units, Aut (Smith) M 1:15-4:05

124A, B. Advanced Acting Workshop—Sequence is designed for students who have completed the 120 series (A, B, C or D, E, F). Prerequisite: consent of instructor.
124A. Advanced Meisner Technique—Selected exercises illuminating Stanford Meisner's systematic approach to the actor's craft.
4 units, Aut (Weber) TTh 1:15-3:05

124B. Breaking Down Barriers—Focuses on language as a way of breaking down inhibitions.
4 units, Win (Smith) MW 1:15-3:05

127A. Dance History and Philosophy—(Same as Dance 160A.) Historical lecture survey of the lives and works of key figures in Western theatrical dance, from the Renaissance to the present, through films, videos, and discussions. Topics: public attitudes and perceptions and the Romantic ideal in ballet, the changing image of the male dancer, the birth of abstraction in dance, and the pioneering matriarchs of modern dance. All are discussed against the social and cultural backdrop of the time. (DR:2)
3 units, Win (Ross) TTh 2:15-4:05

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

129B, C. Actors Laboratory—For the advanced actor, personal work including audition techniques and characterization emphasizing solving individual acting problems. Prerequisite: consent of instructor.

129B. The Actor and Director—Approaches to issues surrounding the actor/director relationship.
4 units, Win (Rehm) TTh 1:15-3:05

129C. The Actor and Social Action—Development of dramatic material from a variety of conventional and non-conventional sources.
4 units, Spr (Rehm) TTh 1:15-3:05

130A, B, C. Designing Scenery for the Stage—Creations of increasing complexity involving text analysis, historical and artistic style, visual research, spatial organization, drafting, sketching, model building, and director-designer collaboration. Prerequisite: 30, or consent of instructor.

130A. Drafting and Mechanical Perspective—Flat-surface methods of presenting design ideas based on textual analysis and visual research. Interaction with graduate directors.
4 units, Aut (Wilson) W 2:15-5:05

130B. Color Rendering and Model Building—Guided projects in watercolor and three dimensions involving a variety of historical styles.
4 units, Win (Wilson) W 2:15-5:05

131A, B, C. Lighting Design.
131A. Stage Lighting Mechanics—Lecture-lab dealing with all practical aspects of lighting electricity, light sources, instrumentation, control, drafting, plotting, and the basic design process. Prerequisite: 31.
4 units, Aut (Ramsaur) TTh 10-12

131B. Stage Lighting Aesthetics—Laboratory discussion on the aesthetic principles of lighting design: interpretation, concept, color, angle and placement. Various design styles are introduced: dance, rock and roll, opera, musical comedy, thrust, and arena. Lighting designers for departmental productions are assigned from this class. Prerequisites: 131A.
4 units, Win (Ramsaur) by arrangement

131C. Advanced Stage Lighting Design—Projects in lighting mechanics and lighting design are resolved through experimentation, class discussions, and written report. Design projects include dorm shows and other community productions. Lighting designers for major departmental productions are assigned from this class. Prerequisites: 131A and B.
1-4 units, any quarter (Ramsaur) by arrangement

132. Costume Design—Visual analysis of historical styles of costume design interpreted for the
modern theater and developed by the student in various presentational media.
4 units, Spr (Russell) T 10-12

133. Technical Production—Lecture/lab in basic production practices. The theory and use of standard tools and materials used in stage scenery construction. Prerequisite: 30.
4 units, Win (Stewart) MW 10-12
4 hour lab by arrangement

134. Stage Management Project—For students stage managing a Drama Department production.
1-5 units, any quarter (Stewart)

135. Project in Design or Technical Production—Stage design, costume design, lighting design, technical production, or stage managing. Prerequisite: consent of instructor.
1-5 units, any quarter (Staff) by arrangement

136. Project in Technical Production—Technical direction or sound engineering for a Drama Department projection.
1-5 units, any quarter (Staff) by arrangement

140. Workshop in Playwriting.
5 units, Aut (Smith) W 2:15-5:05

150N. Major Dramatic Texts I: Greek and Roman—Selected texts from Aeschylus, Sophocles, Euripides, Aristophanes, Plautus, Terence, Seneca. (DR:2)
4 units, Win (Rayner) MWF 9

151. Major Dramatic Texts II: Renaissance to Romantic—Selected texts from Shakespeare, Racine, Corneille, Molière, Wycherley, Congreve, Goldsmith, Sheridan, Schiller, Hugo, Kleist, Buchner. (DR:2)
4 units, Win (Rayner) MWF 9

152N. Major Dramatic Texts III: Early Realistic to the Present—Selected texts from Ibsen, Chekhov, Brecht, Shaw, Williams, Miller, Shepard, Beckett, Ionesco, Genet, Weiss, Osborne, Pinter, Bond, Brenton, Churchill, Kennedy. (DR:2)
4 units, Spr (Lyons) MWF 10

153. Greek Tragedy: Aeschylus, Sophocles, Euripides—(Same as Classics 12.) (DR:2)
3-5 units, Win (McCall)

154M. Issues in Contemporary American Feminist Performance Theory and Practice—Introduction to feminist theories and types of feminist performance work.
4 units, Win (Joseph) Th 2:15-5:05

154N. American Drama, 1920s-1960s—Survey focusing on the development of American drama through an analysis of representative works and stylistic devices. (DR:2)
4 units, Win (Elam) MWF 10

155N. American Drama, 1960s to Present—Survey of major playwrights and trends in contemporary American drama. So-called “special interest” dramas, i.e., plays emanating from Black, Chicano, Asian-American, feminist, gay, or lesbian experiences, are included to better reflect the actual vitality and diversity of American drama. (DR:2)
4 units (Staff) alternate years, given 1991-92

157N. Contemporary Black Playwrights—The dramaturgy, i.e., thematic issues, styles, and aesthetics, of contemporary playwrights in the U.S., the Caribbean, and Africa. The concept of an African Diaspora or cultural continuity between Africa and the Americas is the premise; also explores diversity among the various societies represented. (DR:2)
4 units, Spr (Elam) MWF 10

158C. Contemporary Performance—American avant garde and other non-traditional performance pieces from the 1960s through the 1980s.
4 units, Spr (Elam) MWF 10

159A, B, C. Shakespeare—(Same as English 173A, B, C.) (DR:2)
159A. 5 units, Aut (Rebholz) MTWTh 11
159B. 5 units, Win (Riggs) TTh 1:15-3:05
159C. 5 units, Spr (Orgel) TTh 1:15-3:05

160. Theaters and Staging: Ancient to 18th Century—The stylistic evolution of theater architecture and staging. Focus is primarily European; parts deal with Africa and Asia. Emphasis on the ways in which theaters and staging reflect their own cultural and spatial environments. (DR:2)
4 units, Aut (Eddelman) MWF 10

161. Theaters and Staging: 18th Century to the Present.
alternate years, given 1991-92

162. History of Costume and Fashion—Lecture-survey on the history of dress in the Western world from ancient times to the present.
4 units, Win (Russell) MWF 2:15

165. Topics in American Musical Theater—Thematic and formal developments in American musical theater, focusing on nine musicals. Slides, recordings, and films. Recommended: background in musical theater.
4 units, Aut (Eddelman) MWF 10

170. Introduction to Directing—Prerequisite: consent of instructor.
4 units, Win (Rehm) TTh 3:15-5:05
190. Special Research—Individual project in the work of a playwright, period, or genre. Prerequisite: consent of instructor.
1-5 units, any quarter (Staff)
by arrangement

200. Senior Honors Project—See "Undergraduate Programs" for description. Must be taken twice in sequence. Admittance by application to the Drama Department faculty during the junior year.
1-5 units, by arrangement.

ADVANCED COURSES
Courses numbered 200 through 299 are designed for advanced undergraduates and graduates.

235. Project in Design or Technical Production.
1-5 units, any quarter

240. Workshop in Playwriting.
5 units, Aut (Smith) W 2:15-5:05

250. Major Dramatic Texts I: Greek and Roman—(See Drama 150N.)
4 units, Aut (Rayner) MWF 9

251. Major Dramatic Texts II: Renaissance to Romantic—(See Drama 151.)
4 units, Win (Rayner) MWF 9

252. Major Dramatic Texts III: Early Realistic to the Present—(See Drama 152N.)
4 units, Spr (Lyons) MWF 9

254N. American Drama, 1920s-1960s—(See Drama 154N.)
4 units, Spr (Elam) MWF 11

255N. American Drama, 1960s-Present—(See Drama 155N.)
4 units, Staff alternate years, given 1991-92

257N. Contemporary Black Playwrights—(See Drama 157N.)
4 units, Spr (Elam) MWF 11

260. History of the Theater: Ancient to the 18th Century—(See Drama 160.)
4 units, Aut (Eddelman) MWF 10

261. History of the Theater: 18th Century to the Present—(See Drama 161.)
4 units (Eddelman)
alternate years, given 1991-92

262. History of Costume and Fashion—(See Drama 162.)
4 units, Win (Russell) MWF 2:15

270. Independent Project in Directing—Prerequisites: 170 and approval of Drama faculty.
2-5 units, any quarter (Staff)
by arrangement

290. Special Research—Individual project in the work of a playwright, period, or genre.
1-5 units, any quarter (Staff)
by arrangement

GRADUATE
For graduates but open to advanced undergraduates with consent of instructor.

300. Contemporary Theoretical Structures in the Analysis of Drama—The analytic paradigms of Poststructuralism, New Historicism, recent psychoanalytic theory, feminism, phenomenology, and the new Mimesis as these theoretical arguments interact with the reading of dramatic texts and the understanding of performance.
5 units, Aut (Lyons) MW 10-12

301. Practical Criticism—Workshop on the practical side of the profession: preparing a dissertation prospectus, writing research grant proposals, and revising and placing journal articles.
3 units, alternate years, given 1991-92

330A,B,C. Design Workshop—Advanced design for the theater.
5 units, Aut, Win, Spr (Staff)
by arrangement

331A,B,C. Second-Year Design Project—Design of a full-length production in conjunction with directing project (372).
5 units, Aut, Win, Spr (Staff)
by arrangement

332. Third-Year Design Project.
5 units (Staff)

351B. Seminar: Pinter.
5 units, Win (Rayner) MW 2:15-4:05

351I. Seminar: Congreve.
5 units, Spr (Lyons) TTh 2:15-4:05

352. Seminar: Comedy.
5 units, Aut (Rayner) MW 1:15-3:05

353M. Seminar: Medieval Drama—(Same as English 312.) Intensive survey of the texts and traditions behind the forms of dramatic performance in the Middle Ages. Considers the theatrical impulse behind much of medieval public life, drawing on surviving evidence of cycle plays, mysteries, moralities, elements of pageant, spectacle, and religious observance. Systems of patronage; issues in the "theory" of tragedy and comedy in the Middle Ages; and developments in modern approaches to the study of popular expression and ritual.
5 units, Spr (Lerer)

354A. Seminar: Aesthetic Currents in European Theater—Contemporary postwar aesthetic theories and developments that have created in-

360 SCHOOL OF HUMANITIES AND SCIENCES
novative scenography and directorial viewpoints in continental theater. Slides and films.
5 units, Spr (Apostolidès, Eddelman, Weber) MW 2:15-4:05

359A. Seminar: Shakespeare—(Same as English 373A.)
5 units, Win (Orgel) F 9-12

359B. Seminar: Shakespeare—(Same as English 373B.)
5 units, Spr (Orgel) F 9-12

360. Seminar: Topics in Theater History—Classical Greece to the Mid-19th Century—The stylistic evolution of theaters and staging from the classical period up to the development of Naturalism. Emphasis on the ways theaters and staging reflect their own cultural and spatial environments.
5 units, alternate years, given 1991-92

361. Seminar: Topics in Theater History—1890 to the 1930s—Emphasis on innovation and experimentation as it developed in European and American theater. Focuses on the aesthetic theories that lie behind selected topics: Naturalism, Appia, Craig, the “isms,” and scenography created by artists.
5 units, Win (Eddelman) MW 10-12

370A, B, C. Directing Workshop I—The director’s approach to works in the realistic tradition. Investigation of basic directorial problems in scenes, using a multi-form theater space, designing actor/audience relationships, and composing modular scenic units. Performances limited to class. Prerequisite: consent of instructor.
370A. 5 units, Aut (Weber) by arrangement
370B. 5 units, Win (Ramsaur, Russell, Wilson) by arrangement
370C. 5 units, Spr (Weber) by arrangement

371A, B, C, D. Directing Workshop II.
371A. Graduate Directing Workshop II—Exploration of dramaturgic and directorial methods in working on plays from the classic, Elizabethan, Epic, or Post-Naturalistic theater. Scene work.
5 units, Aut (Weber) by arrangement
371B. Graduate Directing Workshop II: Staged Reading.
2 units, any quarter (Weber) by arrangement
371C. Graduate Directing Workshop II: Dramaturgy.
3 units, any quarter (Weber) by arrangement
371D. Graduate Directing Workshop: Project.
5 units, any quarter (Weber) by arrangement

6 units, any quarter (Weber) by arrangement

390. Tutorial.
1-4 units, any quarter (Staff) by arrangement

399. Dissertation Research.
any quarter (Staff) by arrangement

OVERSEAS STUDIES

The following are approved for the Drama major and taught overseas at the campus indicated. Students should discuss with their major advisors which courses best meet individual needs. Descriptions can be found in the “Overseas Studies” section of this bulletin or in the Overseas Studies Program office, 126 Sweet Hall.

101A. German Theater: East and West—Berlin. 4 units, Aut (Kramer)
190D. Between Art and Politics: Special Topics in Polish Literature and Theater—Krakow. (DR:2)
3 units, Spr (Orzechowski)

CENTER FOR EAST ASIAN STUDIES

Director: Lyman P. Van Slyke
Assistant Director: Theodore N. Foss
Affiliated Faculty:
Art: John D. La Plante, Michael Sullivan (Emeritus), Melinda Takeuchi, Richard Vinograd
Economics: Masahiko Aoki, John J. Gurley (Emeritus), Lawrence Lau, Yingyi Qian
Food Research Institute: Scott D. Rozelle
History: Peter Duus (on leave Spring), Harold L. Kahn, James E. Ketelaar, Jeffrey P. Mass, Lyman P. Van Slyke
Linguistics: William J. Poser, Peter Sells
Philosophy: David S. Nivison (Emeritus)
Political Science: Nina Halpern, Nobutaka Ike (Emeritus), John W. Lewis (on leave), Robert North (Emeritus), Daniel Okimoto, Kurt Steiner (Emeritus), Robert E. Ward (Emeritus)


In addition, a number of other Stanford faculty have some teaching or research interests related to East Asia: Takeshi Amemiya (Economics), Chen Fu-Mei (Hoover Institution), Walter P. Falcon (Food Research), William B. Gould (Law), Bruce F. Johnston (Food Research), Dudley Kirk (Emeritus, Food Research), Gerald Meier (Business), Ramon Myers (Hoover Institution), Richard T. Pascale (Business), Sylvia Yanagisako (Anthropology), Pan A. Yotopoulos (Food Research)

The Center for East Asian Studies coordinates all University instructional, research, and special activities related to China and Japan. Faculty and students who share a common interest in the study of East Asia are brought together by the center from a broad range of academic concerns covering nearly every discipline and historical period. In addition to supporting a wide variety of academic and extra-curricular activities on the Stanford campus, the center is also involved in programs which link the University's resources on China and Japan with civic groups, secondary schools, and local colleges in the San Francisco Bay Area. 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.

Further information may be obtained from the Center for East Asian Studies, Room 14, Littlefield Center, Stanford University, Stanford, California 94305; telephone (415) 723-3362.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

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.

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. 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.

Potential majors must submit a written application (Student Proposal for a Major in East Asian Studies), 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 must complete at least 75 units of coursework treating China and/or Japan. Courses to be credited toward major requirements must be completed with a letter grade indicator of "C" or better. 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 only 30 units of language coursework count toward the requirements for the major.

2. History: 15 units—Completion of at least one of the following course sequences:
   - History 192A, 192B, 192C (Chinese History)
   - History 194A, 194B, 194C (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.
which may be credited toward the substantive concentration.

HONORS PROGRAM

Majors with a letter-grade indicator of 3.25 or better in all courses related to East Asia may apply for the honors program 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.

COTERMINAL DEGREE

The center admits a limited number of Stanford undergraduates to work for a coterminal A.M. in East Asian Studies. While the coterminal degree plan permits admittance to a graduate program as early as the eighth quarter and no later than the end of the 11th quarter of undergraduate study at Stanford, the center accepts A.M. applications only once a year. Therefore, applications must be submitted by January 1. 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 Stanford transcript; three letters of recommendation, at least two of which should be from members of the department of concentration; and scores from the General Test of the Graduate Record Exam. In addition, applicants must provide a list of courses they intend to take to fulfill degree requirements. The decision on admission rests with the A.M. Admissions Committee of the Center for East Asian Studies. Students must meet all requirements for both A.B. and A.M. degrees. They must complete a total of 15 full-time quarters (or the equivalent), or three full quarters after completing 180 units for a total of 217 units.

EAST ASIAN STUDIES THEME HOUSE

EAST House, on campus at Governor's Corner, is an undergraduate residence which houses 80 students and offers them a wide variety of opportunities to expand their knowledge, understanding, and appreciation of China and Japan. A member of the East Asian faculty serves as resident fellow of EAST House. Assignment is made through the regular undergraduate housing draw.

KYOTO CENTER FOR JAPANESE STUDIES

Students interested in the study of Japanese language, history, culture, and social organization can apply to the Kyoto Center for Japanese Studies, a September-to-April program managed by Stanford which includes students from eight other American universities. Every Spring Quarter, the Stanford Center in Technology and Innovation, also in Kyoto, offers an academic quarter focused on Japanese organizations and the political economy of research, development, and production of high technology and advanced industries followed by an internship in a Japanese firm, laboratory or agency. For information about either program, students should contact the Overseas Studies Office in Sweet Hall.

GRADUATE PROGRAMS

MASTER OF ARTS

The A.M. Program in East Asian Studies is designed both for students who plan to complete a Ph.D. but who have not yet decided on the particular discipline in which they prefer to work, and students who wish to gain a strong background in East Asian Studies in connection with a career in nonacademic fields such as business, law, education, journalism, or government service. However, career-oriented students should realize that a master's degree in East Asian Studies alone may often provide insufficient preparation for work in many professions, and they are advised to plan for additional professional training.

The master's degree program allows a great deal of flexibility in combining language training, interdisciplinary area studies, and a disciplinary concentration. The director of the center assigns faculty advisors to all students. Members of the staff and faculty are available for academic and career planning. The A.M. program is normally completed in two academic years, but students may shorten this time by receiving credit for prior language work or by attending summer sessions. Because of the limited availability of the center's financial resources, students admitted to this program with aid are urged to complete the degree requirements in less than two years if their background makes it possible.

Applicants must take the General Test of the Graduate Record Examination and have the results sent to the Office of Graduate Admissions. Foreign applicants are also required to take the Test of English as a Foreign Language. Applications for admission and financial aid may be obtained by writing to the Office of Graduate Admissions, Building 590, Stanford University,
Stanford, California 94305. The deadline for completed applications for admission and financial aid is January 1.

The basic requirements for the A.M. degree in East Asian Studies are as follows:

Language Requirement—Students must complete the equivalent of the first three years of language training in either 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 will 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. Graduate language courses may be applied to the Area Studies requirement discussed below.

Students in the A.M. program are eligible to apply for the Inter-University Language programs in Taipei and Yokohama. For further information, see the "Institute for International Studies" section in this bulletin. 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 studies courses required for the degree.

Area Studies Requirement—Students must complete the 1-unit core course, East Asian Studies 330, and an additional nine courses numbered 100 or above related to East Asia and totaling at least 37 units beyond the courses used to fulfill the third-year-level language requirement. (Note that Chinese and Japanese language courses numbered 100-199 are considered to be at the third-year level and do not count toward the courses required for the degree.) The nine courses must be taken for a letter grade. An integral part of the program is training in research and a demonstration of research ability in a discipline. Three courses, one of which must be a seminar, colloquium, or advanced course in which a research paper on China or Japan is written, must be within a single department. The master's paper, representing a substantial piece of research, should be filed with the center's program office as part of the graduation requirements. 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 circumstances, credit toward the Area Studies requirement is not given for courses taken prior to entering the A.M. program. Students in this program may, however, take courses for exchange 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 program grants an A.M. degree in East Asian Studies and a Doctor of Jurisprudence (J.D.) degree. It is designed to train students interested in a career in teaching, research, or the practice of law related to East Asian legal affairs. 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 background 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 to the A.M. program in East Asian Studies and then apply to the Stanford Teacher Education Program during the first year at Stanford. Completion of the joint program requires at least two years, including one summer session when beginning the education component of the program.

EAST ASIAN STUDIES AND BUSINESS

This joint program grants an A.M. degree in East Asian Studies and a Master of Business Administration. Students must apply separately to the East Asian Studies A.M. program and the Graduate School of Business and be accepted by both. Completion of this combined course of study requires approximately three academic years (perhaps including summer sessions), depending on the student's background and level of training in Chinese or Japanese language.

RELATED PROGRAMS

Qualified graduate students may apply for A.M. degrees within the Food Research Institute and the School of Medicine.
EAST ASIAN STUDIES AND FOOD RESEARCH

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 a letter grade indicator of "B" or better, and who complete at least 45 units of approved work in courses numbered 100 or above with a grade of "B" or better. 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. Applications should be made to Chairman, Graduate Instruction Committee, Food Research Institute.

EAST ASIAN STUDIES AND HEALTH SERVICES RESEARCH

The Master of Science degree in Health Services Research (H.S.R.) is an interdisciplinary program training students in research and analytic skills for careers in the growing health industry as innovative health planners, system analysts, and policy makers. Students concluding the first year of graduate study at Stanford are eligible to apply for the degree, which is granted by the Department of Health Research and Policy in the School of Medicine. The degree may be pursued concurrently with the second and subsequent years of graduate study and is awarded upon completion of 45 units of coursework. This work is to be split approximately equally between research workshops and formal courses relevant to the health sector. Each student's program is planned to meet individual interests in health services in addition to fulfilling H.S.R. core requirements. For more information, apply to the Program Administrator, Division of Health Services Research.

DOCTORAL PROGRAMS

Stanford does not offer a Ph.D. in East Asian Studies. However, there are more than 100 doctoral students with a specialization on China or Japan within various departments and schools of the University. The departments which offer an East Asian concentration are: Anthropology, Art, Asian Languages, Comparative Literature, Economics, History, Linguistics, Philosophy, Political Science, and Religious Studies. It is also possible to specialize in East Asia within some of the doctoral programs of the professional schools of Business, Education, and Law, and the Food Research Institute. Inquiries should be directed to the individual department or school concerned.

FINANCIAL AID

Students in A.M. or Ph.D. programs who plan to do work in Chinese or Japanese language, or language-related area courses, may be eligible for Foreign Language and Area Studies (FLAS) fellowships and are encouraged to apply for them at the time of application to Stanford. Recipients of FLAS fellowships must be American citizens or permanent residents. For further information, contact the Stanford East Asia National Resource Center, Rm. 14, Littlefield Center, Stanford University, Stanford, California 94305-5013.

COURSES

The courses listed below deal primarily with China and/or Japan. Many other theoretical and methodological courses within the various departments at Stanford 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 bulletin.

ANTHROPOLOGY

11. Sex Roles and Society. 3-5 units, Win (Stockard)
14. Cultures in Crisis. 5 units, Spr (Befu)
21. The World Outside the West: Change and Tradition Before the Age of European Imperialism. 6 units, Aut (Duus, Roberts, Chamberlain)
22. The World Outside the West in the Age of European Imperialism. 6 units, Win (Abernathy, Befu, Beinin)
117. Traditional Chinese Society. 5 units, Aut (Stockard)
121. Japanese Society and Culture. 5 units (Befu) given 1991-92
123. Japanese Economic Organization. 5 units, Aut (Befu)
125. Japanese Women through Novels. 5 units (Befu) given 1991-92
240. Marxisms, Feminisms, Postmodernisms. 5 units, Spr (Gupta, Yanagisako)
258. Ideology and Cultural Nationalism. 5 units (Befu) given 1991-92

ART

2. Ideas and Forms in Asian Art. 4 units, Win (Vinograd)
4. Themes and Style in Japanese Art. 4 units, Win (Takeuchi)
20. Introduction to the Art of Asia (to 600 A.D.).  
4 units, Aut (La Plante)

21. Introduction to the Art of Asia (7th Century-13th Century).  
4 units, Win (La Plante)

22. Introduction to the Art of Asia (14th Century to the Present).  
4 units, Spr (La Plante)

126A/226A. Introduction to Chinese Painting.  
4 units, Spr (Vinograd)

126B/226B. Early Chinese Pictorial Art.  
4 units (Vinograd) not given 1990-91

126C/226C. Later Chinese Painting.  
4 units (Vinograd) not given 1990-91

128A/228A. Ritual Bronzes of Ancient China.  
4 units (La Plante) not given 1990-91

128B/228B. Chinese Ceramics.  
4 units, Spr (La Plante)

128C/228C. Buddhist Art in Asia.  
4 units (La Plante) not given 1990-91

128D/228D. Architecture and Gardens of Japan.  
4 units (La Plante) not given 1990-91

128E/228E. Japanese Ceramics.  
4 units (La Plante) not given 1990-91

129A/229A. Japanese Art from Prehistory to Muromachi Period.  
4 units (Takeuchi) not given 1990-91

4 units, Spr (Takeuchi)

226E. Colloquium: Across Cultures—Encounters of Eastern and Western Art.  
4 units (Vinograd) not given 1990-91

226F. Colloquium: Psychological and Psychoanalytic Approaches to the Visual Arts.  
4 units, Win (Vinograd)

227A. Seminar: Painting and Theory in the Sung Dynasty.  
4 units (Vinograd) not given 1990-91

227B. Seminar: Studies on 18th- and 19th-Century Chinese Painting.  
4 units, Aut (Vinograd)

229E. Colloquium: Japanese Woodblock Prints.  
4 units, Spr (Takeuchi)

4 units, Aut (Takeuchi)

4 units, Win (Takeuchi)

**ASIAN LANGUAGES**

46. Introduction to Chinese Thought—(Same as Philosophy 46, Religious Studies 55).  
4 units, Aut (Ivanhoe) MWF 10

50. The Japanese Language.  
3 units, Aut (Tokunaga) MW 10

91. Traditional East Asian Civilization: China.  
5 units, Aut (Van Zoeren) MWThF 11

92. Traditional East Asian Civilization: Japan.  
5 units, Win (Hare) MWThF 10

4 units, Aut (Van Zoeren) TTh 1:15-2:30

132. Chinese Fiction and Drama in Translation.  
4 units, Win (Wang) MWF 11

133. Modern Chinese Literature in Translation.  
4 units, Spr (Lyell) MW 11

4 units (Matisoff) not given 1990-91

4 units, not given 1990-91

4 units, Aut (Hare) MWF 11

4 units, Spr (Orbaugh) TTh 11-12:15

4 units, Win (Staff) M 3:15-5:05

152. Nomad Empires of Inner Asia—(Same as History 195).  
4-5 units, Spr (Dien) MTWThF 1:15

153. Science and Technology in Traditional China—(Same as History 193, History of Science 153).  
5 units (Dien) given 1991-92

156. China from Earliest Times to the 9th Century—(Same as History 192A).  
5 units, Aut (Hare, Kahn) MTWThF 11

5 units, Win (Palumbo-Liu) MW 11-12:30

4 units (Matisoff) not given 1990-91

3 units (Ueda) not given 1990-91

**CHINESE**

First-time registrants in a first- or second-year course must take a placement test if they have had any training in Chinese before entering Stanford.
1, 2, 3. First-Year Modern Chinese.  
5 units, Aut, Win, Spr (Shou)  
MTWThF 9, 10, 11, or 1:15

5, Intensive First-Year Modern Chinese.  
12 units, Sum (Staff) MTWThF 8-12

7, 8. Beginning Conversational Chinese.  
2 units, Win, Spr (Yin) TTh 2:15

21, 22, 23. Second-Year Modern Chinese.  
5 units, Aut, Win, Spr (Chuang)  
MTWThF 9 or 1:15

21B, 22B, 23B. Second-Year Modern Chinese for Bilingual Students.  
3 units, Aut, Win, Spr (Wang) MWF 2:15

12 units, Sum (Staff) MTWThF 8-12

27, 28, 29. Intermediate Conversation.  
2 units, Aut, Win, Spr (Shou) TTh 2:15

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 (Zhu) TTh 2:15-4:05
112. 5 units, Win (Zhu) TTh 2:15-4:05
113. 5 units, Spr (Wang) TTh 2:15-4:05

121, 122, 123. Advanced Conversation.  
2 units, Aut, Win, Spr (Chuang) W 2:15-4:05

3 units, Aut, Win, Spr (Staff)

200. Directed Reading in Chinese.  
5 units by arrangement, Aut, Win, Spr (Staff) by arrangement

201, 202. Proseminar.  
5 units, Aut, Win (Dien) W 2:15-4:05

211, 212, 213. Advanced Modern Chinese.  
5 units, Aut, Win, Spr (Staff) by arrangement

221, 222, 223. Advanced Classical Chinese.  
221. Philosophical Texts.  
5 units, Aut (Ivanhoe) MW 1:15

222. Historical Narration.  
5 units, Win (Dien) MW 1:15

223. Literary Essays.  
5 units, Spr (Van Zoeren) MW 1:15

230. Interpreting Confucian Texts.  
5 units, Win (Ivanhoe) TTh 2:15

231. Neo-Confucianism—(Same as Religious Studies 119A.)  
3 units, Win (Ivanhoe) MW 9

241. The Short Story.  
5 units, Aut (Lyell) MW 1:15
5 units, Win (Chuang) MW 11
243. The Novel.  
5 units, Spr (Lyell) MW 2:15-3:30

255. Literary History and Methodology.  
5 units (Lyell) given 1991-92

260. Introduction to Chinese Poetry.  
4 units (Van Zoeren) not given 1990-91

261. Shih-ching and Ch’u-tz’u.  
4 units (Van Zoeren) not given 1990-91

263. Lyric (shih) I.  
4 units, Spr (Van Zoeren) TTh 1:15

264. Lyric (shih) II.  
4 units (Van Zoeren) not given 1990-91

271. Traditional Chinese Fiction.  
4 units, Aut (Wang) TTh 11-12:15

291. The Structure of Modern Chinese.  
4 units, Spr (Zhu)

334. Seminar in Modern Chinese Literature.  
5 units (Lyell) not given 1990-91

JAPANESE

First-time registrants in a first- or second-year course must take a placement test if they have had any training in Japanese before entering Stanford.

1, 2, 3. First-Year Modern Japanese.  
5 units, Aut, Win, Spr (Sakamoto, Staff)  
MTWThF 9, 10, 11, or 1:15

12 units, Sum (Staff) MTWThF 8-12

3 units, Aut, Win, Spr (Busbin)  
MTWThF 9, 10, 11, or 1:15

3 units, Aut, Win, Spr (Busbin)  
MTWThF 9, 10, 11, or 1:15

5 units, Aut, Win, Spr (Nebrig, Staff)  
MTWThF 9, 10, 11, or 1:15

12 units, Sum (Staff) MTWThF 8-12
2 units, Aut, Win, Spr (Kubota)
TTh 1:15 or 2:15

ADVANCED
101,102,103. Third-Year Modern Japanese.
5 units, Aut, Win, Spr (Kubota)
MTWThF 11-12:20

12 units, Sum (Staff) MTWThF 9-12

3 units, Aut Win, Spr (Kubota)
MW 2:15-3:30

121,122,123. Advanced Japanese Conversation.
2 units, Aut, Win, Spr (Kubota) TTh 11

GRADUATE
5 units by arrangement, Aut, Win, Spr (Staff) by arrangement

201,202. Proseminar.
201. 5 units (Matisoff) given 1991-92
202. 5 units (Hare) given 1991-92

211,212,213. Advanced Modern Japanese.
5 units, Aut, Win, Spr (Komatsu)
TTh 11-12:15

246. Introduction to Classical Japanese.
5 units, Aut (Staff) by arrangement

247. 5 units (Matisoff) given 1991-92
248. 5 units, Win (Hare) by arrangement

250. Introduction to Kambun.
4 units, Spr (Ueda) TTh 2:15-3:30

251. Graduate Seminar: Japanese Historical Texts.
5 units (Mass) not given 1990-91

4 units, Spr (Hare)

4 units, not given 1990-91

287. Teaching Japanese as a Second Language.
4 units, Aut (Tokunaga) MW 11

296. Readings in Modern Japanese Literature.
4 units (Ueda) not given 1990-91

298. Translation Workshop.
4 units, Aut (Ueda) TTh 2:15.

5 units (Hare) not given 1990-91

396. Seminar in Modern Japanese Literature.
5 units, Win (Orbaugh) TTh 11

KOREAN
1,2,3. First-Year Modern Korean.
5 units, Aut, Win, Spr (Cho)
MTWThF 1:15

5 units, Aut, Win, Spr (Cho)
MTWThF 2:15

101,102,103. Third-Year Modern Korean.
3 units, Aut, Win, Spr (Cho).
by arrangement

200. Directed Reading in Korean.
Aut, Win, Spr (Cho) by arrangement

271. The Structure of Korean.
4 units, Win (Cho) by arrangement

EAST ASIAN STUDIES
1 unit, Aut (Staff) M 3:15

ECONOMICS
121/221. Economic Development in China—
(Same as Food Research 148.)
5 units, Win (Rozelle) MW 1:15-3:05

124. The Japanese Economy.
5 units, Spr (Aoki)

5 units, Win (Litwack, Qian)

130. Rise of Industrial Asia—(Same as Political Science 125.)
5 units, Aut (Lau, Lewis, Lho, Okimoto, Raphael) T 3:15-5:05

149. The Modern Firm in Theory and Practice.
5 units, Spr (Milgrom)

220. Marxian Economic Theory.
5 units, Spr (Harris)

292. Comparative Theory of Firms and Organizations.
5 units, Win (Aoki)

293. Socialist Economies.
5 units, Spr (Litwack, Qian)

391. Seminar in Comparative Institutional Analysis.
10 units (Aoki, Greif, Litwack, Milgrom, Qian) by arrangement

EDUCATION
161. Introduction to Teaching and Learning in Asia.
3 units, Spr (Herring) by arrangement
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Time</th>
<th>Instructor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>148/248</td>
<td>Economic Development in China— (Same as Economics 121.)</td>
<td>5</td>
<td>Win (Rozelle) MW 1:15-3:05</td>
<td></td>
</tr>
<tr>
<td>148/248</td>
<td><strong>Economic Development in China</strong></td>
<td><strong>5</strong></td>
<td><strong>Win (Rozelle) MW 1:15-3:05</strong></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>The World Outside the West: Change and Tradition before the Age of European Imperialism— (Same as Anthropology 22, Political Science 22.)</td>
<td>6</td>
<td>Aut (Roberts, Duus, Chamberlain) M-F 10</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>The World Outside the West: Change and Tradition before the Age of European Imperialism— (Same as Anthropology 22, Political Science 22.)</td>
<td>6</td>
<td>Win (Abernethy, Befu, Beinin)</td>
<td></td>
</tr>
<tr>
<td>192A</td>
<td>China from Earliest Times to the 9th Century— (Same as Asian Languages 156.)</td>
<td>5</td>
<td>Win (Kahn, Dien) MTWThF 11</td>
<td></td>
</tr>
<tr>
<td>192B</td>
<td>China from the 9th to the 19th Century— (Same as Asian Languages 156.)</td>
<td>5</td>
<td>Win (Kahn) MTWThF 11</td>
<td></td>
</tr>
<tr>
<td>192C</td>
<td>Modern and Contemporary Chinese History— (Same as Asian Languages 153, History of Science 153).</td>
<td>5</td>
<td>Spr (Van Slyke) MTWThF 11</td>
<td></td>
</tr>
<tr>
<td>193</td>
<td>Science and Technology in Traditional China— (Same as Asian Languages 153, History of Science 153).</td>
<td>5</td>
<td>Spr (Van Slyke) MTWThF 11</td>
<td></td>
</tr>
<tr>
<td>194A</td>
<td>Early and Medieval Japan to 1500.</td>
<td>5</td>
<td>MTWTh 9</td>
<td></td>
</tr>
<tr>
<td>194B</td>
<td>Late Medieval and Early Modern Japan 1500-1840.</td>
<td>5</td>
<td>Win (Ketelaar) MTWThF 10</td>
<td></td>
</tr>
<tr>
<td>195</td>
<td>Nomad Empires of Inner Asia— (Same as Asian Languages 152.)</td>
<td>5</td>
<td>Spr (Dien) MTWThF 1:15-2:05</td>
<td></td>
</tr>
<tr>
<td>295</td>
<td>Undergraduate Colloquium: A History of Japanese Religion.</td>
<td>5</td>
<td>Spr (Ketelaar) Th 1:15-3:05</td>
<td></td>
</tr>
<tr>
<td>296</td>
<td>Undergraduate Colloquium: Ordinary Lives: The Social History of Early Modern China.</td>
<td>5</td>
<td>Spr (Kahn) T 1:15-3:05</td>
<td></td>
</tr>
<tr>
<td>297</td>
<td>Undergraduate Colloquium: South Korea’s Emergence in the Postwar International System.</td>
<td>5</td>
<td>Win (Lho)</td>
<td></td>
</tr>
<tr>
<td>298A</td>
<td>Undergraduate Colloquium: Visions of Utopia—Travellers to China.</td>
<td>5</td>
<td>Aut (Kahn) M 1:15-3:05</td>
<td></td>
</tr>
<tr>
<td>299A/399A</td>
<td>Undergraduate Colloquium: From Classical to Medieval Japan.</td>
<td>5</td>
<td>Spr (Mass) W 2:15-4:05</td>
<td></td>
</tr>
</tbody>
</table>

390A. Graduate Colloquium: Topics in Late Traditional Chinese History.  
5 units, Aut (Kahn) T 1:15-3:05

390B. Graduate Colloquium: Topics in Modern Chinese History.  
5 units, Win (Van Slyke) T 1:15-3:05

390C. Graduate Colloquium: Topics in Contemporary Chinese History.  
5 units, Spr (Van Slyke) T 1:15-3:05

395A. Graduate Colloquium: Japan before Tokugawa.  
5 units, Win (Mass) W 2:15-4:05

395B. Graduate Colloquium: Medieval and Early Modern Japan.  
5 units, Spr (Ketelaar) T 1:15-3:05

395C. Graduate Colloquium: Modern Japan.  
5 units, Aut (Duus) Th 1:15-3:05

490A. Graduate Seminar: Research in Modern and Contemporary China.  
5 units, Win (Van Slyke) W 1:15-3:05

490B. Graduate Seminar: Research in Modern and Contemporary China— (Continuation of 490A.)  
5 units, Spr (Van Slyke)

498. Graduate Seminar: Japanese Historical Texts— (Same as Asian Languages 251.)  
5 units (Mass) not given 1990-91

316. Law in Radically Different Cultures— (Same as Anthropology 157/257, Political Science 182L.)  
(Barton, Staff) not given 1990-91

448. Law in the Pacific Community.  
3 units, Aut (Barton)

277. Topics in the Syntax of East Asian Languages.  
4 units, Spr (Gerds, Sells)

46. Introduction to Chinese Philosophy— (Same as Asian Languages 46, Religious Studies 55).  
4 units, Aut (Ivanhoe) MWF 10  
sections by arrangement

129/229. Confucian Ethics.  
4 units, Spr (Staff)

20. Introduction to Comparative Politics.  
5 units, Spr (Halpern)

5 units (Okimoto) given 1991-92
5 units, Aut (Halpern)

5 units, Aut (Okimoto, Lewis, Staff)

139. Seminar: Chinese Foreign Policy.  
5 units, Win (Halpern)

139A. Japanese Foreign Policy.  
5 units, Win (Okimoto)

1-4 units, Aut, Win, Spr (Fagen, Lusignan, Siegel) W 7:30-9

5 units, Aut (Okimoto)

5 units, Win (Okimoto)

225. Seminar: Political Economy of Socialist Reform.  
5 units, Spr (Halpern)

RELIGIOUS STUDIES

1E. Eastern and Western Conceptions of Self.  
5 units (Yearley) not given 1990-91

4 units (Staff) not given 1990-91

18. Zen Buddhism.  
4 units, Spr (Bielefeldt) MWF 1:15
plus section

4 units, Aut (Faure) MW 11-12:15
plus section

55. Introduction to Chinese Thought—(Same as Philosophy 46, Asian Languages 46).  
4 units, Aut (Staff) MWF 1 plus section

111. Religious Classics of Asia.  
4 units, Win (Bielefeldt, Faure, Yearley) MWF 10

5 units (Faure) not given 1990-91

117. Syncretism and Sectarianism in Chinese Buddhism.  
5 units (Faure) not given 1990-91

118. Death Rituals in East Asia.  
4 units (Faure) not given 1990-91

119A. Neo-Confucianism.  
3 units, Win (Ivanhoe) MW 9 plus section

5 units (Bielefeldt) not given 1990-91

150. Systems of Buddhist Thought.  
5 units, Spr (Bielefeldt) MWF 10

152. New Religions in America.  
5 units, Aut (Nattier) MWF 10

207. Religion, Culture, and Gender.  
5 units, Aut (Napper) TTh 2:15-4:05

209. Buddhism in Central Asia: The Indian Border Regions.  
5 units, Spr (Nattier) MW 2:15-4:05

210. Speech and Writing in the Buddhist Tradition.  
4 units (Faure) not given 1990-91

211. The Taoist Religion.  
5 units, Win (Kirkland) TTh 2:15

212. Interpreting Confucian Texts.  
5 units, Win (Ivanhoe) TTh 2:15-4:05

218. The Trickster in Asian Religions.  
4 units, Win (Faure) MW 2:15-4:05

5 units (Faure) not given 1990-91

230A. Zen Buddhism Seminar.  
5 units (Bielefeldt) not given 1990-91

4 units, Win (Bielefeldt) by arrangement

4 units (Faure) not given 1990-91

(Bielefeldt, Faure, Yearley) by arrangement

ECONOMICS


Chairman: Gavin Wright

Vice Chairman: Lawrence Lau


Associate Professors: Timothy F. Bresnahan, Steven N. Durlauf

Assistant Professors: Julie L. Anderson, Orazio Attanasio, Avner Greif, Harry Huizinga, Anjini Kochar, John M. Litwack, Yingyi Qian, Douglas O. Staiger, Robert W. Staiger, Jeroen Swinkels, Frank A. Wolak
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.

The undergraduate program provides an excellent background for those going on to graduate work in the professional schools (e.g., business and law) and may also be structured to prepare students for a Ph.D. program in economics. The department's curriculum is an integral part of Stanford's programs in International Relations, Public Policy, and Urban Studies, as well as the Food Research Institute.

The Economics Department's Ph.D. program is one of the best in the country. The primary objective of the graduate program is to educate students as research economists. In the process, students also acquire the background and skills necessary for careers as university teachers and as practitioners of economics. The curriculum includes a comprehensive treatment of modern theory and empirical techniques. Currently, 25 to 30 students are admitted each year.

The faculty represents a wide spectrum of interests and conducts research on a broad range of topics. Most fields of economics are covered, including microeconomic and macroeconomic theory, mathematical economics, econometrics, economic history, international trade, alternative economic systems, labor, public finance, comparative institutional analysis, and economic development.

**UNDERGRADUATE PROGRAMS**

**BACHELOR OF ARTS**

Undergraduate Economics majors must choose between two programs:

- The program in Economic Perspectives and Policies teaches students to think and write about economic problems and issues, using the basic tools of economic analysis without extensive use of mathematics.

- The program in Quantitative Economics also deals with economic problems and policy issues, but with a more mathematical orientation. One of its goals is to bring students to a level of quantitative proficiency in economic theory and applied econometrics to do master's level work. Students who have taken Math. 43 or Economics 180 or who have equivalent preparation are qualified to enter the quantitative major. The department recommends election of this major by students who have or can acquire the required mathematics skills. Students who can satisfy the mathematics requirement are urged to take 51Q even if they are uncertain which major they will eventually choose, since 51Q is required for the Quantitative program but also may be substituted for 51 under the Perspectives and Policies major.

In order to provide more opportunities for students with strong analytical and mathematical skills, the department offers advanced (A) versions of selected courses. The "A" courses cover the same basic material as the regularly numbered courses, but more rigorously and in greater depth.

Students who expect to undertake graduate study in economics, particularly prospective Ph.D. candidates, are strongly advised to elect the 'A' courses and the Quantitative major.
COURSEWORK REQUIREMENTS

QUANTITATIVE ECONOMICS

1. Economics 1, 51Q or 51A, and 52 or 52A, completed by the end of the sophomore year, if possible.
2. Thirty units in courses numbered 100 or above.
   a) Economics 102, 103, and 104 are required and must be taken at Stanford in California.
   b) Fifteen additional units from economics courses numbered between 100 and 198, excluding 101-104, 151-155, 170-172, and 180-181. A maximum of 10 units of directed reading (139D and Food Research Institute (F.R.I.) directed reading) may be used. Courses 212A, B and 214A, B in Engineering-Economic Systems and courses numbered 205 and above in F.R.I. may be used. Some courses offered by Overseas Studies may be counted toward this requirement (see the list below).
3. Mathematics 43 or equivalent. Economics 180 may be substituted for Mathematics 43.

ECONOMIC PERSPECTIVES AND POLICIES

1. Economics 1, 51, and 52. Economics 51 and 52, whenever possible, should be completed by the end of the sophomore year. Economics 51Q or 51A may be substituted for 51, and 52A may be substituted for 52.
2. Thirty units in courses numbered 100 or above.
   a) Economics 101 is required and must be taken at Stanford in California.
   b) Two courses (10 units) must be chosen from among Economics 102, 111 or 111A, 118, 141 or 141A, 145, 149, 157, and 165 and must be taken at Stanford in California.
   c) Fifteen additional units from among economics courses at Stanford numbered above 99 and below 300 excluding 101, 103-104, 151-155, and 190-191. A maximum of 10 units of directed reading, (139-D and F.R.I. directed reading) may be used. Courses 212A, B, and 214A, B in Engineering-Economic Systems and in F.R.I. courses numbered 205 and above may be used. Some economics courses offered by Overseas Studies may be counted toward this requirement (see the list below).
3. Fifteen units of quantitative work. All courses taken to satisfy this requirement must be approved in writing by the student’s Economics Department advisor. Advisors automatically approve courses from among the following: Economics 90, 91, 102, 170, 171, 172, 180, and 181; any Mathematics courses numbered 19 or above and Advanced Placement Math Credit (equivalent to Math 41 and 42); any Operations Research courses; any Statistics courses numbered 60 or above; Psychology 60; Computer Science 105A, 106A, B, and Industrial Engineering 133. No more than 10 units of accounting courses (Economics 90, 91, Industrial Engineering 133) may be used toward this requirement.
4. Senior Research Paper (3 units). Register only at Stanford in California for Economics 188 during the quarter in which the 20-page paper is written. It should be written, applying the principles learned in economics courses, after the basic economics and quantitative requirements and most of the upper division courses have been completed.

OTHER REQUIREMENTS

At least 25 units applied toward coursework requirements (1) and (2) of either of the foregoing programs must be taken at Stanford in California. To use transfer credit in partial satisfaction of the requirements under either program, the student must obtain written permission from the Economics Department’s Associate Director of Undergraduate Studies, who will establish the amount of credit to be granted toward completion of the department requirements.

No courses receiving Economics Department credit under either program may be taken Satisfactory/No Credit. No more than 10 units of coursework for requirement (3) of the Economics Perspectives and Policies program may be taken Satisfactory/No Credit.

An average letter grade indicator of “C” or better must be received for all units at Stanford applied toward requirements (1) and (2) of either program.

No course may be counted more than once in satisfying these requirements.

Students are responsible for seeing that all grades of “incomplete” are cleared within one year after the grade is given.

HONORS PROGRAM

The honors program is designed to encourage a more intensive study of economics than is required for the normal major, with course and research work of exceptional distinction. It leads to a Bachelor of Arts with Honors in Economics. In addition to the requirements for the A.B. in Economics listed above, the honors program requires:

1. A letter grade indicator (LGI) in economics courses of at least 3.5. See details in the departmental Information Book for Economics Majors.
Submission of an honors thesis of very high quality. The thesis is written under the direction of a member of the Economics Department or its affiliated faculty. Honors students may take up to 10 units of Honors Directed Reading (199D) for the purpose of completing the thesis. Units of 199D do not count toward the coursework requirements for the basic economics major, or in the computation of the LGI under requirement (1).

Juniors interested in the honors program are urged to attend an informational meeting scheduled by the departmental Director of the Honors Program each Winter Quarter. Prospective candidates for the honors program must submit an application to the director no later than the end of the second full week of the third quarter prior to graduation (typically the Autumn Quarter of the senior year). Also required, later in the same quarter, is submission of a three-page thesis prospectus which must be approved by the thesis advisor.

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 ensure that students get thorough grounding in the methodology of theoretical and empirical economics, while at the same time providing a specialized training in a wide variety of subfields and a broad understanding of associated institutional structures. Toward these ends, the program is structured so that the student has little choice in the curriculum at the outset but considerable latitude later on.

Students admitted to graduate standing in the department are expected to have a strong background in college-level economics, mathematics, and statistics. Preparation ordinarily consists of a college major in economics, a year-long calculus sequence that includes multivariate analysis, a course in linear algebra, and a rigorous course in probability and statistics. Students not sufficiently prepared in these areas must do remedial work.

MASTER OF ARTS

The department does not admit students who plan to terminate their graduate study with the A.M. degree. Students may (but need not) elect this degree in preparation for the Ph. D. degree. A master's option is also available to Ph. D. candidates from other departments. (The coterminal A.B./A.M. program previously offered was terminated June 1, 1990.)

Admission—Prospective students must have completed the Stanford requirements for a Bachelor of Arts in Economics or approximately equivalent training. Since students are required to take some of the same courses as Ph. D. candidates, similar preparation in mathematics and statistics generally is expected.

Requirements—A master's program must satisfy the following criteria:

1. Completion at Stanford of at least 45 units of credit beyond those required for the bachelor's degree, of which at least 40 units must be in the Economics Department. Courses numbered below 100 may not be counted for this purpose. Economics courses must include 202, 210, and at least two other 200 level courses. Courses that 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. No seminar courses numbered 300 or above can be counted.

2. Demonstration of competence in empirical methodology at the level of Economics 170. Normally, this is done by including that course in the program of study.

3. Submission of two term papers (or a thesis of sufficient quality). At least one of these papers must be deemed to represent graduate level work. Normally, this means that it is written in connection with a 200-level course. A maximum of 10 units of credit can be earned for a thesis toward the 45-unit degree requirement.

4. An average letter grade indicator (LGI) of "B" must be maintained for all master's level work. In addition, an LGI of "B-" or better must be earned in each of the two graduate theory courses. All courses must be taken for a letter grade.

DOCTOR OF PHILOSOPHY

Admitted students must be adequately prepared in calculus, linear algebra, and statistics (see above). When deemed appropriate, a student may be required to complete the necessary background preparation at Stanford. All students take a common core curriculum at the outset and later branch out in the desired fields of specialization. Well-prepared students should anticipate spending, with some overlap, approximately two years in coursework and another two years in seminars, independent study, and dissertation research. The goal is to complete the program in four years, although some types of research programs may require at least five years to complete. The department has a strong
commitment to guiding students through the program expeditiously.

Questions and petitions concerning the program and the admissions process should be addressed to the Director of Graduate Study, who (as chair of the Graduate Studies Committee) has ultimate responsibility for administering the graduate program.

Specific requirements are best discussed in two stages, the first consisting of requirements for admission to candidacy and the second involving further requirements for earning the degree.

Admission to Candidacy for Ph.D.—A student may apply for admission to candidacy when the following minimal requirements are met:

1. Successful results on comprehensive examinations in "Price and Allocation Theory" (the examination based on material from Economics 202, 203, 204), "Theory of Income and Economic Fluctuations" (the examination based on material from Economics 210, 211, 212), and "Econometrics," (the examination based on material from Economics 270, 271, 272).

2. Completion of the requirements in two additional fields from the list below or one such field together with a substantial amount of work toward a minor in a related department approved by the Director of Graduate Study. Advanced fields include alternative approaches to economic analysis, econometrics, economic development, economic history, general theory, international economics, labor economics, monetary theory, public finance, structure of industry, theory of choice, comparative institutional analysis.

(The student cannot offer both general theory and theory of choice fields to fulfill the requirement.)

Each field listed above can be satisfied by completing two courses, though students in some fields may be advised to add a third course which can then be counted toward the distribution requirement discussed later. All courses (or comprehensive exams, when offered) must be passed with a letter grade indicator (LGI) of "B" or better.

3. Completion of a "second-year paper," normally written in conjunction with one of the special fields selected above.

It is expected that the student will meet, and indeed exceed, the above standard by the end of the second year of residency. When this is not possible for any reason, the Director of Graduate Study should be consulted as early as possible during the second year. Once it is deemed that the above standards have been met, the student should complete the University form "Application for Candidacy for Degree of Doctor of Philosophy" and submit it to the Graduate Program Office. After approval, candidacy remains valid for five years (although it can be terminated earlier by the department if progress is deficient); it can be renewed or extended beyond this period only under unusual circumstances.

Further requirements for the Ph.D. degree are—

1. Additional coursework: Four other graduate level courses must be completed. One of these must be from the area of economic history unless that field has already been selected above and, in any event, these courses must be "distributed" in such a way that at least two fields not selected above are represented. In addition, if the special fields consist of econometrics together with one field from mathematical economics, the distribution courses must include at least two from outside these areas. With the approval of the Director of Graduate Study, some of the distribution courses may be drawn from a minor subject, for those choosing that option.

2. Distinction: The student is expected to show "distinction" in some important aspect of his or her graduate program. Generally this is accomplished by earning an LGI of "A-" or better in one or more of the fields offered. However, distinction can be earned in other ways, e.g., by writing and publishing an article in a professional journal.

3. Teaching Experience: Each student must serve as a teaching assistant for at least one quarter, normally during the second or third year of residence.

4. Seminar Participation: Each student is expected to participate in at least two distinct research seminars by the end of the third year of residence. Normally, participation in a seminar requires one or more oral presentations and the submission of a research paper (which, however, need not be completely separate from dissertation research).

5. Ph.D. Dissertation: The process involves selecting a topic; choosing an appropriate advisor; submitting a prospectus (signed by the advisor) outlining proposed research; selecting a three-member reading committee (usually all from the Economics Department, although exceptions can be made under certain circumstances); passing the University oral examination at which these three faculty (and two other members of the Academic Council) ask questions about the completed research; and submitting a final draft of the work signed by all members of the reading
committee. The student is advised to initiate this process as early as possible.

Ph.D. MINOR

To be recommended for the degree of Doctor of Philosophy with Economics as a minor subject, a student must 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 annually. The standard of achievement in these examinations is the same for minor as for major candidates.

JOINT DEGREE PROGRAMS

The Department of Economics and the School of Law offer a joint program leading to the Doctor of Philosophy in Economics and the J. D. degree in Law. See the Law School catalogue for descriptions of its participation in the joint program.

To qualify, the student's program objectives must clearly justify such a joint program; decisions by the Economics' Graduate Studies Committee govern. A student's program in economics must satisfy the same standards as a Ph.D. degree in Economics taken with a minor in Law. It is expected that dissertation research will cross departmental lines and that members of the dissertation committee will be drawn from both faculties.

Students normally spend the first year full time either in economics or in law and the second year full time in the other department. After the second year, courses in economics and law may be pursued simultaneously.

Other joint programs may be arranged; e.g., the Ph. D. in Economics 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 Bulletin for the requirements. Conversely, a student taking the J. D. in the School of Law may apply for an A.M. in Economics.

FELLOWSHIPS AND ASSISTANTSHIPS

The department awards a number of fellowships for graduate study. Some first-year students are awarded full fellowships, including a stipend and tuition. All students whose record justifies continuation in the program may be assured support for the second through fourth years. Support takes the form of employment as a teaching assistant or research assistant. These half-time appointments provide a stipend and tuition allowance. Entering students are not normally eligible for research or teaching assistantships.

Applications should be submitted before January 1 to the Office of Graduate Admissions.

COURSES

Notes—Consult the quarterly Time Schedule for the exact times courses are given.

Because the "Q" and "A" courses are more advanced, when 51 is a course prerequisite, 51Q and 51A also suffice; when 51Q is required, 51A suffices; when 52 is required, 52A suffices.

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. Inflation and unemployment. The role of government: spending, regulation, taxation, monetary and fiscal policy. (DR:5)
   5 units, Aut (T. Taylor)
   Win (Hickman)
   Spr (Gurley)

51A. Advanced Microeconomic Theory—Mathematically rigorous course on the interaction of firms and households through markets. Topics: market efficiency in simple general equilibrium models; game-theoretic models of competitive interactions; and issues in information economics, e.g., moral hazard and adverse selection. Prerequisites: 1, 180 or Math. 43.
   5 units, Spr (Brown)

51Q. Economic Analysis I—(Graduate students register for 151Q.) 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: 1, Math. 43 or equivalent. (DR:5)
   5 units, Aut (Swinkels)
   Win (Qian)

51. Economic Analysis I—(Graduate students register for 151.) Same as 51Q except that calculus is not used. (DR:5)
   5 units, Aut, Spr (Welfe)
   Win (Boal)

52. Economic Analysis II—(Graduate students register for 152.) Analysis of equilibrium and instability in the economic systems as a whole. National accounts and aggregate relationships
among stocks and flows in markets for goods, services, and financial assets. Prerequisite: 51.

5 units, Aut (Sauer, Schulze)
Win (Sauer)
Spr (Schulze, Earle)

52A. Advanced Economic Analysis II—Study of the two major paradigms for understanding macroeconomic fluctuations. Part I: the equilibrium model of economic fluctuations. The neoclassical growth model is derived. Implications of the model for consumption, investment and asset prices. Part II: the neo-Keynesian model, concentrating on the IS/LM model and the role of policy in the context of different types of market imperfections. Prerequisite: 51A or 51Q.

5 units, not given 1990-91

90. Introduction to Accounting—(Graduate students register for 190.) Introduction to the principles and concepts underlying financial reports: the income statement, statement of financial position, and the “funds” statement, and 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. Limited enrollment in Spring.

5 units, Aut, Win (Hansen)
Spr (Zollinger, Canellos)

91. Introduction to Cost Accounting—(Graduate students register for 191.) The use of internal financial data for managerial decision making. Students who have had or are now taking a college-level accounting course may not enroll. Prerequisite: 90 or Industrial Engineering 133.

5 units, Spr (Hansen)

100. Economic Theory in Historical Perspective—The historical development of economic theory from several perspectives. Emphasis is on the progress of analytic clarification and elaboration. Also, the influence of contemporary economic and political categories with which different economists worked, and the relation of the development of economic theory to concurrent developments in political and social thought.

5 units, not given 1990-91


2-3 units, Win (Dupuy)

100C. Limits of Economic Rationality II: Individualism and Social Justice—(Same as French 288B.) Examination of several attempts to conceive of the “good society” in terms akin to economic rationality. Contemporary Anglo-American theories—John Rawls, Robert Nozick, Friedrich Hayek, David Gauthier, in light of the French liberal tradition—Montesquieu, Tocqueville, Constant. (English)

2-3 units, Spr (Dupuy) TTh


5 units, Aut (Eaule, Goulder)
Win (Goulder, Steinmueller)
Spr (Levin, Hancock)

102. Introduction to Econometrics—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 acquire it early in the quarter. Prerequisite: Statistics 60 or the equivalent.

5 units, Aut, Spr (Boal)
Win (Kochar)

103. Applied Macroeconomic Analysis—Construction and use of econometric models for analyzing macroeconomic phenomena. Students complete individual projects and core material. Topics vary with the instructor. Limited enrollment with priority for majors enrolled in the Quantitative Economics track. Prerequisites: 52 and 102.

5 units, Aut (Sauer)
Win (Attanasio)
Spr (Attanasio, Sauer)

104. Applied Microeconomic Analysis—Develops skills in the empirical analysis of microeconomic theory, models, and data. Topics vary with the instructor. Students complete individual projects and core material. Limited enrollment; priority for majors in the Quantitative Economics track. Prerequisites: 51Q or 51A, and 102.

5 units, Aut (J. Anderson)
Win (Nguyen, Rothwell)
Spr (D. Staiger)

106. The World Food Economy—(Same as Food Research 103.) Interrelationships among food, population, and economic development. Agricultural and rural development in achieving economic and social progress in low-income nations. Emphasis on public sector decisionmaking as it relates to food policy.

4-5 units, Win (Falcon) MW 9-10:50

107. Commodity Futures Markets and Prices—(Same as Food Research 105.) The uses and functioning of commodity futures markets, market performance issues and measures, and anal-
ysis of the economic effects of futures markets. Prerequisite: 1 for Economics majors. 
5 units, Aut (Peck) TTh 9-10:50

111. Money and Banking—Financial processes emphasizing 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, Win (Huizinga) Spr (Haak)

111A. Advanced Money and Banking—same topics as 111, covered in more depth and with greater rigor. 
5 units, not given 1990-91

4 units, Win (Keeleg) MWF 10

113. Technology and Modern Industrial Society—(Same as VTSS 107.) The interplay of technology and the process of economic development from 1870 to the present. Topics: the origins of modern industry in the U.S. and Europe, factors affecting the rate and direction of technological change and diffusion, technology and the growth of large-scale organizations, the spread of industrialization to less-developed countries, late-comers to industrialization (the cases of Japan and newly industrializing countries), the growth and slowdown in mature industrial countries, and present concerns and future prospects (the influence of technology on employment, civilian "spillovers" from military R&D spending, and coping with technological change). (DR:5) 
4-5 units, Spr (Rosenberg) optional section for extra unit

115. European Economic History—General trends and detailed analysis of topics emphasizing organization and growth of trade and industry in Western Europe from the 11th century. Prerequisites: 51 and 52. 
5 units, not given 1990-91

116. American Economic History—The history of American economy from colonial times to present, emphasizing the years between the Revolution and WW II. The application of economic analysis to historical issues. Topics: 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 (McLean)

118. The Economics of Development—The economic problems and policy concerns of Third World countries. Topics: theories of economies' structural transformation during the process of economic development, trade and industrialization policies, inequality and poverty, agriculture and rural development, migration, population growth, education, nutrition, health, domestic and international sources of development finance. The focus is on principles, not case studies. Prerequisite: 51. 
5 units, Spr (Kochar)

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 diversity of experience. Country case studies illustrate the systematic components of the experience of economic development and those of population growth with implications in terms of alternative structures of development, the timing of the demographic transition, income distribution, employment, and migration. Interactions and causal effects between economic development and population growth. 
5 units, Win (Yotopolous) MW 3:15-5:05

5 units, Spr (Litwack)

121. Economic Development in China—(Same as Food Research 148; graduate students register for 221.) Structure and development of China's economy, emphasizing the People's Republic. Topics: economic legacy of the late Qing and Republican periods; China's development strategy; planning and resource allocation; labor, employment, and population, income distribution, foreign trade; and recent reforms. Prerequisite: 1. 
5 units, Win (Rozelle) MW 1:15-3:05

122. The Theory of Capitalist Development—Theoretical and historical analysis of the growth and development process of capitalist economies. Focus: analysis of mechanism, determinants, and consequences of the process; causes of its unevenness on a world scale; and the question of historical stages in capitalist development. Topics: capital accumulation, income distribution, effective demand, employment and labor supply, technological progress and struc-
tural change, international trade and investment, underdevelopment, and the role of the state. Theoretical approaches: Classical, Marxian, Schumpeterian, Keynesian, and Neoclassical.

5 units, Win (Harris)

123. Economic Development in Latin America—(Same as Food Research 218; open to advanced undergraduate students, with the consent of instructor.) Historical approach to the political economy of development, focusing on economic growth and structural change of open economies. The evolution from raw material and primary product-based export economics to industrialization and the process of diversification, innovation, and their relationships to rent-seeking. Changing patterns of interdependence, debt and adjustment, price policy and stabilization, the political economy of accumulation, and labor market adjustment and migration. Seminar with major research paper.

5 units, Aut (Reynolds) MW 3:15-5:05

124. The Japanese Economy—Description and analysis of contemporary economic institutions and mechanisms: work organization; structures of information, incentives, distribution, and governance at the corporate firm; industrial organization and corporate grouping; the role of financial institutions and the government. Comparison with corresponding American institutions. Macroeconomic performance of the Japanese economy and its interaction with the rest of the world.

5 units, Spr (Aoki)

125. Economic Development in Africa—(Same as Food Research 149; graduate students register for 249.) Economic development issues in Africa, emphasizing the sub-Saharan region. Topics: socio-economic maps of Africa; recent economic history, demography, and migrations; development strategies; agricultural policies, external debt, famines and drought; environmental degradation.

5 units, Aut (Fafchamps) TTh 1:15-3:05

126. Comparative Economic Systems—Theoretical and institutional analysis of how economic problems are resolved under alternative economic systems. Examination of alternative theories of capitalism and socialism. The roles of market vs. hierarchical organizations in resource allocation. Comparisons of various capitalist and socialist economies.

5 units, Win (Litwack, Qian)

127. The Political Economy of Commodity Markets—(Same as Food Research 106; graduate students register for 206.) History, politics, and theoretical analyses of domestic and international markets for basic commodities. Topics: government regulation of private trading, public trading through buffer stocks and marketing boards, international commodity agreements, and the changing views of the social value of private speculation. Examples from 18th century to present.

5 units, Spr (Williams) TTh 9-10:50

128. Contemporary Polish Economy—The main forces behind Poland's severe economic crisis and rapid changes during the 1980s. Emphasis on interaction between political and economic factors. Similarities and differences among Eastern European countries.

5 units, Aut (Wojtyna) MTWThF 10

129. Analysis and Management of Development Projects—(Same as Food Research 129.) Contemporary techniques and experiences in appraising, implementing, and managing development projects. Three modules: project planning and scheduling using CPM and PERT methods; theory, calculation, and use of conventional appraisal criteria such as net present value, benefit-cost ratio, and internal rate of return; and development of database systems for project monitoring and evaluation. Partial budgeting techniques compare financial and economic decision criteria. Hands-on exercises with data form LDC agricultural projects. Required use of microcomputers and project planning, spreadsheet and database management software.

5 units, Spr (Gotsch) MW 9-10:50

130. Rise of Industrial Asia—(Same as Political Science 125.) Interdisciplinary seminar on the political, economic, security, social, and cultural aspects of industrial development and change in Asia as a region. Enrollment limited to 15 students. Consent of instructors required. Consent of Director of Undergraduate Studies required for credit toward fulfillment of the requirements for an economics major.

5 units, Aut (Lau, Lewis, Lho, Okimoto, Raphael) T 3:15-5:05

132. Application of Mathematical Programming to Agricultural Systems—(Same as Food Research 130.) Develops application skills including exercises in mixed integer, multi-period, quadratic, and risk-programming. Producer-consumer models. Computer homework exercises analyze agrarian reform, water resource development, technology choice, and allocation of research resources. Model manipulation and data problems are stressed. Prerequisite: one course in microeconomic theory.

3-5 units, Aut (Gotsch) MW 11-12:50
5 units, Spr (Arthur) MW 1:15-3:05

139D. Directed Reading and Research—(Graduate students register for 239D.)
1-10 units (Staff)

140. Introduction to Financial Economics—Introduction to modern portfolio theory and corporate finance. Topics: capital budgeting techniques, consumer behavior towards risk, properties of various financial instruments, and the Capital Asset Pricing Model. Models for pricing options and other contingent claims. Prerequisites: 51, at least one course in calculus, and at least one course in statistics.
5 units, Win (Haak)

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, Spr (Goulder)

141A. Advanced Public Finance—Same topics as 141, in greater depth and with more rigor.
5 units, not given 1990-91

142. Economic Policies of the European Community—(Same as Food Research 146; graduate students register for 246.) Analysis of current economic policies of the European Community and the planned completion of the internal market by 1992. Development of competition, transportation, and factor market policies; agricultural policy reform and changes in the food industry; external trade policy and relations with the U.S. and Japan; monetary and macroeconomic coordination and proposals for a common currency and central bank. Prerequisites: 51, 52, or equivalent.
5 units, Aut (Josling) MW 1:15-3:05

144. Economics of American Agriculture: Structure and Policy—(Same as Food Research 144.) American agriculture and its historical and contemporary role in the economy. Topics: the role of agriculture in American economic development, policy toward commercial agriculture, poverty problems in rural America, and the international dimensions of U.S. agriculture. Emphasis on policy alternatives rather than on farm management.
4-5 units, Aut (Falcon) MW 9-10:50

5 units, Win (Earle)

146. Comparative Labor Markets—Analysis and description of labor markets in different countries. Empirical regularities and irregularities across countries in wages, employment, and unemployment. Alternative labor market models and labor market institutions. Economies covered: Western Europe, Japan, Australia, certain less developed economies, the centralized economies of the Soviet Union and China, the emerging economies in Eastern Europe. Prerequisite: 51. Recommended: 102.
5 units, Spr (Pencavel)

147. Economics of Human Resources—Investment in human capital, including education, information, health, and on-the-job training. Role of human capital in the analysis of economic growth. Effects of ability, socioeconomic background, and investment in human capital on the distribution of income. Prerequisite: 51.
5 units, Aut (D. Staiger)

148. Urban Economics—(Same as Urban Studies 120.) The economy of cities. Location and land use, urban transportation, housing, and local taxation, and provision of public services. Emphasis on theory; some discussion of public policy. Students must write a field essay applying urban economic theory to some aspect of the San Francisco urban scene. Prerequisite: 51.
5 units, Aut (Arnott)

149. The Modern Firm in Theory and Practice—Theoretical and institutional analysis of modern corporate firms: industrial relational, motivational, financial, information structural, managerial, and legal. Also, the role of various hybrid institutional forms between the market and the integrated firm: subcontracting, franchising, R&D cooperatives, and consortia. Practices in the American, Western European, and Japanese firms. Prerequisites: 51A or 51Q; familiarity with quantitative approach.
5 units, Spr (Milgrom)

150. Economics and Public Policy—(Same as Public Policy 104.) The relationship between economic analysis and economic policies. Economic rationales for public policies; methods and techniques of policy evaluation and the role of benefit-cost analysis; economic models of political processes, and their connection to the analysis of economic policymaking; and the relationship of income distribution issues to policy choice. How economic analysis is done, and why
the political process regards it as useful but not as necessarily determinative of policy choices. Readings include the theoretical foundations of economic policy analysis and policy decisions, and the analysis of the adoption and implementation of programs in a variety of policy areas. Prerequisites: 51, 52 (52 may be taken concurrently.)

5 units, Win (Noll)

151, 151A, 151Q. Economic Analysis I—(See 51.)

152, 152A. Economic Analysis II—(See 52.)

154. Economics of Legal Rules and Institutions—How legal rules (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, not given 1990-91

155. Environmental and Natural Resource Economics—The source of environmental problems in a market economy and the efficiency of alternative remedies (regulation, taxation, legal action, and innovative institutional proposals such as marketable pollution permits). Alternative methods for measuring the economic damages from environmental pollution. Economic aspects of non-renewable and renewable resources emphasizing market failures arising from common property problems (e.g., the overexploitation of fisheries). Long run prospects for economic growth on "Spaceship Earth." Prerequisite: 51, 51A, or 51Q. Recommended: Math. 43.

5 units, Win (Schulze)

156. Economics of Health and Medical Care—(Same as Health Research and Policy 256; graduate register for 256.) Empirical, institutional, and theoretical analysis of problems of health and medical care. Topics: measurement, valuation, and determinants of health; physicians, hospitals, and the drug industry; financing and organization of medical care; public policy issues. Open to graduate students and undergraduates (seniors, juniors) with training in microeconomics and some background in statistics or mathematics. Prerequisite: 51 or permission of instructor.

5 units, Spr (Fuchs)

157. Imperfect Competition—Extends and develops the basic tools of price theory in the context of U.S. industrial market structure. Emphasis on the application of theoretical models and concepts to the behavior of firms and markets when the conditions of perfect competition are not satisfied. Topics: monopoly, oligopoly, monopolistic competition, concentration measures, international competition, advertising, innovation, externalities, economies of scale, and the role of information in markets. Prerequisite: 51.

5 units, Aut (Bresnahan)

158. Antitrust and Regulation—The history, economics, and legal background of the institutions under which U.S. industry is subject to government control. Topics: antitrust law and economics; the economics and practice of public utility regulation in the communications, transportation, and energy sectors; and the effects of licensing. Emphasis is on application of economic concepts in evaluating the performance and policies of government agencies.

5 units, Spr (Boal)

159. Economics of Regulation—Changing policies toward microeconomic interventions by the federal government. Topics: recent efforts to reform regulatory policies and institutions and to deregulate various sectors; the legal, political, and economic theories that prevailed prior to the reform movement; and the effects of the reforms. Exploration of hypotheses regarding these issues in the context of a variety of regulatory institutions and issues. Apply to Stanford in Washington.

5 units, Aut, Spr (Owen) T 4-6

160. Game Theory and Economic Applications—Game theoretic perspective on the analysis of conflict resolution in the economic and political spheres. Basic concepts of non-cooperative Game Theory: game description, strategies, the role of information, extensive and normal forms. Examination of a sample of solution concepts: Minimax, Equilibrium, Perfection, Core. Some application to Bargaining Theory, and Shapley value. Prerequisites: 51 and one course in calculus, or the consent of instructor.

5 units, Aut (Greif)

165. International Economics—Comparative advantage in production and trade among nations; trade policy; the international monetary mechanism; domestic monetary, fiscal, and exchange rate policies and their relationship to foreign trade. Prerequisites: 1, 51, and 52.

5 units, Aut (R. Staiger)

Win (Huizinga)

166. International Trade Policy—(Same as Food Research 166.) Effects of selected government policies affecting international trade. Trade policy and economic welfare, exchange rate policy.
government responses to competition from imports, issues underlying international negotiation of reductions of barriers to trade and special trade arrangements for developing countries. Prerequisite: 165.

5 units, Spr (Pearson) MW 11-12:50

167. European Economic Integration—Theory of Customs Union and Free Trade Areas; trade creation and trade diversion; origin, development, and working of the European Common Market; the European common agricultural policy; Theory of Optimum Currency Areas and economic integration. A European parallel currency? Origin, development, and working of the European Monetary System (EMS) and relationships to other currency blocs. Prerequisite: 165 or consent of instructor.

5 units, not given 1990-91

170. Intermediate Econometrics I—(Same as 270.)

5 units, Aut (Amemiya)

171. Intermediate Econometrics II—(Same as 271.)

5 units, Win (Wolak)

172. Intermediate Econometrics III—(Same as 272.)

5 units, Spr (MacCurdy)

180. Mathematics for Economists—Training in areas of mathematics which have frequent applicability to economic problems. Preparation for 51Q; for students who have had some calculus but lack a strong mathematical background. Topics: functions of several variables; partial derivatives and differentials; first and second order conditions for organization; elementary matrix algebra, determinants, and characteristic roots; quadratic forms; maximization of a function of several variables subject to equality constraints. Selected applications in economics. Prerequisites: 1, and Math. 41 or the equivalent.

5 units, Aut (Romer)

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: static and dynamic theories of the household and the firm, and problems in aggregative planning and control. Prerequisites: 51, 180, or Math. 43 or equivalent.

5 units, Aut (Romer)

185. The Distribution of Income and Wealth—Basic facts about the distribution of income and wealth in the U.S., with comparisons to other advanced countries. Methods of measuring inequality. Statistical distributions and stochastic models. Economic theories of the distribution of income: neo-classical, Marxist, and neo-Keynesian. The relation between wealth and income distribution. Normative theories of just distribution and the limiting effects of incentives on the redistribution of income (may be taken as 285 by graduate students). Prerequisites: 51 (preferably Q or A), 102, and one course in calculus.

5 units, not given 1990-91

187. Junior Research Workshop—Introduces economics majors to current research in applied and theoretical economics. Students read, discuss, and present research papers in particular areas. Topics: collective choice and welfare economics; and the theory of incentives in the production and distribution of knowledge. Also for students in honors program considering thesis topics in mathematical economics, welfare economics, or public economics. Enrollment limited to 15; preference given to juniors. Prerequisites: 51Q, 51A, or 51 and one course in calculus.

5 units, Win (Dasgupta)

188. Senior Research Paper—Attend organizational meeting on Friday, first week of classes (see Stanford Daily for details).

3 units, Aut, Win, Spr (Litwack, Swinkels)

190. Introduction to Accounting—(See 90.)

191. Introduction to Cost Accounting—(See 91.)

199D. Directed Reading and Research—Honors. In-depth study of an appropriate question and completion of a thesis of very high quality. Normally written under the direction of a member of the Economics Department (or a member of some closely related department). (See description of honors program.) Register for at least 1 unit for at least one quarter. Meets first week of Autumn Quarter (see Stanford Daily for details).

1-10 units, Aut, Win, Spr (Litwack, Swinkels)

PRIMARILY FOR GRADUATE STUDENTS


A. CORE THEORY CURRICULUM

of the firm in competitive markets. Profit and cost functions. Partial equilibrium analysis of the market. Economic behavior under uncertainty. Open to advanced undergraduates with consent of instructor. Prerequisite: thorough understanding of the elements of differential calculus and linear algebra.

202E. For Economics Ph.D. students.
5 units, Aut (Lau)
202O. For other students.
5 units, Aut (Brown)

203. Price and Allocation Theory II—Two five-week modules. First concerns the Walrasian model of a competitive economy, focusing on the existence, uniqueness, and optimality of competitive equilibria in simple general equilibrium models such as pure exchange and representative agent models. Second is an introduction to normal and extensive form games, principal-agent theory and the techniques for computing optimal contracts, optimal taxes, and optimal regulatory schemes. Prerequisite: 202.

203E. For Economics Ph.D. students.
5 units, Win (Brown, Milgrom)
203O. For other students.
5 units, Win (Starrett)


5 units, Spr (Kurz)


5 units, Aut (Hall)


5 units, Win (Stiglitz)

212. Theory of Income and Economic Fluctuations III—Dynamic stochastic equilibrium models as tools for understanding the evolution of prices and quantities. Decision theories appropriate to dynamic and random environments and corresponding equilibrium concepts. Applications include models displaying growth and cyclical fluctuations, models of monetary and fiscal policies. Econometric restrictions imposed by the models. Prerequisite: 211.
5 units, Spr (Attanasio)

301A,B,C. Workshop in Microeconomics.
10 units (Staff) by arrangement

310A,B,C. Workshop in Macroeconomics.
10 units (Staff) by arrangement

B. ALTERNATIVE APPROACHES TO ECONOMIC ANALYSIS

To receive credit for this field, students must complete two of the following three courses.

200. Topics in the History of Economic Thought—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 his contemporaries: John Stuart Mill, Karl Marx, W. Stanley Jevons, Carl Menger, and Leon Walras. The development of thought in terms of internal development and changing external economic conditions.

5 units, Spr (Arrow)

219. Value, Distribution, and Accumulation—Conceptual and analytical problems concerning the determination of value, price, distribution, and accumulation in the capitalist economy. Survey of their meaning, significance, and background in the development of economic thought. Focus is on the analytic treatment of these problems. Consideration of the specific approaches of Classical and Marxian economic theory, their recent elaboration and extension, Keynesian-Marxian syntheses, and comparison with relevant elements of Neoclassical theory.

5 units, Win (Harris)

220. Marxian Economic Theory—Marxian economic theory regarding the analysis of value and surplus value, prices and profits, the circuits of capital, reproduction, accumulation, technical change, and economic crises. Focus is on recent elaborations, extensions, and applications of the theory.

5 units, Spr (Harris)

395.A,B,C. Workshop in Alternative Approaches to Economic Analysis.
10 units (Staff) by arrangement

C. ECONOMIC DEVELOPMENT

To receive comprehensive credit in the field in 1990-91, students must complete both 214 and 215. Students wishing to do research in this field are strongly advised to take supporting coursework in international economics, comparative institutions, and the Food Research Institute.
214. Economic Development I—Theoretical and empirical studies of resource allocation in developing countries. Topics: nutrition, health and fertility in poor households; joint production and consumption decisions in agricultural households; common property; involuntary unemployment and surplus labor in agriculture; rural land and credit institutions.
5 units, Aut (Dasgupta, J. Anderson)

215. Economic Development II—Dual economy models; industrialization and protectionism; rural-urban migration; urban labor markets; the banking system; interest rate determination; and the productivity of capital; price inflation, monetary control and the foreign exchanges; liberalization of domestic finance and foreign trade; stabilizing the macroeconomy.
5 units, Win (J. Anderson, McKinnon)

217. Money and Finance in Economic Development—Offered as a separate course in alternate years. For 1990-91, it is incorporated into 215 above.

D. ECONOMIC HISTORY

The requirements for the field are: (1) a comprehensive exam in Spring Quarter based on material from at least two of the courses listed below, and (2) one research paper on a subject approved by one of the faculty teaching any of the following five courses.

224. Science and Technology in Economic Growth—The roles played by the growth of scientific knowledge and technical progress in the development of industrial societies. Emphasis on the interactions between science and technology, and the organizational factors which have influenced their effectiveness in contributing to productivity growth. Upper division undergraduates may attend with consent of instructor.
5 units, Win (Rosenberg)

225. Technology, Economy, and Society—Determinants and consequences of technological innovations in the economic history of the West from the 9th to the 19th centuries. Selected "clusters" of technical innovations in production and warfare are examined for the determinants of the rate and bias of innovative activity, economic and cultural conditions governing diffusion, and the problems of identifying and measuring primary and second-order economic consequences.
5 units, not given 1990-91

226. Problems in American Economic History—The American economy from colonial times to the present, focusing on the period 1790 to 1940. The role of economic history as a distinctive intellectual approach to the study of economics. Topics: slavery and the Southern economy, labor scarcity and technological progress, the Great Depression of the 1930s, and the emergence of the U.S. to economic pre-eminence.
5 units, Spr (Wright)

227. European Economic History—Economic growth and development in Western Europe from the 11th to the 20th centuries, emphasizing the formative period up to the 19th century. The experiences of Britain, France, Germany, and other continental countries, with that order of emphasis. The interrelations between the growth and distribution of output, demographic trends, technological and organizational changes in trade and industry, and the changing formal and informal institutions governing political and economic activity.
5 units, not given 1990-91

228. Institutions in Economic History: Form, Function, and Evolution—(Given as 294 in 1990-91.)
5 units, Aut (Greif)

325A,B,C. Workshop in Economic History.
10 units (Staff) by arrangement

E. MONETARY THEORY AND ADVANCED MACROECONOMICS

Requirements for the field are successful completion of 233 and 234, and the acceptance of a research paper in the areas covered by either 233 or 234. 217 and 265 are recommended.

5 units, Aut (Bean)

5 units, Spr (Sargent)

F. PUBLIC FINANCE

To receive credit for the field, students must complete 241 and 242, and pass a comprehensive examination based on both courses.

241,242. Public Finance and Taxation I and II—Normative and positive tax policy. Tax Incidence Efficiency; corporation financial policy; ex-
penditure evaluation; social insurance and public goods.

241. 5 units, Win (Shoven, Stiglitz)
242. 5 units, Spr (Stiglitz, Shoven)

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, saving, investment, labor supply, etc.; alternative policies and methods of evaluation. Workshop format combines student research, faculty presentations, and guest speakers. Prerequisites: 241 or consent of instructor.

10 units (Staff) by arrangement

354A,B,C. Workshop in Law and Economics. 6 units, Aut, Win, Spr (Polinsky) by arrangement

G. ECONOMICS OF LABOR

To receive credit for the field, students must complete 246 and 247.

5 units, Aut (Pencavel)

5 units, Spr (MaCurdy)

345A,B,C. Workshop on Economics of Factor Markets.
10 units (Staff) by arrangement

H. ECONOMICS OF INDUSTRY

To receive credit for the field, students must successfully complete 257 and 258, and submit one research paper, the subject of which has been approved in advance by one of the faculty teaching 257, 258, 259, or 260. Students who expect to make this field one of their primary research interests are strongly urged to take additional courses in the field.

Students expecting to make Economics of Industry their primary research field, and to write a dissertation in it, are required to take either 259 or 260 and one of the workshops.

256. Economics of Health and Medical Care—(See 156.)

257,258. The Economics of Industry, Regulation, and Firm Organizations I and II—Theoretical and empirical analyses of the determinants of market structure; firm behavior and market efficiency in oligopolies; theory and practice of procompetitive government policies; relationship of product quality and technological innovation to market structure; internal organizations of the firm; choices between contracting and vertical integrating; government regulation of business; public utilities, regulated competition, licensing, product and worker safety, environmental protection; the political economy of business policies.

257. 5 units, Aut (Wolak)
258. 5 units, Win (Noll)

260. Special Topics in Industrial Organization and Regulation—Focused, in-depth study of issues of current research and policy interest: empirical tests of oligopoly theories; dynamics of change in regulatory policy; theory of economic institutions; anti-trust status of joint ventures; and use of capacity, innovation, and product variety as a barrier to entry. Significant research issues that remain unresolved and promising ways to attack them.
5 units, Spr (Bresnahan)

5 units, Win (Arthur) TTh 1:15-3:05

262. Experimental Methods of Institutional Analysis—Use and design of laboratory methods to test theories of individual behavior in various institutional settings, including markets, small groups, and political processes. Readings/lectures on methods of experimental research and current state of research findings, and individual research projects in which students design and run an experiment.
3 units, not given 1990-91

303. Workshop in the Economics of Science and Technology—Sponsored by the department and the Center for Economic Policy Research. Focuses on applied studies and policy issues relating to resource allocation and organization of basic science and engineering research, commercialization of scientific knowledge; diffusion of technological and organizational innovations; impacts on productivity and economic welfare in the U.S. and other industrially advanced economies.
10 units, Aut, Win, Spr (Staff)
355. Workshop in Industrial Organization, Regulation, and Applied Microeconomics—Working seminar on current research in the field by visitors, presentations by students; and structured discussion of recent papers. Students are required to write an original research paper, make a formal seminar presentation, and lead a structured discussion.

10 units, Aut, Win, Spr (Staff) by arrangement

358A,B,C. Workshop in Political Economics and Collective Choice—Multidisciplinary working seminar on current topics in mechanisms of social choice, political processes, and the politics of economic policy. Offered in collaboration with the Graduate School of Business and the Department of Political Science. Participants are required to undertake an original research project, approved by the instructors, and to make an oral presentation.

10 units, Aut, Win, Spr (Baron, Bendor, Ferejohn, Noll)

1. INTERNATIONAL ECONOMICS

To receive credit for this field, students must complete 265 and 266, for which one term paper is required. Students wishing to specialize further are strongly advised to take 267, in which topics may vary somewhat depending on the research interests of the instructor. Further complementary courses are 217 and 234. Selected courses in Economics of Industry sometimes cover trade-related problems.


5 units, Aut (Huizinga)


5 units, Win (R. Staiger)

267. Special Topics in International Economics—Portfolio models of exchange rate determination under floating exchange rates. Alternative fixed-rate monetary arrangements including the 19th-century gold standard, postwar Bretton Woods, and the European Monetary System. The dollar as an international reserve currency and U.S. monetary policy. The international capital market. Prerequisites: 265 and 266.

5 units Spr (McKinnon)

365A,B,C. Workshop in International Economics.

10 units (Staff) by arrangement

J. ECONOMETRICS

Students not specializing in this field are required to take 270, 271, 272.

To receive credit in the econometrics field, students must complete 273, and either 274 or 275.


5 units, Aut (Amemiya)

271. Intermediate Econometrics II—Relaxation of classical-regression assumptions; simultaneous equation models; time series analysis. Prerequisite: 170/270.

5 units, Win (Wolak)


5 units, Spr (MaCurdy)

273. Advanced Econometrics I—Large sample theory; maximum likelihood estimation; nonlinear least squares; generalized least squares. Prerequisites: 272, Math. 113.

5 units, Aut (Amemiya)

274. Limited Dependent Variables—Discrete choice models; Tobit models; Markov chain and duration models. Prerequisite: 273.

5 units, Win (Amemiya)


5 units, Spr (T. Anderson)

276. Special Topics in Econometrics—Possible subjects: robust estimation; stochastic control; prediction theory; Bayesian analysis; factor analysis; pooling of time series and cross section data. Prerequisite: 273.

5 units, not given 1990-91

370A,B,C. Workshop in Econometrics.

10 units (Staff) by arrangement

K. MATHEMATICAL ECONOMICS

Field I: Theory of Choice—Requirements are two of the following four courses.

280. Welfare Economics—(Same as Operations Research 367.) Social choice theory; optimal
mechanism design; welfare measurement and identification using hedonic price methods. Analysis of constrained second best.
5 units, Spr (Starrett)

5 units, Aut (Salsanie)

5 units, Win (Arrow)

Field II: General Theory—Requirements are two courses chosen from 284, 286, and 287.

284. Topics in Dynamic Economics—Principle of optimality, discounted dynamic programming under certainty and uncertainty, and applications in economics. Optimal control theory and applications. Stochastic control and Ito calculus. Non-linear dynamical systems, bifurcations and sunspot equilibria. Topics may change each year.
5 units, Aut (Kurz)

285. The Distribution of Income and Wealth—(See 185.)

286. Game Theory and Economic Application—
I. Non-cooperative games: games in extensive and normal form; games with incomplete information; Nash equilibrium and refinements of the equilibrium concept; elements of repeated games. II. Cooperative games: the characteristic function and the core; balanced games and relations to Walrasian equilibrium; Shapley value. Bargaining theory.
5 units, Spr (Swinkels)

287. General Equilibrium Theory—Comprehensive treatment of current research in general equilibrium analysis of economies with incomplete markets. Topics: questions of existence and optimality with nominal and real assets. Students must participate actively in the seminar by presenting relevant journal articles. Prerequisites: 202 and 203.
5 units, Win (Brown)

290. Multiperson Decision Theory—(Same as Business 601C.) Review of selected current working papers emphasizing methods of game theory and topics in mathematical economics that use game-theoretic models. The effects of differences in information, limitations on observability and contracts, etc., on strategic behavior. Prerequisites: two courses from the Choice Theory/Mathematics Economics sequences, or consent of instructor.
5 units, not given 1990-91

385A,B,C. Workshop in Mathematical Economics.
10 units (Staff) by arrangement

386. Interdisciplinary Seminar on Conflict Resolution—(Same as Business 694, Law 325, Operations Research 366, Psychology 283.) Addresses problems of decision making, risk analysis, conflict resolution and negotiation from normative and descriptive perspectives.
1-2 units, Win, sometimes Spr (Arrow, Mnookin, Ross, A. Tversky, Wilson) T 4-6

387. Interdisciplinary Workshop in Equity and Social Choice Theory—(same as Philosophy 235, Political Science 263) Graduate seminar on recent work on social choice theory and related literatures in economics, philosophy, and political science as it concerns the equitable allocation of resources and respect for individual rights. Students receive up to 3 units for presenting their own work or a survey paper.
1-3 units, Win (Suppes, Ferejohn) T 3:15-5:05

388. Interdisciplinary Workshop in Risk Management—(Same as Operations Research 369.) Examines a number of current issues in risk management from an organizational perspective. Speakers from engineering, economics, law, medicine, and business, as well as risk management private consultants.
1 unit, Spr (Lieberman, Arrow) T 4-5:30

L. COMPARATIVE INSTITUTIONAL ANALYSIS

To receive credit for this field, students are required to take 291 and then select at least one of: 292, 293, or 294. Students expecting to make Comparative Institutional Analysis their primary field are also required to take the workshop (391).

291. Contracts and Organizations—Optimal regulation and the problems of information and commitment. Single and multi-dimensional principal-agency theory, incentives in teams, property rights, ownership and control, contract renegotiations, rent-seeking and influence costs. Coordination problems and team theory. Applications are to for-profit and not-for-profit firms, cooperatives, political entities, etc.
5 units, Aut (Milgrom)
292. Comparative Theory of Firms and Organizations—Comparative analysis of prototype models performing various functions of firms: information (hierarchical vs. horizontal coordination), distribution (market-based contracts vs. internal bargaining), incentives (market-based contracts vs. rank hierarchy), financial control (credit vs. equity), etc. The bargaining-game and duality theories of the firm. Innovation process. Emphasis is on theory, but the motivation of analysis is provided by the comparison of U.S., Japanese, European, and socialist firms. 5 units, Win (Aoki)

293. Socialist Economies—Applications of planning and organization theory to problems in socialist economies in the U.S.S.R. and China. Topics: coordination, incentives, loss of control in informationally-decentralized hierarchies, and problems in reform and the coexistence of plan and market. The current reform processes in the U.S.S.R., China, and Eastern Europe. 5 units, Spr (Litwack, Qian)

294. Institutions and Organizations in Historical Perspective—(Same as 228.) Description and analysis of institutions and organizations in the Western historical experience, emphasizing the formative period from the 11th to the 18th centuries. The discussion of the formation, function, and evolution of institutions to highlight alternative conceptual frameworks—neo-classical, transaction cost economics, institutionalism, Marxism and Neo-Marxism, while utilizing game theory, mechanism design, contract theory, etc. Topics: institutions related to trade organization, the organization of production, feudalism, mercantilism, and the state. 5 units, Aut (Greif)

391. Seminar in Comparative Institutional Analysis. 10 units (Staff) by arrangement

OVERSEAS STUDIES

The following courses are approved for the Economics major and taught overseas at the campus indicated. Students are encouraged to discuss with their major advisors on campus which courses would best meet individual educational needs. Descriptions can be found in the "Overseas Studies" section of this bulletin or in the Overseas Studies Program office, 126 Sweet Hall.

123X. Efficiency of Capitalist and Socialist Economics and the Polish Crisis—Krakow. 5 units, Spr (Wojtyna)

124X. Transformation of the Global Economy and Its Implications for Latin American Growth—Santiago. 5 units, Spr (Hachette)

128X. Contemporary Problems of Economic Growth—Tours. (DR:5) 5 units, Aut (Leboucher)

159X. Political Economy of Industrial Change: Italy and Europe in a Global System—Florence. 5 units, Win (Bianchi, Bellini)

167X. European Economies in a Changing World—Oxford. 5 units, Spr (Crafts)

168X. Economic Analysis of Europe and the Single European Act—Tours. (DR:5) 5 units, Win (Leboucher)

Chair: J. Martin Evans
Vice Chair: Ronald A. Rebholz
Director of Creative Writing Program: Nancy H. Packer
Director of Freshman English Program: Charles N. Fifer

Professors: John B. Bender (English and Comparative Literature), George H. Brown, W. B. Carnochan, Terry Castle, George G. Dekker, W. S. Di Piero, J. Martin Evans, John Felstiner (on leave Autumn), Kenneth W. Fields (on leave Winter and Spring), Charles N. Fifer, Albert J. Gelpi, David Halliburton, Shirley Heath, Arturo Islas, Denise Levertov, Seth Lerner, John L'Heureux (on leave Spring), Herbert Lindenther (Comparative Literature and English), Charles R. Lyons (by courtesy), Diane W. Middlebrook (on leave Autumn and Spring), Thomas C. Moser, Stephen Orgel, Nancy H. Packer, Patricia A. Parker (Comparative Literature and English), Marjorie G. Perloff, Robert M. Polhemus, Ronald A. Rebholz, Adrienne Rich (on leave 1990-91), David R. Rigg, Lucio P. Ruotolo, Gilbert Sorrentino, Elizabeth C. Traugott (Linguistics and English), Wesley Trimpi

Associate Professors: Sandra E. Drake (on leave Winter and Spring), Jay Fliegelman, Regenia Gagnier, Barbara Charlesworth Gelpi (on leave 1990-91), Horace A. Porter, Mary F. Wack
Assistant Professors: Nancy Porter Stork, Michael Tratner
Professor (Teaching): Larry Friedlander
Acting Assistant Professor: Linda Paulson
Visiting Professors: Michelle Cliff, Ronald Johnson
Visiting Assistant Professors: James P. Carson, Margo Hendricks, Priscilla Wald
Instructors: Cheryl Ross, Michael Stanford
Teaching Fellow: G. E. Light

The Department of English offers work in English and American literature, other literature written in English, 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 fulfilling the department's requirement of proficiency in a foreign language. (Information on this requirement should be obtained from the department's 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 Satisfactory/No Credit basis at the discretion of the instructor, but students intending to go on to graduate school should weigh the fact that a grade of satisfactory provides little evidence of their abilities.

MAJOR PROGRAMS OF STUDY 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 urged to continue with literature courses in whatever language or languages they study. English majors who already possess the necessary language skills are urged to satisfy this requirement by taking an upper division course in a foreign literature read in the original language. Such a course simultaneously fulfills one of their elective requirements.

Because the English Department recognizes that the needs and interests of literature students vary, it has approved several major programs of study in English. Each of these has different objectives and requirements; and students should consider carefully which major corresponds most closely to their 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 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, Woolf, and Melville. Students must choose one course from each of the following nine areas. (A course from Area A will prove more useful if taken sooner rather later; and, if possible, students should take courses in chronological sequence). At least one of the courses satisfying the major must be English 180-189 (Seminars for English Majors) or English 196 (Honors Seminar) or an English seminar offered in the Stanford in Oxford program. Other English courses which are taught in a seminar format and require a substantial amount of critical writing may be approved by the Undergraduate Studies Committee on a case by case basis. Students are urged to satisfy this requirement in the sophomore or junior year. Seniors are admitted to English 180-189 seminars only with the consent of the instructor.

A) Language: English 102, 180A, 205, Linguistics 1, 70, 73.
ENGLISH 389


E) Restoration and 18th Century: English 114, 115, 131A, 131B, 163C, 184A.


G) American Literature before 1900: English 121, 134C, 163A, 186A.


P) Poetry: English 92, 150.

In addition, students must elect two additional courses in English or American literature, or other literature written in English from those offered by the English Department (excluding only English 1-2-3, 7-8-9, and advanced composition courses). In place of one of these courses, students may choose one upper division course in a foreign literature read in the original language.

A student who took a 3-unit sub-100 English course while still a non-major may count it retroactively towards the elective requirement for the major. Only one such course may be applied to the major.

Students may apply as many as four English courses taken at other approved universities towards their major.

Major in English with a Creative Writing Emphasis—This program is designed for students who want a basic knowledge of the English literary tradition as a whole and at the same time want to develop skills in writing poetry or fiction. Students must take a total of 13 courses offered through the English Department. Like all English majors, they must choose one course from each of the nine areas A-H, P listed above, and fulfill the language and seminar requirements.

In addition they must take four courses specifically designed for either the fiction or the poetry concentration. Fiction writers must first take English 90 (Fiction Writing), then two quarters of 190 (Intermediate Fiction Writing) or a more advanced fiction writing course, and 137 (Development of the Short Story). Poets must first take English 92, then two quarters of 192 (Intermediate Poetry Writing) or a more advanced poetry writing course, and one course in poetry in addition to the course that fulfills area requirement P, to be approved by a poetry instructor in the Creative Writing Program. Courses taken to satisfy an area requirement cannot also satisfy a Creative Writing requirement.

Admission to English 190 or 192 is by permission of the instructor and based on the quality of the student's work. Students should submit a manuscript to the Creative Writing office at least one week before registration day of the term in which the course is offered. Students not admitted to the intermediate courses may take the introductory course a second time, providing at least one quarter intervenes.

Students must maintain a letter grade indicator of "B" in all Creative Writing classes to graduate with the major in English with a Creative Writing emphasis.

Major in English with Interdisciplinary Emphasis—This is a major intended for students who wish to combine the study of literature of one broadly defined historical period with an interdisciplinary program of courses relevant to that literature. Students are required to fulfill the language and seminar requirements listed under the major in English and to take a total of 15 courses distributed as follows:

1. One course in Area A, to be taken as early as possible in their program of studies.
2. Either one course each in Areas B, C, and D (emphasis in Medieval and Renaissance literature) or one course each in Areas E, F, G, and H (emphasis in English and American literature from the Enlightenment to the present).
   a) Students electing an emphasis in Medieval and Renaissance literature must take 111 and 112.
   b) Students electing an emphasis in English and American literature from the Enlightenment to the present must take 110.
3. Three elective English courses in the area of emphasis.
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, feminist studies, history, modern thought and literature, and political science. These six courses should form a coherent program, and they must be relevant to the historical focus of the courses chosen by the student to meet requirement (2). Each of these six courses must be approved in advance by the student's advisor.
5. In addition, students in the interdisciplinary program must write at least one interdisciplinary paper. This may be a senior honors essay (197), a senior independent essay (199),
an individual research paper (194 or 198), or a paper integrating the material in two courses the student is taking in two different disciplines.

**Major in 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 nine courses in English, one from each of the areas A-H, P listed under the major in English, and fulfill the seminar requirement. 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.

**Major in English and Italian Literatures**—This is arranged as in the major in English and French Literatures, requiring the completion of nine courses in English, one from each of areas A-H, P, an English Department seminar, 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.

**Major in English and German Literatures**—Candidates for the A.B. in this major must complete a program exactly analogous to the two preceding majors, with nine courses in English, one from each of areas A-H, P, an English Department seminar, and a coherent program of four courses in German literature, read in the original, with approval by the departments involved as specified above.

**Major in English and Spanish or Spanish-American Literatures**—Candidates for the A.B. in this major must complete nine courses in English, including one from each of the nine areas A-H, P, an English Department seminar, and a coherent program of four courses in Spanish or Spanish-American literature, totaling at least 20 units and read in the original. The program of each student must be approved by the departments involved as specified above.

**Major in English and Classics**—Candidates for the A.B. in this major must complete nine courses in English, including one from each of the nine areas A-H, P, an English Department seminar, and a coherent program of four courses in Classics, totaling at least 20 units and read in the original. The program of each student must be approved by the departments involved as specified above.

**HONORS PROGRAM**

Students who wish to undertake a more extensive program in English literature, including tutorials, a seminar, and independent research, are invited to apply for the honors program as soon as possible after declaring an English major and, in any case, no later than Autumn Quarter of the junior year. Application consists of completing a form and submitting a sample of critical writing. Admission is selective. Provisional admission is announced in early December. Permission to continue in the program is contingent upon successful completion of two tutorials and submission, by May 15, of a Senior Honors Essay proposal with bibliography.

In the junior year students may choose between the following two options: (1) At Oxford, take two quarters of the seminar sequence offered by St. Catherine’s College, Oxford, or at least 10 units of tutorial work arranged by the Director of the Oxford program. (2) At Stanford, take 10 units of tutorial work in the English Department. Students who elect the latter option select two regular English Department lecture courses, registering for 3 rather than 5 units. With each course they also take a 5-unit tutorial (196T) on the same or related material with an advanced graduate student.

The courses taken at Oxford or at Stanford to satisfy this requirement for the honors program can also be used where appropriate to satisfy the area requirements for the English major.

In the Autumn and Winter Quarters of the senior year, honors students complete the senior honors essays for 10 units under supervision of a faculty advisor. In Autumn Quarter, honors students take a 5-unit senior honors seminar on critical approaches to literature. In Winter Quarter, they take a 3-unit essay workshop, normally taught by the Director of the Honors program. The workshop focuses on the process of researching and writing the essay. The deadline for submitting the honors essay is the end of Winter Quarter, or, with the agreement of the faculty advisor, no later than April 15.

Students in the honors program complete the following:

- **Area Requirements (A-H, P)**—nine courses
- **Two tutorials**—10 units
- **Senior seminar and workshop**—8 units
- **Senior Honors Essay**—10 units

The director of the honors program may, in special cases, modify these requirements.

**Note**—For other opportunities for extended essay projects, see Senior Independent Essay and English 194 and 199.
ADDITIONAL ADVANCED WORK

INDIVIDUAL RESEARCH
Students taking 100- or 200-level courses may, with the consent of the instructor, write a follow-up 5-unit paper based on the course material and due no later than the end of the succeeding quarter (register for 194). Only students who have successfully completed the initial course and who have applied for the follow-up course before the end of the quarter in which they took the initial course are eligible. The research paper is written under the direct supervision of the professor; it must be submitted first in a preliminary draft and subsequently in a final version.

INTEGRATED WORK
Students taking (either simultaneously or consecutively) two or three courses which have a clear thematic or historical relationship to each other may, with the consent of the relevant instructors, write one large-scale paper integrating the material in the courses in question.

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. Exceptional English majors who are not in the honors program but who elect Senior Independent Study may apply in the senior year for departmental honors if their program of study has been approximately equivalent to that required of regular honors students. Applicants should consult an advisor in the department.

HONORS PROGRAM IN HUMANITIES
An Honors Program in Humanities is available for English majors who wish to supplement the major by a related and carefully guided program of studies. See the "Humanities Special Programs" section in this bulletin for a description of the program. Students wishing to take the Comparative Literature option within the Honors Program in Humanities should see the "Comparative Literature" section in this bulletin.

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 nonmatriculated 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, 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. State of California Community College Instructor Credential—Candidates who successfully complete the requirements for the A.M. degree in English for this credential.

GRADUATE PROGRAMS
For University regulations governing advanced degrees see the “Degrees” section in this bulletin.

Eligibility—Students with a bachelor’s degree of acceptable quality may apply to pursue graduate work toward an advanced degree in English at Stanford. (Formal application for candidacy is a separate step taken somewhat later.) Students whose previous preparation falls short of the requirements for the degree of Bachelor of Arts in English at Stanford are 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 as candidates for only the Ph.D., the Master of Arts in English and American Literature, or the Master of Arts in Teaching (MAT). 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 with a “B” letter grade indicator (LGI) of nine courses (normally 45 units) 101 and above, including at least two 300-level courses. 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 to 10 units of directed reading and research as English 398, which would result in a substantial piece of scholarly or critical writing.
During the first two weeks of the first quarter, candidates for the master's degree in English and American Literature should consult the advisor designated by the Director of Graduate Studies in order to draw up a three-quarter study plan. Normally, the student should take one course each from the following five fields: Medieval; Renaissance; 18th 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 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 considers exceptions.

Candidates who can demonstrate unusually strong preparation in the history of English literature may undertake a 40- to 60-page master's essay. Such candidates should register for 15 units of English 398 with the faculty member who supervises the work on the essay. Candidates who write a master's essay may petition to be excused from up to 15 units of the requirements described above. The additional 30 units 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. (For ways of fulfilling this requirement, see the section below on language requirements for the Ph.D.)

Candidates for a coterminal master's degree must fulfill all requirements for the Master of Arts in English (including the language requirement), as well as general requirements and major requirements for the A.B. in English. A minimum LGI of 3.5 in the major is required of those applying for the coterminal master's degree. See the 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.

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 to further 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 of this bulletin.

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.

DOCTOR OF PHILOSOPHY

University regulations regarding this degree are discussed in the "Degrees" section of 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. (Since departmental doctoral requirements are now in the process of minor revision, students should consult the most recent edition of "Informal Notes: Procedures for the Ph.D." Copies are available in the English Graduate Studies Office, room 51L.)

A candidate for the Ph.D. degree must complete three years (nine quarters) of full-time work, or the equivalent, in graduate study beyond the bachelor's degree. Candidates are 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 final coursework in the doctoral program, must be taken at Stanford.

Toward 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 three courses) may come from 100-level courses.

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 requirement 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.
**ENGLISH LITERATURE**

Requirements are as follows:

1. A 5-unit course in Old English (usually 205) and a 5-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. The colloquia and seminars should be from different genres and periods as approved by the advisor.

3. A 2-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a 5-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, 398, and 399) distributed according to the advisor's judgment and the candidate's needs. A student may receive graduate credit for three 100-level courses in the English Department.

6. Consent of the advisor if courses taken outside the English Department are to count toward the 97-unit requirement.

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 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 coursework 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 meets the first week of Winter Quarter to consider the petition in conjunction with the student's grades for the first quarter here. If the committee cannot make a decision at that time, it meets 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 has 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 Quarter 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. Such petitions are 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 covers the field of concentration (as defined by the student and the student's advisor).

**ENGLISH AND AMERICAN LITERATURE**

Requirements are as follows:

1. A 5-unit course in Old English (usually 205) and a 5-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 from different genres and periods as approved by the advisor.

3. A 2-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a 5-unit course on teaching composition.

4. Students are encouraged to take an advanced course in literary theory or criticism.

5. Consent of the advisor if courses taken outside the English Department are to 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 covers the field of concentration (as defined by the student and the student's advisor).

**ENGLISH AND COMPARATIVE LITERATURE**

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 coursework and reading is devoted to this period, with the re-
mander 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 involves advanced work in three literatures, one of which may be English. Interested students should consult an English Department advisor, but faculty from Comparative Literature may also provide useful supplementary information.

The requirements 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 10 units of courses chosen from among those offered in linguistics, English philology, and early and middle English literature including Chaucer. No particular courses are required of all students.

3. A 2-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a 5-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 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 many as 20 units of this requirement may be satisfied through courses in reading and research. A student may receive graduate credit for three 100-level courses in 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, normally 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.

**ENGLISH AND LINGUISTICS**

Requirements are as follows:

1. A 5-unit course in Old English, a 5-unit course in Middle English, and English 102 (History of the English Language) for 5 units.

2. A minimum of three seminars in different genres and periods as approved by the advisor. The student normally takes a total of six courses from the graduate colloquia and graduate seminars.

3. A 2-unit course introducing the new graduate student to the various opportunities and responsibilities of the department and a 5-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 are 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 includes 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 covers the field of concentration (as defined by the student and the student’s advisor). Topics for the colloquy include at least one on applications of linguistics to literary studies. Half of the question period is 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, French, or German as one language and may choose the second language from the following: Greek, Latin, French, German, Italian, Spanish, Russian, or another language relevant to the student's field of study. 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 does 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 is normally 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 is given before registration in the Autumn Quarter in order to permit those who need the course to register for Latin 3. It is also 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 letter grade indicator (LGI) 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 15, respectively, with an LGI of "B" or higher.

Dissertation

As early as possible during their graduate study, Ph.D. candidates are 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 as possible 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 are required to extend 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 "Humanities Special Programs" section in this bulletin.

Ph.D. 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 "Modern Thought and Literature" section in this bulletin and consult Professor Mary Pratt in the Spanish and Portuguese Department.

CREATIVE WRITING FELLOWSHIPS

The Creative Writing Program each year offers four two-year fellowships in poetry and four two-year fellowships in fiction. These are not degree-granting fellowships. Information is available in the Creative Writing office.

COURSES NUMBERING SYSTEM

Freshman Writing Courses: 1-3
Introduction to Literature: 5
Cultures, Ideas, and Values: 7, 8, 9
English Language Courses: 101-109, 200-209, 308-309
INTRODUCTORY

Classes designed for students whose major is undeclared or is not in English.

Tutorial Center—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 1 and 2 satisfies the University's Writing Requirement. Both involve reading texts and reviewing writing techniques. First quarter: students concentrate on finding an appropriate thesis and developing and organizing ideas. Second quarter: students concentrate on style and diction and on preparing and writing a research paper. A variety of workshops are offered. The primary concern of all the workshops, whatever the nature of the readings, is student writing and its improvement. The readings are intended to serve writing needs and are not studied for their own sakes. (DR: W)

3A. Writing: Process, Structure, and Style—Focus is directly on student writing, supplemented by a general range of readings. A few sections are conducted as tutorials, focusing on individual weekly conferences for each student, in addition to the weekly class meeting.

4 units, Aut, Win, Spr (Staff)

3B. Social and Contemporary Issues—Writing is largely based on discussion of readings on politics and social matters.

4 units, Aut, Win, Spr (Staff)

3C. Literature and Related Topics—Writing is generally based on the study of various kinds of literature and other creative activities (film, etc.). These are not designed as conventional literature or film courses.

4 units, Aut, Win, Spr (Staff)

4. Directed Writing—For students who 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, Win, Spr (Staff)

7.8.9. Literature and the Arts—A Cultures, Ideas, and Values (C.I.V.) sequence emphasizing literature, writing, and the creative imagination. Lectures explore literature in its cultural context and include sessions on art, architecture, music, and drama, moving chronologically from antiquity to the present, setting works in historical, intellectual, and generic perspective. Students meet three times weekly for lectures, and three times to discuss texts and work on writing. Seminar instructors are experienced writing teachers, and student essays receive close attention. Autumn and Winter Quarter writing workshops use a careful reading of the C.I.V. texts to help students understand the process of writing and to improve their own writing. Students must be concurrently enrolled both quarters in C.I.V. and the writing components of the course. Students with and without Advanced Placement credit may sign up.

7.7A. Antiquity and the Middle Ages— Begins with The Epic of Gilgamesh and the Hebrew
ENGLISH 397

Bible and continues to the dawn of the Renaissance, covering Homer, Sappho, Sophocles, Plato, Virgil, the New Testament, St. Augustine, the Koran, the Beowulf poet, Dante, Marie de France, Lady Murasaki, Boccaccio, and Chaucer. Writing instruction concentrates on finding an appropriate thesis and on developing and organizing ideas. (DR:1)

8 units (5 for English 7; 3 for English 7A), Aut (Parker, Staff) lectures plus sections and workshops

8, 8A. Renaissance and Enlightenment—Readings from the Renaissance to the Enlightenment, including works by Machiavelli, More, painters of the Italian Renaissance and the Northern Renaissance, Bach, Shakespeare, Donne, Milton, Defoe, Swift, Mozart, Rousseau, Mary Wollstonecraft, Paine, Jefferson, Madison. Writing instruction concentrates on style and diction, and on preparing and writing a research paper. (DR:1)

8 units (5 for English 8; 3 for English 8A), Win (Riggs, Staff) lectures plus sections and workshops

9. The Modern World—Modern thought and literature from the French Revolution to contemporary times, including works by the English Romantics, Mary Shelley, Balzac, Goya, Dickens, Zola, Beethoven, the Impressionists, Darwin, Marx, Freud, Yeats, Woolf, Morrison, Garcia-Marquez, Atwood; also modern poetry and American jazz. (DR:1)

5 units, Spr (Paulson, Staff) lectures plus sections

10, 11, 12. Masterpieces of English and American Literature—In-depth study of selected works by major English and American writers from the medieval to modern periods.

10. Masterpieces of English Literature I: Chaucer, Shakespeare, Milton, and Their Contemporaries—(English majors and others taking 5 units, register for 110.) Introduction to the works of three of the greatest English writers: Chaucer, Shakespeare, and Milton. (DR:2)

3 units, Aut (Lerer)

11. Masterpieces of English Literature II: From the Enlightenment to the Modern Period—(English majors and others taking 5 units, register for 111.) Introduction to literary masterpieces written in English between 1700 and the present. Divided about equally between poetry and fiction, with some drama. (DR:2)

3 units, Win (Paulson)

12. Masterpieces of American Literature—(English majors and others taking 5 units, register for 112.) An intensive look at some major North American writers and their work: Hawthorne, James, Twain, Whitman, Dickinson, O'Connor, Fitzgerald, Stevens, and others. (DR:2)

3 units, Win (A. Gelpi)

30. The Novel—(English majors and others taking 5 units, register for 130.) Introduction to how a close, sympathetic reading of the construction, narrative technique, and human values of a variety of major novels can increase the student's appreciation of a significant literary genre. (DR:2)

3 units, Aut (Packer)

40. Drama—(English majors and others taking 5 units, register for 140; same as Drama 50.) (DR:2)

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

50. Poetry and Poetics—(English majors and others taking 5 units, register for 150.) Introduction to the reading of poetry through a variety of poems, emphasizing the ways the meanings of poems are shaped through diction, imagery, figurative language, and technical elements of verse. (DR:2)

3 units, Aut (Lindenberger)

Win (Middlebrook)

Spr (Felstiner)

65D. Medieval Epic and Romance—(English majors and others taking 5 units, register for 165D.) A survey of medieval English masterworks and related literature from the Continent.

3 units, Aut (Stork)

73. Shakespeare—(Same as Drama 59.) A reading of representative comedies, histories, and tragedies. For the general student and the prospective English major. (DR:2)

3 units, Aut (Friedlander)

90. Fiction Writing—Basic problems of narrative and imaginative writing. Prerequisite: completion of the writing requirement.

5 units, Aut, Win, Spr (Haefele, Owens, Spencer)

92. Reading and Writing Poetry—Introduction to the understanding and writing of poetry. Prerequisite: completion of the writing requirement. (Area: P)

5 units, Aut, Win, Spr (Neelon)

Western Thought and Literature—See Humanities 61, The Ancient Near East, Greece, and Rome; 62, The Middle Ages and The Enlightenment to the Present.

BASIC UNDERGRADUATE SURVEYS, SEMINARS, AND WORKSHOPS

Note—Graduate students may receive graduate credit for three 100-level courses.
102. The History of the English Language—
(Same as Linguistics 102.) The evolution of the
English language as a medium of literary expres-
sion. (Area:A) (DR:4)
5 units, Aut (Lerer)
110. Masterpieces of English Literature I:
Chaucer, Shakespeare, Milton, and Their
Contemporaries—(See 10.)
5 units, Aut (Lerer)
111. Masterpieces of English Literature II:
From the Enlightenment to the Modern Pe-
riod—(See 11.)
5 units, Win (Paulson)
112. Masterpieces of American Literature—(See
12.)
5 units, Win (A. Gelpi)
113. The Renaissance—A basic survey of English
literature. (Area:C)
5 units, Win (Orgel)
114. Restoration Literature—(Area:E)
5 units, Win (Carson)
115. Restoration and 18th-Century Literature—
(Area:E)
5 units, Spr (Castle)
121. American Literature and Culture to 1855—
(Same as American Studies 150.) (Area:G)
5 units, Aut (Fliegelman)
125. American Fiction, 1917-1945—(Area: H)
5 units, Spr (Moser)
130. The Novel—(See 30.)
5 units, Aut (Packer)
131A. The 18th-Century British Novel—(Area:E)
5 units, Aut (Castle)
131B. The 18th-Century British Novel—(Area:E)
5 units, Win (Fifer)
132. The 19th-Century English Novel—(Area:F)
(DR:2)
5 units, Aut (Polhemus)
133. The 20th-Century English Novel—(Area:H)
(DR:2)
5 units, Win (Trainer)
134C. American Fiction: Romance to Realism—
(Area:G)
5 units, Win (Halliburton)
137. Development of the Short Story—Required
of creative writing students in fiction. Reading
and discussion of American, British, and Con-
tinental short stories, emphasizing changes and
developments in the form. (Area:H) (DR:2)
5 units, Spr (Packer)
140. Drama—(See 40.)
5 units, Win (Lyons)
150. Poetry and Poetics—(See 50.) (Area:P)
5 units, Aut (Lindenberger)
Win (Middlebrook)
Spr (Felstiner)
151. Renaissance Poetry: Intentions, Struc-
tures, and Styles—The shorter forms of 16th- and
17th-century English poetry. (Area:C).
5 units, Aut (Trimpil)
154A. Major Romantic Poets—Introduction to
a selection of the poems and most important
critical statements of Blake, Wordsworth, Col-
eridge, Byron, Shelley, and Keats. (Area:F)
5 units, Win (Dekker)
155A. Modern British Poetry—Survey of several
British poets from the 1890s to the present,
including Thomas Hardy, G. M. Hopkins, D.
H. Lawrence, Philip Larkin, Thom Gunn, and
others. (Area:H)
5 units, Aut (DiPiero)
158B. Jane Austen—(Area:F)
5 units, Win (Watt)
161B. Afro-American Writing, 1970 to the
Present—(Same as African and Afro-American
Studies 161B.) Readings: Toni Morrison, Alice
Walker, Baraka, Ralph Ellison, Gloria Naylor,
and Toni Cade Bambara. (Area:H) (DR:2)
5 units, Aut (Drake)
161C. 20th-Century Afro-American Fiction—
(Same as African and Afro-American Studies
161C.) A study of Afro-American fiction from
the Harlem Renaissance forward. Works by Jean
Toomer, Zora Neale Hurston, Ernest Gaines,
Richard Wright, Ralph Ellison, James Baldwin,
Toni Morrison, Ishmael Reed, James Alan
McPherson, Gloria Naylor, and Alice Walker.
(Area:H)
5 units, Win (Porter)
161D. Afro-American Autobiography—(Same as
African and Afro-American Studies 161D.) Study
of the various forms and central themes of Afro-
American autobiography from slavery to the
present. Starting with the slave narrative, works
by Frederick Douglass, Harriet Jacobs, Booker
Johnson, Zora Neale Hurston, Richard Wright,
Ralph Ellison, James Baldwin, Eldridge Cleaver,
Malcom X, Maya Angelou, and Alice Walker.
(Area:H)
5 units, Spr (Porter)
163A. Presentations of American Women—Rep-
resentations of American women in late 19th-
and early 20th-century fiction, advertising, pho-
tography, and film. Literary works include Daisy
Miller (H. James), Maggie (S. Crane), The
Awakening (K. Chopin), and Three Lives (G. Stein). (Area:G) 5 units, Spr (Wald)

163C. 18th-Century Women’s Writing—(Area: E) 5 units, Spr (Carson)

165A. Introduction to Medieval Culture—(Same as Medieval Studies 165.) Introduction to the development of medieval culture through study of religious, philosophical, literary, artistic, social and political sources, emphasizing interrelationships among them. Lectures by faculty from various departments. (Area:B) (DR:2) 5 units, Spr (Brown, Staff)

165D. Medieval Epic and Romance—(See 65D.) (Area:B) 5 units, Aut (Stork)

167A. Literature of Fantasy—Science fiction, the detective and horror story, and surreal fiction all began in the 19th-century. Study seminal works such as Grimm’s Fairy Tales, Frankenstein, Alice in Wonderland, and the stories of Edgar Allan Poe, and then contemporary works that continue and extend the tradition of fantasy in literature. (Area: H) (DR:2) 5 units, Spr (Friedlander)

169A. Returning the Gaze: Reading Pornographic Culture—(Same as Comparative Literature 102.) Examines what has been at stake in preserving pornography as freedom of speech and studies pornography’s power to define us. How distinctions between high and popular culture, reading and acting, autonomy and domination become as difficult to reconfirm as they have seemed crucial to maintain in art and under the law. Uses feminist literary and legal theory to analyze pornography in a number of texts, including written narratives, film, and magazines, and to propose redefinitions. Limited to 15 students. 5 units, Aut (Cheek, Cooppan)

169B. Readings in the Asian American Novel—(Same as Comparative Literature 169B.) (Area: H) 5 units, Aut (Palumbo-Liu)

169C. A Question of Nature: The Lyric in Classical China and the English Romantic Age—(Same as Comparative Literature 169C, Asian Languages 169.) (Area:F) 5 units, Win (Palumbo-Liu)

169D. Readings in Asian American Short Fiction—(Same as Comparative Literature 169D.) (Area:H) 5 units, Spr (Palumbo-Liu)

169F. Caribbean Writers—(Area: H) 5 units, Win (Cliff)

171A. Chaucer’s Canterbury Tales—(Area:B) 5 units, Win (Wack)

171B. Chaucer’s Troilus and the Dream Poems—(Area:B) 5 units, Spr (Lerer)

172. Milton—(Area:C) 5 units, Spr (Evans)

173A. Shakespeare—(Same as Drama 159A.) As You Like It, The Merchant of Venice, Henry IV: Part One, Henry IV: Part Two, Measure for Measure, Hamlet, King Lear, The Tempest. (Area:D) (DR:2) 5 units, Aut (Rebholz)

173B. Shakespeare—(Same as Drama 159B.) Twelfth Night, Measure for Measure, Henry IV: Part One, Troilus and Cressida, Hamlet, Macbeth, Antony and Cleopatra, The Winter’s Tale. (Area:D) (DR:2) 5 units, Win (Riggs)

173C. Shakespeare—(Same as Drama 159C.) As You Like It, The Merchant of Venice, Othello, Hamlet, King Lear, The Tempest. (Area:D) (DR:2) 5 units, Spr (Orgel)

178. Toni Morrison—(Same as Feminist Studies 164A.) (Area:H) 5 units, Win (Cliff)

180-189. Seminars for English Majors—Scholarly and critical studies of literary texts. One such seminar (or its equivalent) is required of all English majors. 180-188 satisfy the appropriate area requirements, A-H, P (see program for major in English above). The subject matter of 180 is mainly linguistic studies; 181, medieval literature; 182, Renaissance literature, and so on. 189, which can count as one of two required electives (see program for major in English above), is mainly the theory of literary genres. Preference for these seminars given to English majors. Sign up at English Department.

180A. Seminar: Language and Literary Theory—(Area:A) 5 units, Spr (Heath)

181A. Seminar: Medieval Women Writers—(Same as Feminist Studies 181A.) (Area:B) 5 units, Win (Stork)

182A. Seminar: Elizabethan Tragedy—(Area:C) 5 units, Aut (Riggs)

182B. Seminar: History of Criticism—(Area:C) 5 units, Win (Trimpi)

182C. Seminar: Jacobean Drama Through Performance—(Area:C) 5 units, Aut (Friedlander)

182D. Seminar: The Social Text of 17th-Century Poetry—(Area:C) 5 units, Win (Ross)
183A. Seminar: Shakespeare Through Performance—(Area:D)
   5 units, Win (Friedlander)

184A. Seminar: High Life and Low Life: Polite and Popular Forms in 18th-Century English Literature—(Area:E)
   5 units, Aut (Castle)

185A. Seminar: Dickens and Balzac—(Area:F)
   5 units, Win (Paulson)

185B. Seminar: Victorian Literature and Society—Anthony Trollope and Others—(Area:F)
   5 units, Spr (Gagnier)

185C. Seminar: The Victorian Novel—(Area:F)
   5 units, Spr (Paulson)

186A. Seminar: Psychological Themes in American Fiction—(Same as American Studies 208.) (Area:G)
   5 units, Spr (Moser)

187A. Seminar: Joyce—(Area:H)
   5 units, Win (Trainer)

187B. Seminar: William Carlos Williams—(Area:H)
   5 units, Spr (Sorrentino)

187C. Seminar: Modernist British Fiction—(Area:H)
   5 units, Spr (Buckwald)

187D. Seminar: Post-Colonial Literature in English—(Area:H)
   5 units, Aut (Stanford)

187E. Seminar: American Lives—(Same as American Studies 223.) (Area:H)
   5 units, Win (Islas)

187F. Seminar: American Jewish Literature—(Same as Anthropology 111H, Drama 157H.) (Area:H)
   3-5 units, Spr (J. Moser)

189A. Seminar: Creating a Popular Culture—Three Historical Cases.
   5 units, Aut (Light)

189B. Seminar: Political Science Fiction—(Same as Modern Thought and Literature 189B.)
   5 units, Spr (Medovoi)

190. Intermediate Fiction Writing—May be taken twice. For admission, manuscript must be submitted to Building 50, room 51C. Prerequisite: 90.
   5 units, Aut, Win, Spr (Spencer, L’Heureux)

191A. Writing About Science.
   3 units, Aut (Joly)

191B. Writing About Social Sciences.
   3 units, Win (Arthur)

191C. Writing About Business.
   3 units, Spr (Harvey)

191D. Writing About Law.
   3 units (Staff)

191E. Advanced General Composition.
   3 units, Win (Emery)

192. Intermediate Poetry Writing—May be taken twice. Prerequisite: 92.
   5 units, Aut, Win, Spr (Neelon)

194. Individual Research—See section above on "Undergraduate Programs, Opportunities for Advanced Work, Individual Research." 5 units, any quarter, by arrangement

195. Ad Hoc Undergraduate Seminars—Undergraduates (at least three) 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 should be submitted to the director of undergraduate advising at least two weeks before the end of the quarter. No more than 5 units of credit are given for 195 and/or 198 in one quarter. 195 may not be used to fulfill departmental area or elective requirements without permission.
   any quarter, by arrangement

196A. Honors Seminar: Critical Approaches to Literature—Required of all seniors in the English honors program.
   5 units, Aut (Halliburton)

196B. Honors Essay Workshop—Required of all English honors students.
   3 units, Win (Moser)

196T. Honors Tutorial.
   5 units, Aut, Win, Spr (Staff)

197. Senior Honors Essay.
   10 units (in two quarters)
   Aut, Win, Spr (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 a member of the department. No more than 5 units of credit are given for 198 and/or 195 in any one quarter. 198 may not be used to fulfill departmental area or elective requirements without permission. Group seminars are not considered appropriate to 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 10,000-word critical or scholarly essay (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 Undergraduate Advisor, room 40-41H, before preregistration in May of the junior year. Each student accepted is assigned to an instructor, with whom an appropriate reading list is prepared before the end of the Spring Quarter.

10-15 units (in three quarters)

Aut, Win, Spr (Staff)

SPECIFIC TOPICS AND AUTHORS: FOR UNDERGRADUATE AND GRADUATE STUDENTS

Note—Students in other departments who wish to broaden their programs will find many of these courses useful.

205. Old English—Study of Old English; critical reading of short poems and selected prose in language and literature. Prerequisite for 370. (Area:A)

5 units, Aut (Stork)

208. Post-Classical Latin—(Same as Classical Latin 118.) Careful reading of Latin texts of graded difficulty, including late pagan writers, the Vulgate Bible, patristic writings, medieval prose and poetry.

5 units, Aut (Brown)

209. Introduction to Paleography and Codicology—(Same as Classics 177.) Introduction to late antique and medieval manuscripts in Latin, medieval Latin, and vernacular scripts, and the materials and composition of the medieval book.

5 units, Spr (Brown)

211. Readings in Middle English—The language and dialects of Middle English and reading in the various genres of prose and poetry. (Area:B)

5 units, Win (Wack)

213. Seminar: Literary Patronage and Women in 17th-Century English Theater—(Area C)

5 units, Win (Hendricks)

262G. The Caribbean-Americas: An Introduction to Their Literature, Thought, and Cultural Worlds—(Same as African and Afro-American Studies 248; Spanish 248.)

3-5 units, Aut (Wynter)

265. Introduction to Literary Theory—(Same as Comparative Literature 265.) For seniors and co-term students planning graduate work in literature and for those who want to have a basic course in theory. The major contemporary developments from Russian Formalism to Deconstruction to "Cultural Studies," with emphasis less on coverage than on the development of the student's own theoretical position. All read the same literary text (to be chosen) and see how the different approaches work in relationship to it.

5 units, Win (Perloff)

265B. Literature and the Institution of Literary Study—(Same as Comparative Literature 100, French and Italian 106, German Studies 179D)

5 units, Win (Gumbrecht, Schnapp)


5 units, Aut (Wald)

267. The Poetics of Post-Modernism—Not a survey of contemporary poetry but a course that asks: What is "postmodern" poetry? How has the term "postmodern" been used and what is the relationship of Postmodern to Modern, to avant-garde? The "situation of poetry" in the immediate post-war years and the 1960s, the issue of Black Mountain, the Objectivists, and the New York poets vis-a-vis more mainstream work. Part I of a two-quarter sequence. (See 309A.) (Area:H)

5 units, Win (Perloff)

269C. The Poet and the Painter in American Modernism—Study of Modernist poets—Pound, Stevens, Williams, and Crane—whose poetry and poetics developed through an engagement with modern painting. (Area: H)

5 units, Win (Gelpi)

290. Reading for Fiction Writers—Writers read and analyze three or four fictional texts. Student's writing is based on the structures and techniques discoverable in these texts. Prerequisite: 190.

5 units, Aut (Sorrentino)

292. Advanced Poetry Writing—For undergraduates, selected by the instructor. Promising student poets write poetry in an atmosphere of mutual aid. Manuscripts must be submitted to the Creative Writing secretary by December 1.

5 units, Win (Levertov)

293. Verse Translation Workshop—Students pursue and present work in progress, and discuss practical and theoretical questions. Consult instructor during prior quarter.

5 units, Spr (Felstiner)

302. Colloquium: Feminism, Formalism, New Historicism—Rereading the Renaissance—
(Same as Comparative Literature 302.) Study of contemporary critical issues in relation to canonical and non-canonical Renaissance texts.

5 units, Win (Parker) W 3:15-6:05


5 units, Win (Bender)


5 units, Win (Halliburton)

304. Colloquium: The Romantic Age: The Generation of Wordsworth and Austen—Major poems and prose works of 1789-1815 studied in relation to: primitivism in literature and religion, the writer as protagonist for revolution and reaction, the development of distinctively "Romantic" literary genres, the survival of "Augustan" forms and values.

5 units, Win (Dekker)

305. Colloquium: Literature and Institutions—(Same as Comparative Literature 305.) Theoretical investigation with practical examples from various historical periods, of authorship, readership, evaluation, and the production and dissemination of literary texts.

5 units, Aut (Lindenberger)

306H. Colloquium: Theories of Narrative and Genre—(Same as Linguistics 267.) Inquiry into the shift from structural analyses of plot to treatments of temporality and cause-and-effect in narrative discourse (non-literary and literary). Emphasis on linguistic/cognitive approaches and their influence on interdisciplinary studies of narratives. Readings of primarily American fiction and nonfiction (history, biography, autobiography), emphasizing oral literature.

5 units, Spr (Heath)

307C. Colloquium: Methods and Materials for the Study of Modern Literature—Research techniques and library resources for conducting a Benjaminian mode of cultural inquiry into post-Enlightenment British and American literature (1750 to the present) Focuses on reconstructing the original ideological environments of selected modern works, including semantic, socio-economic, and technological dimensions. Attention to non-canonical and quasi-literary discourses used to historicize texts.

5 units, Spr (McPheron)

309A. Colloquium: Poetics of Post-Modernism—(Part of a 2-quarter sequence. See 267.) The more radical developments in today's poetry (language poetry, performance, visual, poetics, sound poetry, book art) in relation to advanced theory. Prerequisite: 267 or its equivalent. (Area H.)

5 units, Spr (Perloff)

309B. Colloquium: History of Literary Theory (Ancient)—Graduate level reading and lecture.

5 units, Aut (A. Gelpi)


5 units, Spr (Lerer)

315. Seminar: Elizabethan Tragedy.

5 units, Aut (Riggs)

316. Seminar: 18th-Century Literature.

5 units, Aut (Carson)


5 units, Aut (A. Gelpi)

360A. Seminar: History of Literary Theory (Medieval/Renaissance)—Graduate level reading and lecture.

5 units, Win (Trimpi)

360B. Seminar: History of Literary Theory (Medieval/Renaissance)—Graduate level reading and lecture.

5 units, Win (Trimpi)

362. Seminar: Representing Sappho: The Literature of Lesbianism 1746-1936—(Same as Comparative Literature 362.) British, American, and French literary representations of lesbianism from the early 18th-century to the mid-20th-century. The changing status of "lesbianism" as a literary and cultural topos—how female-female desire is defined, the rhetorical and ideological difficulties involved in its representation, the social aesthetic and psychological meanings attached to it by authors in different literary periods. General theoretical topics: the nature of taboo, the difference (if any) between male and female representations of lesbian desire, lesbianism as a "symbolist", "decadent", "modernist", and "utopian" literary motif, the changing moral and political
valuations according lesbian characters in fiction from the 18th to the 20th century. Readings: Fielding, Charlotte Charke, Diderot, Anne Lister, Balzac, James, Radclyffe Hall, Djuna Barnes, Colette, Woolf, Sylvia Townsend Warner.

363B. Seminar: Biography and Psychoanalysis—(Same as Comparative Literature 363B.) Graduate seminar on the application of psychoanalytic insights to biography, especially literary biography. Compares and contrasts the narrative conventions and methodologies governing the presentation of cases in psychoanalysis and in biography. Readings: representative biographies and influential theoretical and critical writings, including Freud, anthropological writings, and literary theory and criticism on biography. Substantial attention to gender issues.

5 units, Win (Ginsberg, Middlebrook)

364. Seminar: British Political Economy—Class, gender, ecological, and global relations as seen in primary texts of socioeconomic theorists from Adam Smith to William Morris.

5 units, Spr (Gagnier)

365B. Seminar: American Literature and Culture in the 1840s.

5 units, Spr (Fliegelman)

369. Expression and Interpretation: Variations of a Theoretical Motive—(Same as Comparative Literature 369, French and Italian 279A, German Studies 342.) The concept "expression" bears overlooked implications which have only recently been seen as a specific feature of Western culture. This has opened a new reading of theories of language, discourse, and literature. The seminar focuses on different theories as variations of a motive. Topics: the romantic origins of academic literary criticism, Hermeneutics, New Criticism, psychoanalytical interpretation, Russian Formalism, deconstruction, and New Historicism.

5 units, Aut (Gumbrecht) Th 3:15-5:30

370. Seminar: Old English Seminar—Subjects alternate every other year between (1) a critical reading of Beowulf and related medieval and modern texts, and (2) a selection of Old English prose and poetry drawn from the AngloSaxon Chronicle, Bede's History of the English People, Gregory's Dialogues, the Exeter Book Riddles, and assorted gnomic, elegaic, and hagiographic verse. Prerequisite: 205 or equivalent.

5 units, Win (Stork)

371. Seminar: Chaucer.

5 units, Aut (Wack)

373A,B. Seminar: Shakespeare and the Idea of Theater—Two-quarter graduate seminar. Part I: a set of approaches to Shakespeare (textual, historical, cultural, political, theoretical), including training in scholarly methods and investigatory practice. Considers what sort of phenomenon theater was in Shakespeare's time, what ends it was designed to serve, what the functions of its mimesis was, what social and political reality it had, what it was as an institution and as a concept. Playhouses, theories of drama, attacks on and defences of the stage, and the texts of Shakespearean plays. Students design an original project for investigation that might become a dissertation subject. Part II is built around these projects, eventuating in the writing of a scholarly paper of publishable quality. Students taking only Part I must produce an appropriate amount of written work. Students who have a relevant project to pursue may, with consent of instructor, enroll for only the second term.

5 units, Win, Spr (Orgel)

383. Seminar: Foucault and Contemporary Critique—(Same as Comparative Literature 301.) The major works of Michel Foucault in relation to developments in contemporary literary theory and cultural critique.

5 units, Spr (Parker) M 6:15-9:05 p.m.

384B. Seminar: The Brontes: Fiction, Family, and Feminism.

5 units, Aut (Polhemus)

385D. Seminar: Henry James and the Romance Tradition—A reading of the major novels and novellas (probably including The American, The Portrait of a Lady, and The Wings of the Dove), and various prefaces and critical essays. Also pertinent works by Hawthorne, Stevenson, Conrad, Wharton, and Cather.

5 units, Aut (Dekker)

388C. Seminar: Conrad and Faulkner.

5 units, Win (Moser)

388D. Seminar: Joyce and Woolf.

5 units, Spr (Trainer)


5 units, Aut (Sorrentino)

390. Graduate Fiction Workshop—Workshop primarily for graduate students in the Writing Program. May be repeated for credit. Prerequisite: consent of instructor.

3-5 units, Aut (L'Heureux) Win (Packer) Spr (Sorrentino)
391. Advanced Work in Writing and Criticism.
   any quarter, by arrangement

392. Graduate Poetry Workshop—Workshop primarily for graduate students enrolled in the Writing Program. May be repeated for credit.
   Prerequisite: consent of instructor.
   3-5 units, Aut (DiPiero)
   Win (Levertov)
   Spr (Johnson)

394. Independent Study—Preparation for qualifying examination and for the Ph.D. oral examination. Satisfactory/No Credit only.
   Sum, by arrangement

395. Ad Hoc Graduate Seminars—Three or more graduate students 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. Satisfactory/No Credit only.
   any quarter, by arrangement

396. Introduction to Graduate Study—Required for first-year graduate students in English, Modern Thought and Literature, and Comparative Literature teaching in the Freshman English program. Experience leading a section, evaluating essays and examinations, and a broad introduction to the opportunities and responsibilities of graduate study. Meets weekly. Assigned brief readings and a short final paper. Satisfactory/No Credit only.
   2 units, Aut (Fifer, Halliburton)

397A. Rhetoric and Teaching Composition—Seminar and apprenticeship required for second-year graduate students in English, Modern Thought and Literature, and Comparative Literature teaching in the Freshman English program. Each student is assigned as an apprentice to an experienced teacher and sits in on classes, conferences, tutorials; later, may be given responsibility for conducting a class, grading papers, holding conferences. Class meetings are devoted to discussing rhetoric, composition, and teaching of writing. Readings are assigned in rhetoric and pedagogy. Each student designs a two-quarter syllabus in preparation for teaching English 1 and 2. Satisfactory/No Credit only.
   5 units, Aut (Fifer)

397B. Teachers Workshop I—Seminar for second-year students teaching composition. (Second-year students are advised to take only one literature course during their first quarter of teaching.) Strong pragmatic emphasis: discussion of writing assignments, evaluation of essays, coordination of reading and writing, conduct of conferences. Occasionally, experienced teachers of composition are invited to discuss particular problems in teaching. No written work required.
   5 units, Win (Fifer) 12-1

397C. Teachers Workshop II—Seminar for second-year students teaching the second quarter of composition, focusing on the syllabus. Students share assignments, problems, and solutions they have encountered in their teaching.
   5 units, Spr (Fifer)

398. Research Course—A special subject of investigation under supervision of some member of the department. Thesis work is not registered under this course.
   any quarter, by arrangement

399. Thesis.
   any quarter, by arrangement

REGULARLY OFFERED BUT NOT DURING 1990-91

64A. Literature of the Holocaust.
64B. The Biblical Presence in Modern Poetry.
65B. Arthurian Literature.
79. Fitzgerald and Hemingway.
101. Linguistics and Literature.
103. The English Language through American Literature.
104. Language and Literary Theory.
117. Romantic and Victorian Literature.
118. Growing Up in Victorian and Early Modern Britain.
119. Modern British Literature.
120. American Historical Novel.
122. American Literature, 1855-1917.
123. American Literature, 1917 to the Present.
124. Identity and Other Enigmas in American Literature, 1850-1900.
143. Restoration and 18th-Century Drama.
152. Classic to Romantic: 18th-Century Literature.
158A. Plath, Sexton, Rich.
161. Afro-American Literature.
161F. The Harlem Renaissance.
162A. Contemporary Chicano Literature.
162B. Chicano Literature: Creative Writing for Bilingual Students.
164A. Literature of the Holocaust.
164B. Biblical Presence in Modern Poetry.
174. Swift.
200A. Introduction to Old Norse-Icelandic.
200B. Advanced Old Norse.
201. Old Saxon.
212A. B. Medieval to Renaissance: The Development of Literary Forms.
216. The Romantic Age: Revolution and Revival.
2239. American Short Fiction.
226G. The Caribbean-Americas: An Introduction to Their Literature, Thought, and Cultural Worlds.
226A. Seminar in Feminist Studies.
226B. 19th-Century Narrative.
226A. The American Enlightenment.
2289. Joyce’s *Ulysses*.
2289. George Eliot.
2290A. Reading and Writing the Novella.
311. Seminar: Methods and Materials for the Study of Medieval Literature.
312. Seminar: Methods and Materials for the Study of Renaissance Literature.
313. Methods and Materials for the Study of Modern Literature.
314. Seminar: *Piers Plowman*.
314E. Seminar: Historical Interpretation of Renaissance Drama—Theory and Practice.
315A. Seminar: Studies in Romanticism.
320. Seminar: The 1890s—American Literature and Culture.
320B. Seminar: American Renaissance.
351. Seminar: Shelley and his Circle—Post-Structuralist Approaches to Romanticism.
355. Seminar: Shelley and his Circle—Post-Structuralist Approaches to Romanticism.
357. Seminar: Recent American Poets.
360C. Seminar: Neoclassicism, Aesthetics, and Modern Criticism.
364B. Seminar: The Bloomsbury Group.
365. Topics in American Literature.
365A. Seminar: The American Historical Romance.
367. Seminar: Theology and the Reading of Medieval Literature.
368. Seminar: Childhood and Sexuality.
374. Seminar: Ben Jonson.
376. Seminar: Milton.
377. Seminar: Swift and Johnson.
384. Seminar: Jane Austen.
385A. Seminar: Ezra Pound and the Pound Tradition.
385B. Seminar: Melville.
385C. Seminar: Wallace Stevens, Poetry and Influence.
388A. Seminar: Virginia Woolf.
388B. Seminar: E.M. Forster.
388F. Seminar: Joyce’s *Finnegan’s Wake*.

**PROGRAM IN ETHICS IN SOCIETY**

**Director:** Partha Dasgupta
**Faculty Committee:** Partha Dasgupta, (Chair) (Economics and Philosophy); Kenneth Arrow (Economics), Barton Bernstein (History), Michael Bratman (Philosophy), Rachel Cohon (Philosophy), John Dupré (Philosophy), Arnold Eisen (Religious Studies), John Ferejohn (Political Science), Thomas Grey (School of Law), David Kennedy (History), Debra Satz (Philosophy), Ernie Young (Center for Biomedical Ethics)

**Visiting Assistant Professor in Ethics in Society, and Philosophy:** Philip Clark

The Program in Ethics in Society fosters scholarship and teaching on fundamental issues of personal and public morality. The program is grounded in foundational work in moral and political philosophy, but it also extends its concerns across a broad range of traditional disciplinary domains and to the study of specific applications in areas such as international relations, poverty and public policy, law, medicine, business, and technological regulation.

Students interested in pursuing studies in these areas should consult with the director or Professor Cohon.

Guest lectures are an important part of the program. These include the annual Tanner Lectures in Human Values, the Wesson Lectures in Problems of Democracy, and the Ethics in Society Lecture Series (five or six lectures/seminars on a selected theme which varies each year).

**HONORS PROGRAM**

The Honors Program in Ethics in Society is open to majors in every field and may be taken in addition to a department major. It is administered by the Ethics in Society Program.

Students should apply for entry at the end of Spring Quarter of the sophomore year or at the beginning of the Autumn Quarter of the junior year. Applicants should have a cumulative letter grade indicator (LGI) of “B+” or higher. They should also maintain this minimum average in the courses taken to satisfy the requirements. Approved coursework satisfying the requirements must be taken in addition to coursework for the major.
REQUIREMENTS

1. Required Courses:
   (a) Philosophy 20, Introduction to Moral Theory, or Philosophy 170. This is normally taken in the sophomore year.
   (b) Philosophy 30, Introduction to Political Philosophy (same as Political Science 51D, Public Policy 103A), or Philosophy 171. This is normally taken in the sophomore year.
   (c) Ethics in Society 77 (same as Philosophy 77.) This course is aimed primarily at the junior year, and is taken upon admission to the honors program.

2. One four- or five-unit undergraduate course on a subject approved by the honors advisor, designed to encourage students to explore those issues in Ethics in Society that are of particular interest to them. Courses of relevance to the Program in Ethics in Society, and in addition to those offered by members of the Program Committee, are offered by other departments. Students may also take a course with the honors thesis in mind. In view of requirement (1), this elective must be outside the Philosophy Department. Students are not restricted to choosing from the sample of such courses included below.


4. Honors thesis on a subject approved by the honors advisor, 8-10 units, with work spread over two quarters.

   A typical student takes Philosophy 20 and 30 in the sophomore year. On admission to the honors program as a junior, he or she takes Ethics in Society 77, given Winter Quarter. Requirement (3) is also fulfilled in Winter Quarter, and requirement (2) (the optional subject) at any time during the junior year, or possibly Autumn Quarter of the senior year. The honors thesis is written during the Autumn and Winter Quarters of the senior year.

GRADUATE STUDIES

In addition to the Ethics in Society Lecture Series, the graduate program centers on a seminar on applied ethics (Philosophy 278). Students present talks on normative themes of their own choosing, providing an opportunity for graduate students from different disciplines to interact in the process of deliberating over ethical matters of common interest.

COURSES

UNDERGRADUATE

For course information not listed, please refer to the relevant department listings elsewhere in this bulletin.


30. Introduction to Political Philosophy—(Enroll in Philosophy 30, Political Science 51D, Public Policy 103A.) The concepts of equality, justice, tolerance, liberty, utility, and rights through some major works in political philosophy. Each presents a distinct and systematic conception of human nature and social and economic conditions of a just association. Readings: Hobbes, Locke, Mill, Marx, Rawls, and Nozick. (DR:3) 5 units, Aut (Hampshire) MWF 11 plus section

77. Ethics in International Relations: Topic—World Destitution—(Same as Philosophy 77.) Focuses on the phenomena of hunger and malnutrition in poor countries, including analytical and empirical material drawn from moral and political philosophy, economics, and nutrition science. Develops methods of quantitative assessment of the extent and distribution of well-being and basic needs in a society. Readings from contemporary sources. Prerequisite: 30 or consent of instructor. 4 units, Win (Dasgupta) MWF 10

80. Ethical Issues in Population Studies—The ethical basis for making individual choices and national policy related to the regulation of sexual conduct, marriage, divorce, birth control, abortion, surrogate motherhood, the right to die, technologically supported life extension, the right to enter a foreign country, or leave it. Issues are set in their demographic context. The historical development of modern Western values systems considered and contrasted with selected alternative systems found in non-Western cultures. 4 units, Spr (Staff)

100. Computers, Ethics, and Social Responsibility—(Enroll in Symbolic Systems 100, Computer Science 201, VTSS 215.)
105. Introduction to African and Afro-American Studies—(Enroll in African and Afro-American Studies 105, Anthropology 105.) (DR:5)


140A,B,C. Ethics of Development in a Global Environment (EDGE)—(Enroll in Engineering 297A,B,C, Political Science 140A,B,C.)

150. Economics and Public Policy—(Enroll in Economics 150, Public Policy 104.)

156. Economics of Health and Medical Care—(Enroll in Economics 156, Health Research and Policy 256.)


164. Race and Ethnicity in American Experience—(Enroll in History 164.)

170. Ethical Theories—(Enroll in Philosophy 170.)

171. Political Philosophy—(Enroll in Philosophy 171.)


183. The Politics of Welfare Policy—(Enroll in Political Science 183D.)

185. The Distribution of Income and Wealth—(Enroll in Economics 185.)

190. Honors Seminar—(Same as Philosophy 179.) Interdisciplinary. Students present issues of public and personal morality. Topics chosen with the advice of the instructors. Student prepared reading list is made available to class members a week prior to their presentation. Group discussion follows.

3 units, Aut (Dasgupta, Moravcsik)

Th 3:15-5:05

210. Ethics and Technology—(Enroll in VTSS 210.)

266. Medical and Legal Ethics—(Enroll in Religious Studies 266.)

286. Character and the Good Life—(Enroll in Religious Studies 286.)

288. Limits of Economic Rationality I: The Nature of the Social Bond—(Enroll in French 288A.)

PRIMARILY FOR GRADUATE STUDENTS

214. Economic Development I—(Enroll in Economics 214.)

248. Gender and Social Theory—(Enroll in Anthropology 248, Feminist Studies 248.)

250. Nutritional Problems of Developing Nations—(Enroll in Food Research 250, Human Biology 110, Anthropology 250.)

274. Morality and Reasons for Action—(Enroll in Philosophy 274.)

278. Graduate Seminar in Applied Ethics—(Enroll in Philosophy 278.) Interdisciplinary. Students present issues of public and personal morality, topic chosen with the advice of the instructors. Student prepared reading list is made available to class members a week prior to their presentation. Group discussion follows.

3 units, Aut (Dasgupta, Moravcsik)

Th 3:15-5:05

285. The Distribution of Income and Wealth—(Enroll in Economics 285; same as 185.)

387. Interdisciplinary Workshop in Equity and Social Choice Theory—(Enroll in Economics 387, Philosophy 255, Political Science 267.)

**PROGRAM IN FEMINIST STUDIES**

Chair: Sylvia Yanagisako

Program Committee: Elaine Chang, Jane Collier, Sarah Fiarman, Elisabeth Hansot, Kathryn Kerns, Lisa Layne, Sherri Matteo, Lee Medovoi, Kirsten Sword, Scott Walker.

Resource Faculty and Staff: Beatriz Arias (Education), Anne Arvin (Medicine), Barbara Babcock (Law), Patricia Barchas (Sociology), James Baron (Graduate School of Business), Joel Beinin (History), Joseph Berger (Sociology), Russell Berman (German Studies), Helen Blau (Pharmacology), Judith Brown (History), Albert Camarillo (History), Laura Carstensen (Psychology), Terry Castle (English), Brigitte Cazelles (French and Italian), Michelle Cliff (Feminist Studies), Elizabeth Cohen (Education and Sociology), Jane Collier (Anthropology), Carol Conell (Sociology), Wanda Corn (Art), Carl Degler (History), Carol Delaney (Anthropology), Carl Djerassi (Chemistry), Sanford Dornbusch (Sociology), Sandra Drake (English), John Dupré (Philosophy), John Felstiner (English), Estelle Freedman (History), Regenia Gagnier (English), Hester Gelber (Religious Studies), Barbara Gelpi (English), Raymond Giraud (French and Italian), Marita Grudzen (Health Research and Policy), Akhil Gupta (Anthropology), Elisabeth Hansot (Political Science), Jerald Herting (Sociology), Margo Horn (Innovative Academic Courses), Mary Hufty (Health Research and Policy), Arturo Islas (English), Kathryn Kerns (Meyer Library), Susan Krie-
Feminist Studies is an interdisciplinary undergraduate program that investigates the significance of gender in all areas of human life. Feminist analysis is based on the assumption that gender is a crucial factor in the organization of our personal lives and our social institutions. It focuses on how gender inequality is created and perpetuated. The courses offered by the program utilize interdisciplinary feminist perspectives to expand and reevaluate the assumptions at work in traditional disciplines in the study of individuals, cultures, social institutions, policy, and 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 undergraduate major 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 major and provides information and advice for graduate work in Feminist Studies.

The committee awards the annual Michelle Z. Rosaldo prizes for the best undergraduate essays on women, gender, or feminism. The prize is awarded in two divisions: senior division for entries submitted by currently enrolled juniors or seniors and junior division for freshmen and sophomores. Essays should reach the Feminist Studies office by April 12; essays completed later in Spring Quarter may be submitted for consideration the following year.

UNDERGRADUATE PROGRAM

BACHELOR OF ARTS

The major in Feminist Studies may be taken as a single major, as one of multiple majors, or as a secondary major. If taken as one of multiple majors, none of the 60 units counted toward the major in Feminist Studies may overlap with units counted toward the major in another department or program. But if taken as a secondary major, then up to 30 of the units counted toward the Feminist Studies major may also be counted toward fulfilling the major requirements in another department or program if that department or program consents.

The major should normally be declared by the beginning of a student’s third year. Students interested in Feminist Studies should consult with the chair of the program before submitting a plan of study. The Feminist Studies office is in Serra House, (415) 723-2412. Students should choose two faculty advisors, one of whom must be the chair of the program, from the list of resource faculty (see above) and may consult with peer advisors. Faculty advisors work closely with the student in helping design an appropriate program of study. A proposal signed by both advisors explaining the rationale for the plan of study must be submitted to the chair.

HONORS CERTIFICATION

FEMINIST STUDIES MAJORS

Admission — The honors program offers an opportunity to do supplemental independent research on a thesis of superior academic quality. It is open to students with a letter grade indicator (LCI) of “B+” or better in coursework in Feminist Studies. Normally, students apply for honors certification in the junior year, or, at latest, in Autumn Quarter of the senior year. To apply, students should design a project in consultation with both of their major advisors, one of whom must be the chair of the program. A proposal signed by both advisors describing the project and including the number of units to be awarded, must be submitted to the chair of the program for final approval. In order for an honors proposal to be considered during a particular quarter, it must be submitted at the Feminist Studies Program office by the fifth week of the quarter.

Requirements — For approved honors projects, it is understood that the units are taken over and above the program already approved for
the major, i.e., in addition to those units which comprise the body of the major.

In addition to completing all the units proposed, the student submits, in the senior year, two preliminary drafts and then a final draft of a thesis based on substantial research. For students graduating in June, the first draft is due by the end of January, the second by mid-March, and the final draft by mid-April. In order for honors to be granted, the student’s three advisors must read the thesis and collectively certify, by means of a signed letter to the Committee of Feminist Studies, that the thesis is of superior academic quality and merits the award of honors. This certification must be turned in no later than May 15.

MAJORS IN OTHER DEPARTMENTS

Honors Certification in Feminist Studies for majors in other departments or programs, as distinguished from honors for students pursuing a major in Feminist Studies, is intended to complement study in any major. Students in any field of study are encouraged to apply.

Admission—Honors certification is open to students majoring in any field who have completed Feminist Studies 101 and 102 with an LGI of “B+” or better, or who have taken three courses related to the topic of their proposed honors research. Normally, students would apply for honors certification in the first quarter of the junior year but must apply no later than the third quarter of the junior year. To apply, students must first consult the Chair of the Program in Feminist Studies, who will help prepare an application outlining the student’s plan for coursework, the rationale for the program, and an honors project. The chair acts as one of the student’s faculty advisors and helps the student select two other faculty advisors to supervise the student’s progress. The completed application, with the signatures of two faculty advisors and the chair of the program, is reviewed by a subcommittee of the Feminist Studies Committee for final approval.

Requirements—

1. Thirty units of coursework in addition to the units granted for the honors project.
   a) 15 units of core courses:
      101. Introduction to Feminist Studies: Issues and Methods
      102A. Contemporary Issues in Feminist Theory,
      or 102B. Feminism and Political Theory
      or 102C. Contemporary Issues in Feminist Thought
      103A. Seminar in Feminist Studies,
      or 103B. Feminist Methodology in the Social Sciences.
   b) Select the remaining 15 units in consultation with advisors from the list of courses approved by the Feminist Studies program. None of the courses selected may simultaneously count toward the student’s major.

2. Submit in the senior year two preliminary drafts, and then a final draft, of a thesis based on substantial research. The thesis must be of acceptable quality on an aspect of Feminist Studies approved by the student’s faculty committee. For students graduating in June, the final draft is due by the end of February and the second by mid-April. The final draft must be submitted four weeks before the end of exam week. Students may receive up to 10 units of credit for preparation of the honors thesis, but these units do not count toward requirement (1).

Honors Certification is recommended for students who have achieved an LGI of “B+” or better in their required coursework in Feminist Studies and who have submitted a thesis judged to be of superior academic quality by the subcommittee of the Feminist Studies Committee charged with making such decisions.

CURRICULUM

For a major in Feminist Studies, the following course of study is recommended: a minimum of 12 courses (a core of five plus seven others) for a total of at least 60 units above the 100 level. The seven courses not in the core should be chosen in consultation with the student’s advisor. To ensure coverage, intellectual focus and breadth in the program, and practical experience, the 12 courses required for the major should be distributed among the core (five courses), the focus (at least five courses), and a practicum.

CORE

The core consists of five courses. The first three are required and should be taken in sequence, if possible. The remaining two courses should be chosen from the list of feminist studies courses. One of these courses should be in the social sciences, the other in the humanities. Also, one of these two should offer a cross-cultural perspective.

Required Courses—

Introduction to Feminist Studies: Issues and Methods (Feminist Studies 101.)
Contemporary Issues in Feminist Theory, Feminism and Political Theory
or Contemporary Issues in Feminist Thought (Feminist Studies 102A, 102B or 102C.)
Seminar in Feminist Studies (Feminist Studies 103A or 103B.)
Courses that fulfill the social science requirement in the Feminist Studies major are numbered from 120-149.

Courses that fulfill the humanities requirement in the Feminist Studies major are numbered from 150-189.

Courses that offer a cross-cultural perspective include Feminist Studies 120, 140, 142.

FOCUS

Of the seven courses not part of the core, at least five should reflect a particular thematic focus, and all seven should be chosen in consultation with the student's advisor.

1. At least three of the focus courses should be feminist studies courses or be selected from the list of approved courses in other departments and programs (see below).
2. At least one should be a major survey, methodology, or theory course, offered by a department or interdepartmental program as an initiation into the practice of study in the field.

The following thematic clusters illustrate foci that individual students can design, in consultation with the advisor:

- Sex and Gender
- Women in Language and Symbol
- Race, Class, and Sex
- Women and Work
- Feminist Perspectives on Science, Health, and the Environment
- Women and Society: The 19th Century
- Women and Society: The 20th Century

PRACTICUM

For Feminist Studies majors, the practicum, taken for 2 to 6 units, should involve field research, community action, organizing and teaching a course, or other supervised research. This requirement may be fulfilled by designing a public service internship, an Innovative Academic course, an Undergraduate Specials course, or by undertaking supervised work in a department. After the practicum, the student must submit a three-to five-page written statement on its nature and its relevance to the major in Feminist Studies.

COURSES

Approved courses contain a significant component of attention to gender difference: the situation of women in Western or non-Western culture or the role of sex-gender systems in social organization. Some courses are planned after the bulletin is printed, but updated listings are available at the Feminist Studies Office. Courses with Feminist Studies numbers have been offered by the program a number of times.

Courses marked (*) satisfy the requirement of a cross-cultural perspective on women's issues.

INTRODUCTORY

101. Introduction to Feminist Studies: Issues and Methods—(Same as Anthropology 12.) How gender inequality is created and perpetuated. Topics: feminist theory, the family, gender and work, sexuality, the politics of health and reproduction, domestic violence, and women's culture. (DR:5)
5 units, Aut (Collier) MWF 1:15-3:05

102B/202B. Feminism and Philosophy—(Same as Philosophy 177.) Feminist approaches to two central areas: political philosophy and philosophy of science. Feminist critiques of the main Western political traditions (Liberalism, Marxism, and Socialism); Radical Feminism: specific issues such as affirmative action, abortion, and pornography. Feminist responses to specific areas of science, especially those concerned with sexual difference; critical consideration of general assumptions about scientific objectivity. Undergraduate prerequisite: 101, or permission of instructor. (DR:3)
5 units, Win (Dupré) TTh 2:15-3:30

102C/202C. Contemporary Issues in Feminist Thought—(Same as Political Science 163.) Undergraduate seminar on recent developments in feminist political thought. Explores understandings of the "political" and the extent to which these constructions exclude women; theories of moral choice and women's reproductive rights; and how implicit gender norms affect the structure of men's and women's careers. (DR:5)
5 units, Spr (Hansot)

120. Women in the Contemporary Middle East—(Same as History 187C.) Survey of women's roles in the modern Middle East. Topics: work, religious expression, politics, and family life. Format: one film showing per week with associated lecture and discussions.
5 units, Spr (Beinin) MW 1:15-3:05

122. U.S. Women's History 1820-1980—(Same as History 173B.) The transformation of Victorian womanhood in the late 19th-century, including the workforce participation of immigrant and black women and the educational and professional opportunities for middle-class white women, the impact of wars and depression on 20th-century women's lives, and the rebirth of feminism. (DR:5)
5 units (Freedman) given 1991-92

126. The Psychology of Women—(Same as Psychology 116.) Research and theory on the socialization and psychological development of
women. The biological, cultural, and social factors that influence gender specific behavior. (DR:4)
3 units, Aut (Carstensen) TTh 10-11:30

129. Economics of Women’s Education and Employment—(Same as Education 131.)
4 units, Spr (Strober) MW 1:15-3:05

135/235. Women and Organizations—(Same as Business 378, Sociology 167.) Examination of dilemmas faced by women in contemporary American organizations: complex formal organizations such as corporations, universities, and health and welfare institutions; and smaller, less formal professional firms and social and political groups. Focus is on tradition and change in the definition of women’s roles, and on women’s styles of management, leadership, decision-making, and communication. The importance of women’s alliances, the dilemmas and characteristics of separate women’s organizations, and the potential for revising organization theory based on observations of women’s behaviors.
5 units, Spr (Krieger) TTh 1-3

140. Sex Roles and Society—(Same as Anthropology 11.) The diversity of women’s and men’s roles, experiences, and self-conceptions in a number of human societies provides a critical perspective on contemporary views of the “nature” of women and men, and how women and men are shaped by particular forms of social life. (DR:5*)
3-5 units, Win (Stockard)

142. Women in Cities: A Cross-Cultural Perspective—(Same as Anthropology 145.) Women’s experiences in cities throughout the world and the determinants of their similarities and differences. Topics: women and migration, changing forms of the sexual division of labor, changing family and kinship structures, prostitution, and political activism.
5 units, Spr (Krieger) TTh 1-3

142A. The Family—(Enroll in Sociology 142.) Family composition, organization, and processes. Historical and recent trends in Western societies are examined and compared with current situations in developing countries. Topics: marriage and divorce, fertility, illegitimacy, value of children, family size, household composition, and sex roles.
5 units, Win (Herting) TTh 10-11:30

143. Status, Friendship, and Social Pressure: An Experimental Approach—(Enroll in Sociology 5.) The basic social processes that structure the individual’s experience in interpersonal situations, including group pressure on individual choices, social control of deviants, operation of status distinctions (sex and race), formation of friendships and formation of intimate relationships (love relationships). Enrollment limited. (DR:4)
5 units, Win (Berger) MW 10

148A. Feminism, Science, and Technology—(Same as VSST 135.) Interdisciplinary: contemporary feminist interventions into science as institution, cultural system, and social practice. Utilizing insights from literary criticism, art history, political science, sociology, and philosophy, examines how scientists from classical Greece to the present have constructed and perpetuated notions of gender and gender difference in the elaboration of knowledge, methodologies, and in the scientific disciplines and professions. Readings: critiques of biology, medicine, physics, history of science, and issues such as reproductive technology, the social constructions of science, and international division of labor.
5 units, Win (Chang)

172. Feminist Approaches to Contemporary Masculinity—Ways in which contemporary masculinities are produced in the context of the family, workplace, sexual relationships, race relations, mass media, science and technology. How and why the meaning of masculinity varies from context to context, framed by the issues of power relations and social inequalities.
5 units, Spr (Medovoi) TTh 3-4:15

ADVANCED
Open to non-majors with the proper prerequisites. Feminist Studies majors have preference when enrollment must be restricted.

103A/203A. Seminar in Feminist Studies—(Graduate students register for 203A.) Advanced feminist theory and research exemplifying feminist methodologies in traditional and emerging disciplines. Topics: the politics of sexual identity; race, class, and ethnicity as feminist issues; non-academic literary criticism grounded in movement publications and anthologies. Undergraduate prerequisite: 101 or 102.
5 units, Aut (Townsend)

5 units, Spr (Krieger) T 3:15-6:05
127. Women and Moral Theory—(Same as Education 276.) Ethics in education from the transformative perspective of feminism. The problems of ethics and evil with emphasis on their significance for education.  
4 units, Aut (Noddings) MW 1:15-3:05

136. Utopian Political Thought—(Enroll in Political Science 153.) How utopias function as blueprints for social change or as thought experiments. An examination of utopian and anti-utopian writing emphasizing feminist utopian thought. (DR:3)  
5 units, Aut (Hansot) MW 2:15-4:05

138. Feminist Theory: Gender, Power, and Justice—(Enroll in Political Science 154.) Emphasis on recent feminist theories. How feminist perspective complicates and enhances political thought. Types of contemporary feminist thought and the effects of men's and women's different perspectives on moral, social, and political issues.  
5 units, Win (Okin)

144. Family and Kinship Organization—(Same as Anthropology 244.) Seminar on the major issues anthropologists have confronted in studies of family and kinship. Competing theoretical frameworks are evaluated through an examination of descent, marriage, gender, domestic groups, and kinship change. Prerequisite: graduate standing in Anthropology or consent of instructor.  
5 units, Win (Yanagisako) MW 10-11:50

145. Seminar: Gender-Specific Perspectives of Birth Control—(Same as Human Biology 150C.) In most societies human fertility control responsibility rests predominantly with women. Is this desirable and realistic, or should changes be instituted? Students choose specific aspects of this problem and address themselves, in the form of research papers, to possible answers. Preregistration essential, using special forms available at Human Biology office. Limited to 15 seniors. Junior standing considered in exceptional cases.  
5 units, Win (Djerassi)

4 units, Spr (Matteo)

147. Creation/Procreation: A Comparative Study—(Same as Anthropology 154.) An alternative to the study of religion and reproduction as distinct categories and separate domains. The gendered aspects of cosmological or religious systems and the cosmological significance of gender in terms of their symbolic interrelationships. Anthropological and other literature examines these relationships in several cultures, including our own. Emphasis on the ways these beliefs are embedded in practices and structures of social life and on Western categories and meanings, and their implications for theorizing.  
5 units, Aut (Delaney) TTh 9-10:30

150. Virgin Mary and Images of Power—(Same as Religious Studies 234B.)  
5 units (Gelber)  
alternate years, given 1991-92

151. Women in Judaism—(Enroll in Religious Studies 128.)  
5 units, Win (Eilberg-Schwartz)

158. Returning the Gaze: Reading Pornographic Culture—(Enroll in Comparative Literature 102, English 269A.) Examines what has been at stake in preserving pornography as freedom of speech and studies pornography's power to define us. How distinctions between high and popular culture, reading and acting, autonomy and domination become as difficult to reconfirm as they have seemed crucial to maintain in art and under the law. Uses feminist literary and legal theory to analyze pornography in a number of texts, including written narratives, film, and magazines, and to propose redefinitions. Limited to 15 students.  
5 units, Aut (Cheek, Cooppan)

160A. Dance History and Philosophy—(Enroll in Dance 160A, Drama 127.) Historical lecture survey on the lives and works of key figures in Western theatrical dance from the Renaissance to the present, through films and discussions. Topics: public attitudes and perceptions and the Romantic ideal; the changing image of male dancers; the birth of abstraction in dance; and the pioneering matriarchs (Isadora Duncan, Martha Graham, Doris Humphrey, and Mary Wigman.) (DR:2)  
3 units, Win (Ross)

3 units, Spr (Ross)

161A. Afro-American Writing 1950-1970—(Enroll in English 161A.)  
5 units, not given 1990-91
161B. Afro-American Writing 1970-Present—(Enroll in English 161B.)
5 units, Aut (Drake)

5 units, Spr (Wald) TTh 3:15-5:05

163C. 18th-Century Women's Writing—(Enroll in English 163C.)
5 units, Spr (Carson)

164A. The Novels of Toni Morrison—(Same as English 178.) Examines the work of a major contemporary writer with reference to the history, politics, and spirituality Morrison describes, and her situation in the literary tradition of African-Americans.
5 units, Win (Cliff) TTh 11-12:30

181A. Seminar: Medieval Women's Writers—(Enroll in English 181A.)
5 units, Win (Stork) F 9-12

186. Undergraduate Topical Seminar on the Psychology of Women—(Same as Psychology 198.) In-depth coverage of a specified topic related to psychology and women. Prerequisite: Psychology 116.
3 units, Win (Carstensen) T 2:15-4:30

197. The Education of Women—(Enroll in French 197.) What have women been supposed to grow up to become in France? How were they to be cultivated for these ideals? How have the ideals of the education of women changed in France between the 16th century and the present? Major literary works and educational treatises by Montaigne, Poulain de la Barre, Moliere, Marivaux, Rousseau, Condorcet, Balzac, Goncourt, Montherlant, Colette, de Beauvoir, and Sarraute. (Taught in English)
4 units, Win (Hullot-Kentor)

207. Religion, Culture, and Gender—(Enroll in Religious Studies 207.)
5 units, Aut (Napper) TTh 2:15-4:05

222. Social Processes and Pathological Outcomes—(Enroll in Sociology 222.) Seminar on abnormal family and group processes resulting in emotional disturbances and behavioral disorders. Topics: the impact of experiences of neglect, abuse, molestation, violence, marital separation, and divorce, war, and natural disasters on children and adults. Prerequisite: graduate standing or consent of instructor.
5 units, Spr (Johnston) T 7-10 p.m.

230A. Undergraduate Colloquium: Women and Gender in Modern France—(Enroll in History 230A.) Women's lives and the importance of gender issues in French politics and society from the late 18th to the early 20th century.
5 units, Aut (Roberts) Th 2:15-4:05

237. Women and Health—(Enroll in Medicine 237.) Topics of interest to women as health care consumers and providers. The historical role of women in health care, how women have changed health care programs, and what changes are anticipated. Lecture series, 1 unit. Optional research project for 2 additional unit.
1-2 units, Aut (Grudzen, Hufty) F 12-1

240. Marxisms, Feminisms, Postmodernisms—(Same as Anthropology 240.) Current debates in the social sciences and humanities between different strands of Marxism, feminism, and postmodernism. Focuses on Marxist and feminist appropriations and critiques of postmodernism by examining the literature on, and by, marginalized and repressed groups. Questions of identity, location, voice, exploitation, and political strategy. Prerequisites: Anthropology 244 and 262 (or equivalent course in feminist theory) or consent of instructors. Enrollment limited to 20 students.
5 units, Spr (Gupta, Yanagisako) TTh 1:15-3:05

265A/365A. Undergraduate Colloquium: Sexuality in American History—(Enroll in History 265A/365A.) Recent historical studies about sexual behavior, sexual ideology, and sexual politics. Topics: the history of contraception, abortion, prostitution, venereal disease, and homosexuality, combining chronological and thematic approaches to sexual history. For advanced undergraduates and graduate students. Enrollment limited to 15; permission of instructor required.
5 units (Freedman) given 1991-92

5 units, Aut (Wald)
268. Seminar: Contemporary Theories of Justice—(Enroll in Political Science 268.) Social and political justice theme facilitating understanding of contemporary debates in political theory. Analyzes recent works that develop principles of justice and discuss the political areas that are in accord with them.
5 units, Win (Okin)

270. Seminar: Gender and Political Theory—(Enroll in Political Science 266.) Major works from the Western tradition of political thought, viewing them through the prism of gender. To understand the ideological roots of inequality between the sexes, examines ways in which assumptions about sexual difference have shaped essential concepts of our tradition (reason, nature, politics, justice, and the separation of public from private life). Compares different and contrasting interpretations of works read. Prerequisite: introductory course in political theory or permission of instructor.
5 units, Spr (Okin)

284. Chicana Writers—(Enroll in Spanish 284.) Examines from various theoretical critical approaches (feminist, semiotic, structural, anthropological, etc.) the works of Chicana writers. Authors: Villanueva, De Cervantes, Cisneros, Viramontes, Portillo Tambley, Corpi, and Vigil.
3-5 units, Spr (Herrera-Sobek)

291. Race, Discourse and the Origins of the Americas: A New World View of 1492—(Enroll in Spanish and Portuguese 291, Comparative Literature 291, Afro-American Studies 291.) Examines major texts related to the Event of 1492 and the prelude voyage of the Portuguese around Cape Bojador to West Africa, which constitutes the formation of a new legitimating basis for structures of New World societies. Analysis of juridico-theological, historical, and literary texts, from the perspective of the Americas; attempts to decipher the politics of representation in the orthodox interpretation of Columbus' discovery and to deconstruct the strategies whereby a symbolic construct of race (in a Natural Law variant) would take primary place in the New World instead of the gender construct of previous human societies. (Texts available in English)
3-5 units, Spr (Wynter)

294. Luso-Brazilian Women in a Postmodern Context—(Enroll in Portuguese 294.) The position of women in the culture of Brazil and Portugal through issues of social class and ethnicity. Female creativity, the relationship of female artists to the male tradition, women's exploitation of women, and the attitude of the middle-class toward popular feminism and social change.
3-5 units, Spr (Lopes)

5 units, Spr (Parker) W 3:15-6:05

362. Seminar: Representing Sappho—Literature of Lesbianism, 1749-1936—(Enroll in English 362.) British, American, and French literary representations of lesbianism from the early 19th century to the mid 20th century. The changing status of "lesbianism" as a literary and cultural topos—how female-female desire is defined, the rhetorical and ideological difficulties involved in its representation, the social aesthetic and psychological meanings attached to it by authors in different literary periods. General theoretical topics: the nature of taboo, the difference (if any) between male and female representations of lesbian desire, lesbianism as a "symbolist", "decadent", "modernist", and "utopian" literary motif, the changing moral and political valuations according to lesbian characters in fiction from the 18th to the 20th century. Readings: Fielding, Charlotte Charke, Diderot, Anne Lister, Balzac, James, Radclyffe Hall, Djuna Barnes, Colette, Woolf, Sylvia Townsend Warner.
5 units, Spr (Castle)

363B. Seminar: Biography and Psychoanalysis—(Enroll in English 363B.) Graduate seminar on the application of psychoanalytic insights to the materials of biography, especially literary biography. Compares and contrasts the narrative conventions and methodologies governing the presentation of cases in psychoanalysis and in biography. Readings: representative biographies and a selection of influential theoretical and critical writings, including Freud, anthropological writings, and literary theory and criticism on biography. Attention to gender issues.
5 units, Win (Ginsberg, Middlebrook) MW 11-12:30

473. Graduate Seminar: Women's Family and Sexual History—(Enroll in History 473.) A research seminar limited to graduate students in U.S. history and, with permission, those with a strong background in this field. (See instructor to propose research topic during Autumn Quarter.) Enrollment limited. Permission of instructor required.
5 units, Spr (Freedman)
Internship in Feminist Studies—For non majors. Augments relevant coursework in Feminist Studies with a supervised field, community, or laboratory experience. Law offices, medical research labs and clinics, social service agencies, legislative and other public offices, and local and national women's organizations are typical placements. The faculty sponsor is chosen from Feminist Studies resource faculty. To be arranged in advance. Per University guidelines, every unit for which credit is given represents approximately three hours of work per week of the quarter. Upon completion, the student must submit a written three- to five-page statement on the nature of the internship and its relevance to the major in Feminist Studies. Maximum of 6 units.

FOOD RESEARCH INSTITUTE

Emeriti: (Professors) Roger W. Gray, Bruce F. Johnston, William O. Jones, Dudley Kirk
Director: Walter P. Falcon
Associate Director: Anne E. Peck
Associate Professor: Jeffrey C. Williams
Assistant Professors: Sandra O. Archibald, Marcel Fafchamps, Scott D. Rozelle
Librarian: Charles C. Milford

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 over 75,000 items, including an up-to-date series of periodicals from over 50 countries. It is open for reference use to students and other scholars. Food Research Institute Studies, published three times a year, reflects the research interests of the institute.

THE INSTRUCTIONAL PROGRAM

Graduate teaching is an integral part of the program for both the A.M. and Ph.D degrees. The teaching program is designed primarily for 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, although certain of its courses may be counted toward majors in other undergraduate programs including economics, sociology, political science, and human biology.

The University requirements for advanced degrees, as set forth under the "Degrees" section in this bulletin, should be consulted by all prospective graduate students.

UNDERGRADUATE PROGRAMS

COTERMINAL A.B./A.M. PROGRAM

The Food Research Institute offers the coterminal degree for advanced undergraduate students in Economics, Political Science, Human Biology, and other departments who are interested in a concentration of coursework in the institute. For admission, a student must have a minimum letter-grade indicator of 3.2. Prerequisites include Economics 51 and 52 and one course in quantitative methods. Students must apply at least four quarters in advance of the degree conferral date and prior to the end of their 11th quarter. Application should be made to the chair of the institute's Instruction Committee. In addition to meeting the requirements for the undergraduate degree, students must complete the requirements for the A.M. as stated below. Students should also consult the University rules for coterminal degree programs.

GRADUATE PROGRAMS

MASTER OF ARTS

The A.M. degree is awarded to students who complete at least 25 units of work in the Food Research Institute and a total of 45 units of approved work with a letter grade indicator of "B" or better. All courses must carry a number of at least 100. Advanced language training may not be included in the 45 units, and students are strongly encouraged to concentrate their coursework in two or three areas within the institute. The master's program is designed to equip students with specific skills, and admission is not encouraged for those desiring a Ph.D.

Qualified graduate students from other schools and departments may apply for an A.M. degree within the 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 chair of the Instruction Committee.
DOCTOR OF PHILOSOPHY

The first two years of the doctoral program consist of a series of required and elective courses totaling about 90 units. Economics 202, 203 (Price and Allocation Theory), Economics 210 (Macroeconomic Theory), and courses in quantitative methods are required. In addition, students prepare for examinations in three elective fields through courses, seminars, and directed reading. Field examinations are taken by the end of the second year. Normally, fields are chosen from the following: 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 a field outside this list or outside the institute must secure prior approval from the Instruction Committee.

Each student is required to prepare a detailed prospectus of the doctoral dissertation, which is subject to committee approval, and to defend research on the topic 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: (1) by completion with passing grade of an approved course for the language concerned, or (2) by passing a special reading examination, to be given by a qualified member of the Food Research Institute or of the relevant language department.

Students must also satisfy University requirements concerning residency and standards of progress as described in the “Advanced Degrees” section of this bulletin.

Ph.D. MINOR

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 Food Research 361 and 363, and approval by the chair of the Instruction Committee of the overall program of work.

FELLOWSHIPS

The Food Research Institute has available a limited number of University fellowships which provide tuition and stipend for qualified students. Instructions for applying for financial aid are included in the application packet. The financial aid application must be filed by January 1.

COURSES

103. The World Food Economy—(Same as Economics 106.) Interrelationships among food, population, and economic development. Agricultural and rural development in achieving economic and social progress in low-income nations. Emphasis on public sector decision-making as it relates to food policy.

5 units, Win (Falcon) MW 9-10:50

105. Commodity Futures Markets and Prices—(Same as Economics 107; graduate students register for 205.) The uses and functioning of commodity futures markets, market performance issues and measures, and analysis of the economic effects of futures markets.

5 units, Aut (Peck) TTh 9-10:50

106. The Political Economy of Commodity Markets—(Same as Economics 127; graduate students register for 206.) History, politics, and theoretical analyses of domestic and international markets for basic commodities. Topics: government regulation of private trading, public trading through buffer stocks and marketing boards, international commodity agreements, and the changing views of the social value of private speculation. Examples from 18th century to present.

5 units, Spr (Williams) TTh 9-10:50

114. Controversies in Human Nutrition—(Same as Human Biology 147.) Two weeks of lectures, followed by student participation in discussions while developing research paper on topics chosen with instructors’ guidance and approval.

2 units, Spr (Butterfield, Martorell) W 3:15-5:05

119. Human Nutrition—(Same as Human Biology 120.) Introduction to human nutrition including the function, digestion, absorption, and metabolism of nutrients; dietary recommendations and standards; and an overview of national and international nutrition problems. Prerequisites: Human Biology core or consent of instructor.

4 units, Aut (Butterfield, Martorell) MWF 11

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 diversity of experience. Country case studies illustrate the systematic components of the experience of economic development and those of population growth with implications in terms of alternative structures of development, the timing of the demographic transition, income distribution, employment, and migration. Interactions and causal effects
between economic development and population growth.

5 units, Win (Yotopoulos) MW 3:15-5:05

129. Analysis and Management of Development Projects—(Same as Economics 129; graduate students register for 229.) Contemporary techniques and experiences in appraising, implementing, and managing development projects. Three modules: project planning and scheduling using CPM and PERT methods; theory, calculation, and use of conventional appraisal criteria (net present value, benefit-cost ratio, and internal rate of return); and development of database systems for project monitoring and evaluation. Partial budgeting techniques compare financial and economic decision criteria. Hands-on exercises with data from LDC agricultural projects. Required use of microcomputers and project planning, spreadsheet and database management software.

5 units, Spr (Gotsch) MW 9-10:50

130. Application of Mathematical Programming to Agricultural Systems—(Same as Economics 132; graduate students register for 230.) Develops application skills including exercises in mixed integer, multi-period, quadratic, and risk programming. Producer-consumer models. Computer homework exercises analyze agrarian reform, water resource development, technology choice, and allocation of research resources. Model manipulation and data problems are stressed. Prerequisite: one course in microeconomic theory.

3-5 units, Aut (Gotsch) MW 11-12:50


5 units, Spr (Arthur) MW 1:15-3:05

144. Economics of American Agriculture: Structure and Policy—(Same as Economics 144; graduate students register for 244.) American agriculture and its historical and contemporary role in the economy. Topics: the role of agriculture in American economic development, policy toward commercial agriculture, poverty problems in rural America, and the international dimensions of U.S. agriculture. Emphasis on policy alternatives rather than on farm management.

5 units, Aut (Falcon) MW 9-10:50

145. Interaction of U.S. Agriculture with the Environment—(Same as Human Biology 153; graduate students register for 245.) Agriculture in the U.S. is shaped by biological and economic influences. Issues: plants and their genetic manipulation, soil and water conservation, pest control, agroecosystems, and food processing and preservation technologies. Focus is on assessing long-run biological, environmental, and economic consequences of agricultural practices, their interactions, and the way in which policy affects these practices. Prerequisite: Economics 1.

4-5 units, Win (Archibald) TTh 9-10:50

146. Economic Policies of the European Community—(Same as Economics 142; graduate students register for 246.) Analysis of the current economic policies of the European Community and the planned completion of the internal market by 1992. Development of competition, transportation, and factor market policies; agricultural policy reform and changes in the food industry; external trade policy and relations with the U.S. and Japan; monetary and macroeconomic coordination and proposals for a common currency and central bank. Prerequisites: Economics 51, 52, or equivalent.

5 units, Aut (Josling) MW 1:15-3:05

148. Economic Development in China—(Same as Economics 121; graduate students register for 248.) The structure and development of China's economy emphasizing the People's Republic. Topics: the economic legacy of the late Qing and Republican periods; China's development strategy; planning and resource allocation; labor, employment, and population; income distribution, foreign trade; and recent reforms. Prerequisite: Economics 1.

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

149. Economic Development in Africa—(Same as Economics 125; graduate students register for 249.) Economic development issues in Africa, emphasizing the sub-Saharan region. Topics: socioeconomic maps of Africa; recent economic history, demography and migrations; development strategies; agricultural policies, external debt, famines and drought; environmental degradation.

5 units, Aut (Pafchamps) TTh 1:15-3:05

166. International Trade Policy—(Same as Economics 166; Ph.D. students register for 266.) Effects of selected government policies affecting international trade. Trade policy and economic welfare, exchange rate policy, government responses to competition from imports, issues underlying international negotiation of reductions of barriers to trade and special trade arrange-
ments for developing countries. Prerequisite: Economics 165.
5 units, Spr (Pearson) MW 11-12:50

188. Colloquium on Population Studies—(Same as Human Biology 60, Biology 183; graduate students register for 288.) Series of talks by distinguished speakers, introducing a wide variety of topics in population studies.
1 unit, Win (Feldman, Arthur)
W 4:10-5:30

PRIMARILY FOR GRADUATE STUDENTS

205. Commodity Futures Markets and Prices—(See 105.)

206. The Political Economy of Commodity Markets—(See 106.)

218. Economic Development in Latin America—(Same as Economics 123; open to advanced undergraduate students, with the consent of instructor.) Historical approach to the political economy of development, focusing on economic growth and structural change of open economies. The evolution from raw material and primary product based export economics to industrialization and the process of diversification, innovation, and their relationships to rent-seeking. Changing patterns of interdependence, debt and adjustment, price policy and stabilization, the political economy of accumulation, and labor market adjustment and migration. Seminar with major research paper.
5 units, Aut (Reynolds) MW 3:15-5:05

220. Price Relationships and Analysis of Commodity Markets—Analysis of commodity prices and markets, including marketing margins, spatial and temporal aspects, storage behavior, information expressed in prices, market structure, market integration, and sectoral models. Prerequisites: microeconomics and econometrics.
5 units, Win (Williams) MW 11-12:50

221. Economics of Production—Production theory emphasizing agriculture. Topics: production, cost and profit functions; technological change; risk and uncertainty in models of production. Readings, complemented with problem sets, emphasize econometric estimation of production relationships. Prerequisites: Economics 202 and econometrics, or consent of instructor.
5 units, Win (Archibald) MW 1:15-3:05

224. Explorations of the New Development Economics—Expanded case for intervention in economic development based on the absence of a complete set of markets in developing countries and asymmetry of information. Implications for strategies of economic development, especially exchange rates, trade, and industrial policies. Prerequisite: graduate trade or development course, or consent of instructor.
5 units, Win (Yotopoulos) TTh 1:15-3:05

225. Modeling Economic Development—Introduction to a variety of tools and models that capture economic phenomena in developing countries. Topics: household models; multi-markets, computable general equilibrium models, disequilibrium and rationing, inter-temporal choice; sequential decisions and uncertainty; contracts and institutions.
5 units, Spr (Fafchamps) TTh 9-10:50

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

229. Analysis and Management of Development Projects—(See 129.)

230. Applications of Mathematical Programming to Agricultural Systems—(See 130.)

236. Population Perspectives in the Third World—(See 136.)

244. Economics of American Agriculture: Structure and Policy—(See 144.)

245. Interaction of U.S. Agriculture with the Environment—(See 145.)

246. Economic Policies of the European Community—(See 146.)

248. Economic Development in China—(Same as 148.)

249. Economic Development in Africa—(Same as 149.)

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

266. International Trade and Investment Policy—(See 166.)

267. International Agricultural Policy—Comparative study of agricultural policies and their
interaction in world markets. Emphasis on policies in industrial and middle-income countries. Determinants of policies and choice of policy instruments. Consequences of these policies for world markets; international regulation of agricultural trade, trade aspects of food quality on environmental regulations, international negotiation on trade aspects of agricultural policies. Prerequisite: 144 or consent of instructor.

5 units, Win (Josling) MW 3:15-5:05

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: 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 (Arthur) given 1991-92

288. Colloquium on Population Studies—(See 188.)

361. Seminar: Research Methods for Applied Economists—Required field seminar for institute Ph.D. students; open to others with consent of instructors.

5 units, Aut (Gotsch) TTh 3:15-5:05

363. Seminar: Policy Analysis for Applied Economists—Required field seminars for institute Ph.D. students; open to others with consent of instructors.

5 units, Spr (Pearson) TTh 3:15-5:05

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: (Professors) Raymond D. Giraud, Alphonse Juilland, Roberto B. Sangiorgi, Leo Weinstein

Chairman: Jean-Marie Apostolidès
Vice Chairman: Jeffrey Schnapp (Italian Division)

French Division

Professors: Jean-Marie Apostolidès, Marc Bertrand, Brigitte Cazelles, Robert G. Cohn, Jean-Pierre Dupuy, René Girard (Paris, Autumn, Winter), Hans Gumbrecht, Ralph M. Hester (Tours, Autumn; on leave Winter, Spring), Pauline Newman-Gordon (Tours, Winter), Patricia Parker, Michel Serres

Assistant Professors: Odile Hullot-Kentor, James Winchell

Professor (Teaching): John G. Barson

Senior Lecturers: Clio P. Dorr, Nelee Langmuir, Michelle Morran

Lecturer: Mary Jane Parrine (Curator, Romance Languages and Humanities)

Acting Assistant Professor: Celeste Kinginger (Language Program Coordinator)

Visiting Professor: André Glucksman (Autumn)

Visiting Assistant Professor: Ehsan Ahmed

Italian Division

Professors: John Freccero (Florence, Autumn, Winter), Patricia Parker

Associate Professors: Jeffrey Schnapp (Graduate Advisor), Carolyn Springer (on leave 1990-91)

Assistant Professor: Robert Harrison (Undergraduate Advisor)

Senior Lecturers: Maria Devine, Leda S. Mussio, Annamaria Napolitano (Language Program Coordinator), Leopoldina Viggiano

Visiting Professors: Herbert Izzo (Winter, Spring), Stefano Velotti (Winter), Hayden White (Spring), Sergio Zatti (Spring)

FRENCH DIVISION

OFFERINGS

The French Division offers a variety of programs in French language and linguistics, literature, cultural history, and theoretical studies, courses in which all interested students are welcome to enroll. Undergraduates may obtain the A.B. degree with emphasis on literature, language, or French studies. In addition to awarding the Ph.D. degree, the French Division also offers a Master of Arts program. Doctoral candidates benefit from training which stresses excellence in scholarship, writing, and publication of scholarly articles and books, and teaching methodology.
With careful planning, A.B. candidates can pursue one of numerous possible extended majors or a double major with French as one component. Similarly, graduate students can take advantage of the joint Ph.D. option with Humanities, a minor in Comparative Literature or other fields, or, for doctoral candidates from outside the division, a minor in French in either of the two options described below. (See Graduate Program, specialization.)

Offerings feature exceptionally strong possibilities for study abroad. The Stanford Program in Tours offers courses in French language, literature, and cultural history in the heart of the Loire château region. Open to advanced French majors and graduate students, the Stanford Program in Paris offers the opportunity to study during the Autumn and Winter Quarters at the University of Paris. Students live with Parisian families or in residence halls and work under the supervision of a Stanford faculty member. Stanford and the French Division also enjoy contacts with the Institut d'Etudes Politiques, the Ecole Polytechnique, and other prestigious institutions. An annual exchange permits two doctoral candidates in French to study at the Ecoles Normales Supérieures. Those interested in study abroad should contact the department during Autumn Quarter and may obtain applications and more information from the Overseas Studies office in Sweet Hall.

The division also offers a range of on-campus features to enhance its academic programs. La Maison Francaise, located at 610 Mayfield, is an undergraduate residence providing numerous opportunities for expanding the experience of French language and culture. In-house seminars discuss contemporary aspects of French civilization. (Assignments to La Maison come through the regular undergraduate housing draw.)

A curator for Romance Languages oversees the extensive collection in French at the Green library. The division also maintains the holdings of the Hoover Institute on War, Revolution, and Peace and include a wealth of information on 20th-century France.

The division takes pride in its numerous publications: the Stanford French Review and the Stanford French and Italian Series have gained critical attention, while Constructions, edited by graduate students, represents a significant avenue of publication for young scholars. And finally, a distinguished group of visiting professors is a permanent part of the French Division.

### UNDERGRADUATE PROGRAMS

#### BACHELOR OF ARTS

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 begun the study of French elsewhere to be granted advanced standing.

In addition to the first years of language study, all French majors must complete 60 units of additional coursework, distributed in accordance with the specialization they have selected. Only upper division courses may count toward the major. Individual work should normally be limited to 4 units. Modifications of the requirements may be granted upon the advisor’s and the chairman’s recommendation.

Students majoring in French are encouraged to participate in the Stanford Program in Paris. The Stanford Program in Tours is recommended for less advanced students. Courses taken at Tours do not automatically count toward the major; interested or returning students should consult the advisor.

Three specializations are available: French Literature, French Language, and French Studies.

#### SPECIALIZATION IN LITERATURE

This option emphasizes work in all periods of French literature from the Medieval to the Modern. Majors who choose this specialization must fulfill the following requirements (60 units):

1. Three advanced language courses: two selected from the courses numbered 123 to 125, and one selected from the courses numbered 200 to 204.
2. Three literature survey courses (numbered 130 to 132).
3. Five literature courses: one in the Middle Ages or the Renaissance (135 to 139; 213 to 229); one in the 17th century (150 to 159); one in the 18th century (160 to 169); one in the 19th century (170 to 179); and one in the 20th century (180 to 189).
4. The remaining units may be taken in literature, cultural history, and related fields. They should serve to strengthen an area of specialization and/or the writing of an honors essay.

Students choosing the literature option should note that most graduate programs in French require proficiency in at least one additional modern language.
SPECIALIZATION IN LANGUAGE

This option emphasizes work in French linguistics and semiotics. Majors who choose this specialization must fulfill the following requirements (60 units):

1. Three advanced language courses: 123, 124, and 125.
2. Three survey of literature courses: 130, 131, and 132.
3. Five language and cultural history courses distributed as follows: one in semiotics (202) or in translation (205); one in linguistics (201 or 203); one in stylistics (200); one in cultural history (290 or 291); and the course in Methods of Teaching French (293).
4. The remaining units may be taken in literature, linguistics, and related fields.

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.

Majors who choose this specialization must fulfill two sets of requirements: 32 units of upper division French courses and 28 units of approved courses outside the division, as follows:

1. Two of the three literature survey courses (130, 131, or 132).
2. Two of the three cultural history courses (290, 291, or 294).
3. Four literature or culture courses: one among the courses numbered 150 to 189; and three among the courses numbered 280-289.
4. The 28 remaining course units taken outside the division must have a significant French component and constitute a coherent program of study. These courses should be approved by the major advisor.

HONORS PROGRAM

Majors in their junior year may apply to the honors program if they have already taken five Upper Division courses with a letter grade indicator of "B+". The honors program student fulfills all regular requirements for the A.B. in French and writes a substantial essay on an aspect of French culture. Preferably in the Spring Quarter of the junior year, the qualified student submits to the major advisor a detailed outline of the proposed essay. Upon approval of the project by the Faculty Council, the student may receive 9 to 12 units of credit of essay work.

HUMANITIES

Students who wish to supplement their departmental major with a related program of studies should see the "Humanities Special Programs" section in this bulletin.

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, majors should satisfy requirements similar to those stated in the "Specialization in Literature" section above.

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 in this bulletin.

GRADUATE PROGRAMS

Applicants should read carefully the general regulations governing advanced degrees in the "Degrees" section in this bulletin. They should have preparation equivalent to an undergraduate major in French with a minimum letter grade indicator 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 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 nonmatriculated 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 300-level course.

MASTER OF ARTS IN TEACHING

The degree of Master of Arts in Teaching (M.A.T.) is offered jointly by the French Division 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 of this bulletin.

TEACHING CREDENTIAL

For information concerning the requirements for teaching credentials, consult the "School of Education" section of this bulletin and the Credential Administrator, School of Education.

MASTER OF ARTS IN FRENCH
(TERMINAL PROGRAM)

The Master of Arts provides a combination of language, literature, cultural history, 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 letter grade indicator of "B," 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.

REQUIREMENTS

The basic course program is as follows:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The course in textual analysis (200)</td>
<td>4</td>
</tr>
<tr>
<td>2. One philology course (202, 204, or 210)</td>
<td>4</td>
</tr>
<tr>
<td>3. One linguistics course (201 or 203)</td>
<td>4</td>
</tr>
<tr>
<td>4. One cultural history course (290 or 291)</td>
<td>4</td>
</tr>
<tr>
<td>5. One methodology course (293 or Linguistics 289)</td>
<td>4</td>
</tr>
<tr>
<td>6. Among the advanced literature courses, two in the early periods (213 to 239); and two in the later periods (240 to 269).</td>
<td>16</td>
</tr>
</tbody>
</table>

Total ........................................... 36

EXAMINATION

The examination is administered two weeks before the end of the final quarter of a candidate's program by a committee of three professors of French chaired by the candidate's advisor. It is a 90-minute oral examination conducted in French and structured as follows:

1. A half-hour presentation in French of a textual analysis. The passage to be commented on is chosen by the candidate's advisor from a work in the candidate's area of interest. The candidate is informed of the selection and given a copy of the text 48 hours before the examination.

2. A one-hour period of interrogation based on the texts included in a reading list provided all A.M. candidates, with emphasis on periods and authors other than those covered in the candidate's work. Questions are asked relating to literature, language, and cultural history.

The candidate's success in the examination is decided by a majority vote. In the event of failure, the examination may be taken a second time.

DOCTOR OF PHILOSOPHY

Regardless of the chosen area of specialization (see below), all graduate students must comply with University and departmental regulations. The following requirements, dealing with such matters as residency, teaching, and examinations, may be in addition to the University's basic regulations discussed in the "Degrees" section of this bulletin.

REQUIREMENTS

The A.M. or its equivalent in French is required of all Ph.D. students, who must, therefore, apply for a master's degree.

Residency and Coursework—For a graduate student entering with an A.B., the Ph.D. program should normally be completed in four years. The first and second years should be devoted to full-time study, for a total of no fewer than 72 units of graduate work; the third and fourth years to study, teaching, and dissertation work. In accordance with University regulations, candidates for the Ph.D. must complete nine quarters (three years) of full-time work, or the equivalent, in graduate study beyond the bachelor's degree.

Teaching—In addition to training capable and creative scholars, one of the program's primary objectives is to promote the effective teaching of French at all levels. To this end, students are expected to demonstrate pedagogical proficiency by teaching under supervision the equivalent of four courses. Prior to teaching (normally during the third and fourth year), students enroll in 293, Methods of Teaching French, or Linguistics 289.

Language—It is recommended that doctoral candidates be competent in Latin and a second Romance language. This choice may vary according to the candidate's area of specialization.

SPECIALIZATION

Two areas of specialization are available to Ph.D. candidates as follows:
FRENCH LITERATURE

Students who choose this option are expected to concentrate on certain areas or centuries, but knowledge of all centuries should be well advanced at the time of the graduation.

The A.M. in French, or its equivalent, is required. The candidate must:

1. Complete a minimum of 36 graduate units, which must include the required courses specified in the terminal A.M. program.
2. Pass the Ph.D. qualifying examination in Spring Quarter of the second year of graduate studies in French.

After successful completion of (1) and (2), the student is admitted to Ph.D. candidacy. Regardless of the area of concentration, the candidate must take a total of 10 literature courses in the department, exclusive of directed reading, covering four centuries. (For the purpose of this requirement, the Middle Ages count as one century.)

The Ph.D. Qualifying Examination—The examination consists of a two-hour oral examination to be held in Spring Quarter of the second year. The candidate is 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 follows the commentary.

The second part of the examination includes a discussion in French or English of the period of the work selected, as well as the periods immediately preceding and following. The examination is intended to provide an opportunity for the candidate to use his/her knowledge of the literary, cultural, and social history of the period. For works of the Middle Ages or 20th century, three successive centuries including that of the candidate's specialization must be represented.

LITERATURE, THEORY, AND CULTURAL STUDIES

This option combines advanced work in literary studies with interdisciplinary and theoretical methods. A primary goal is in-depth understanding of the cross-cultural nature of knowledge. To this effect, students are offered the opportunity to develop an anthropological approach which emphasizes the interactive relations among various processes of interpretation.

The A.M. in French, or its equivalent, is required. The candidate must:

1. Complete a minimum of 36 graduate units, including the courses specified in the terminal A.M. program or their equivalents.
2. Pass the Ph.D. qualifying examination in Spring Quarter of the second year of graduate studies in French.

After successful completion of (1) and (2), the student is admitted to Ph.D. candidacy. Regardless of the area of concentration, the candidate must take two courses among the "theory" series (courses numbered 270/370 to 279/379); three courses among the "disciplinary" series (280/380 to 289/389); and four additional courses in literature, cultural studies, or related fields.

Ph.D. Qualifying Examination—The examination consists of a two-hour oral examination to be held in Spring Quarter of the second year. The candidate is asked to submit a substantial reading list reflecting the area of interest which must be approved by the examination committee.

The examination takes the form of an oral colloquy between the student and the examination committee. The candidate is expected to demonstrate knowledge of a substantial number of literary works in his/her area of concentration; of relevant theoretical approaches; and of the cultural context pertaining to his/her particular interest. The candidate is encouraged to present a commentary in French of a text selected by the advisor. The ensuing discussion may be conducted in French or in English according to the candidate's preference.

University Oral Examination—Regardless of the option selected by the candidate, he/she is expected to take the University oral examination normally no later than the end of the third year of studies. This supposes that the candidate has successfully completed the qualifying examination and formed a doctoral committee.

The examination is primarily a defense of the dissertation project, which candidates prepare well in advance of the examination date, with the aid of their doctoral committee.

The examination consists of:

1. A 30-minute presentation of the dissertation project, followed by a brief question period;
2. A discussion of aspects of the dissertation project (such as subject, scope, structure, methodology, and bibliography) on the basis of written material submitted one month in advance by the candidate.

The examination seeks to assure the scholarly validity of the project and the candidate's ability to complete it successfully. (See "Advanced Degrees" section of this bulletin for graduate school administrative details.)

Dissertation—The doctoral dissertation, which must be written in English (exceptional requests are to be addressed to the Dean of Graduate Studies), should demonstrate the 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 12 to 18 months of full-time work.

JOINT DEGREES AND MINORS

A candidate may also take a joint degree in French and Humanities, as described in the "Humanities Special Programs" section in this bulletin. Minors are possible in Linguistics, in Comparative Literature, in Modern Thought and Literature, and in departments offering related courses such as history, history of art, music, philosophy, 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. With careful planning, students may complete coursework for the Ph.D. and the minor in a total of nine quarters.

Ph.D. MINOR IN FRENCH LITERATURE

The division 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 coursework (six courses) covering at least four centuries in French studies.

ITALIAN DIVISION

OFFERINGS

The Italian Division offers a variety of graduate and undergraduate programs in Italian language, literature, culture, and intellectual history. Its course offerings run the full gamut from small and highly specialized graduate seminars to general courses open to all students on authors such as Dante, Boccaccio, and Machiavelli.

On the undergraduate level, a number of options are available. Students who wish to major in Italian may choose between two concentrations for the A.B. degree in Italian, opting for an emphasis on either Italian literature or Italian studies. Also available to Italian majors is an honors program in the Humanities (see the "Humanities Special Programs" section in this bulletin), an honors program in Italian, and two extended majors—one in Italian and French literature and one in Italian and English literature.

On the graduate level, programs of study leading to the A.M. degree and the Ph.D degree are offered in Italian literature. Joint programs for the Ph.D. degree with the Graduate Program in the Humanities, Comparative Literature, and Modern Thought and Literature are also available.

Special collections and facilities at Stanford offer the possibility for extensive research in Italian studies and related fields. These include the undergraduate and graduate libraries and the Hoover Institution for the Study of War, Revolution, and Peace. Collections in Green Research Library are especially strong in the Medieval, Renaissance, and contemporary periods; the Italian section is one of the larger constituents of the Western European collection at the Hoover Library; and the Music Library has excellent holdings in Italian opera.

STANFORD IN ITALY

Located in a palazzo in downtown Florence, Stanford in Italy affords both undergraduate and graduate students the opportunity for intensive study of Italian language, culture, and literature. Information on the Florence program is available at the Overseas Studies office, room 126, Sweet Hall.

LA CASA ITALIANA

La Casa Italiana, 562 Mayfield, is an undergraduate residence devoted to developing an awareness of Italian language and culture. It works closely with the Italian Cultural Institute in San Francisco and with other local cultural organizations. It often hosts visiting representatives of Italian intellectual, artistic, and political life. A number of departmental courses are regularly taught at the Casa, which also offers in-house seminars. Assignment is made through the regular undergraduate housing draw.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The Italian major offers students the opportunity to develop an in-depth knowledge of Italian literature, language, and civilization via a highly flexible program combining coursework in Italian with work in such fields as art history, classics, comparative literature, economics, English, French history, international relations, music, philosophy, and political science. Regardless of their concentration, all Italian majors are required to complete the first-year language sequence, taking Italian 1, 2, 3 (or the equivalent). They must also take two second-year language courses: Italian 51, 52, and/or 53 (or the equivalent taken at the Florence campus). Students considering an Italian major should consult with the Italian undergraduate advisor as early as possible (even before completing the language requirement) in order to ensure a maximum of flexibility in designing a course of study suited to individual needs and cultural interests.
In addition to five quarters of language study, all Italian majors must complete 60 units of additional coursework, distributed in accordance with the concentration they have selected. Two concentrations are available: Italian literature and Italian studies.

CONCENTRATION IN ITALIAN LITERATURE

The literature concentration emphasizes work in all periods of Italian literature from the Medieval to the Modern. The requirements for majors who choose this concentration are:

1. Complete a minimum of 45 units of Italian courses (selected from courses numbered in the 100s, 200s, and 300s).

2. Of these courses, take at least one on Dante, as well as at least one in each of the following areas: (a) the Middle Ages, (b) the Renaissance, (c) the 18th or 19th centuries, and (d) the 20th century. A Dante course may fulfill the Middle Ages requirement.

3. Take the intermediate-level survey sequence (Italian 227 and 228).

4. Of the 60 units required for the major, take up to 15 units of coursework outside the department in related fields.

CONCENTRATION IN ITALIAN STUDIES

The Italian studies concentration is designed for students whose primary interest is in Italian but who have a strong interest in a secondary and related field (such as history, international relations, etc.). It requires less extensive coursework in Italian literature and slightly more work in Italian language and civilization. The requirements (60 units) for students choosing this concentration are:

1. Complete a minimum of 32 units of Italian courses (selected from courses numbered in the 100’s, 200’s, 300’s).

2. Of these courses, take the following:
   a) Italian 227 and 228, intermediate-level survey sequence (2 quarters).
   b) Italian 127, Introduction to Italian History.
   c) One of the advanced language courses: either Italian 114, 115, or 116.

3. Up to 28 units outside the department in related fields. These courses must have a significant Italian component and be structured to constitute a coherent program of study.

Students opting for the Italian studies concentration must formulate their course plans in quarterly consultation with the Italian undergraduate advisor. The advisor helps design the program of study and advise on course selections, and may also approve courses offered at Stanford in Italy.

THE FLORENCE PROGRAM

All Italian majors, whatever their concentration, are encouraged to spend at least one quarter at Stanford in Italy. Many of the courses offered there may count toward the fulfillment of requirements for the Italian major. Students are encouraged to consult with the Italian undergraduate advisor before a sojourn in Florence to ensure that their course selections meet Italian Division requirements.

EXTENDED MAJORS

Requirements for both extended majors are essentially identical to those of the Italian major with a concentration in Italian literature.

ITALIAN AND ENGLISH LITERATURES

In addition to the 45 units requirement for the A.B. in Italian with a concentration in Italian literature, candidates must complete four English literature courses numbered 100 and above related to the field of concentration in Italian literature.

ITALIAN AND FRENCH LITERATURES

In addition to the 45-unit requirement for the A.B. in Italian with a concentration in Italian literature, candidates must complete four French literature courses numbered 100 and above related to the field of concentration in Italian literature.

HONORS PROGRAMS

ITALIAN

Italian majors with a letter grade indicator of “B+” or better in all Italian courses are eligible for departmental honors. In addition to the requirements listed above, honors candidates must complete and submit an honors essay representing 6 to 9 units of academic work. Proposals for essays must be submitted to the Italian faculty by the end of the candidate’s junior year. If the proposal is accepted, a member of the Italian faculty is assigned to serve as the student’s advisor for the essay. Students interested in the honors program should consult the Italian undergraduate advisor early in their junior year.

HUMANITIES

An honors program in the Humanities is available for Italian majors who wish to supplement their studies with a carefully structured program of humanistic studies. See the “Humanities Special Programs” section of this bulletin for further information.
GRADUATE PROGRAMS
MASTER OF ARTS IN ITALIAN
TERMINAL PROGRAM

The Master of Arts in Italian provides a combination of language, literature, civilization, and general courses designed to prepare secondary school, junior college, or college teachers. Applicants should be undergraduate majors in Italian or in a related field. Knowledge of a second Romance language is desirable.

Candidates must complete a minimum of 36 units of graduate work, with a letter grade indicator of "B" and pass a comprehensive oral examination. To fulfill the requirements in one year, they should enroll for an average of 12 units per quarter.

The basic course program (36 units) is nine graduate courses in Italian, one of which may be in a related field. There is the option of substituting a master's thesis for two literature courses.

Reading knowledge of a second Romance language, demonstrated by passing an examination, is required. French is recommended.

Requirements for the completion of the A.M. include a comprehensive literature and language examination, which is given two weeks before the end of Spring Quarter or at the beginning of the following Autumn Quarter. Before taking the exam, a candidate for the degree must submit to the Italian faculty a sample graduate seminar paper representative of the quality of his or her graduate work. On the basis of this paper, the results of the comprehensive examination, and the student's overall progress, the members of the department vote for or against the awarding of the A.M. degree.

Applications for admission must be received by August 1.

DOCTOR OF PHILOSOPHY IN ITALIAN LITERATURE

Stanford's Ph.D. program in Italian offers the opportunity for advanced work in Italian literature and Italian studies within an unusually flexible interdisciplinary framework. It is fully independent of the Ph.D. program in French and aims to encourage students to bring broader methodological and interdisciplinary concerns to bear on the study of Italian literature. Like conventional Italian Ph.D. programs, it places primary emphasis on developing a command of Italian literature as a whole. Unlike conventional Italian Ph.D. programs, it allows students to construct a highly individualized course of study, integrating specialization in a particular literary period with work in such fields as art history, classics, comparative literature, feminist studies, film, French, history, history of science, linguistics, literary theory, Medieval or Renaissance studies, philosophy, and religion. The program is founded on the belief that this sort of balance between period specialization and interdisciplinary breadth is not only desirable but also essential in a small field such as Italian studies, particularly given the diversity of the Italian literary canon, which extends over a wide variety of disciplines.

Students admitted into the Ph.D. program in Italian work closely with the advisor in structuring a plan of study appropriate to needs and interests. Such a plan usually involves a mix of courses taken within the Italian program, courses taken in other departments, and independent work under supervision of a member of the Italian faculty. Students are admitted into the program as Italian Fellows on a plan which integrates financial support with training as scholars and prospective university teachers. Tenure as a fellow, assuming satisfactory academic progress, is for a maximum of four years. (Graduate-level work completed elsewhere is counted as part of this four-year period.) Although financial support is limited to four years, the timetable for the completion of requirements allows students to spread work over a five-year period. Students in the fifth year normally apply for outside fellowships or part-time teaching positions in the department.

Aside from the benefits of the program's structure and fellowship plan, a number of unique resources are available to Ph.D. students in Italian at Stanford. During their years of study, students may be permitted to take courses, pursue dissertation research, and do independent work at the Stanford campus in Florence under supervision of a member of the Italian faculty. The Florence center, located in a palazzo along the Arno, is near important Florentine libraries and archives and the University of Florence. An additional resource is the Stanford Italian Review, a scholarly journal published twice annually by the Department of French and Italian. Advanced students in the Ph.D. program may become involved in the Review in editorial and other capacities. Graduate students also have at their disposal the resources of La Casa Italiana, a residential theme house which serves as an Italian cultural center and hosts such events as colloquia, lectures, and film series.

ADMISSION TO THE PROGRAM

Although they need not have been undergraduate Italian majors, candidates are expected to be proficient in the Italian language and to have done significant coursework in Italian literature and/or Italian studies on the undergraduate level. Candidates with a broad
In French and Italian Literature. Apart from this requirement, students are granted considerable freedom in structuring a course of study appropriate to individual needs. During the first year, most coursework is usually done within the Italian Department in order to ensure an adequate preparation for the qualifying examination. In the second and third years, students' programs normally consist of a combination of coursework done inside and outside the Italian Department, supplemented by tutorials and independent work pursued under supervision of the Italian faculty.

Qualifying Procedures—Students are admitted on a probationary basis. The probationary period ends once a student is officially admitted to "candidacy" for the Ph.D. as a result of successful completion of the qualifying procedure. The qualifying procedure takes place at the end of the third or during the fourth quarter of graduate study, at which time the student: (1) takes the oral qualifying exam (equivalent to the master's exam), and (2) submits to the Italian faculty a sample graduate seminar paper which the student considers representative of the quality of his or her graduate work at Stanford. On the basis of this paper, the results of the qualifying examination, and the student's overall progress, the members of the department vote for or against admission to candidacy. The terminal A.M. degree is awarded to students who have successfully completed the oral qualifying exam but who are not admitted to candidacy for the Ph.D.

Examinations—Three examinations are required of candidates for the Ph.D., two oral and one written: the qualifying examination (mentioned above), the departmental written examination, and the University oral examination.

1. The qualifying examination tests the student's general knowledge of the Italian language and Italian literature. It is taken at the end of the third or during the fourth quarter of graduate study. It is composed of two sections, the first consisting of a 20-minute presentation by the candidate, the second of a 70-minute question and answer period on the candidate's talk and on his or her reading list. The examination committee for the qualifying examination is made up of the members of the Italian faculty including the student's faculty advisor, who chairs the examination. While the reading list for the examination must be based on the department's standard list, it should be amplified in consultation with the student's advisor so as to reflect each student's particular areas of interest.

2. The departmental written examination serves as a preparatory examination for the Uni-
versity oral (described below) and involves the same reading list and committee of examiners as the University oral. It is normally taken at the end of the third year of graduate study. The six-hour examination is divided into two equal sections. During the first, the student is asked to write an essay on his or her specialty; during the second, on a more general topic. The reading list for the examination must be established in consultation with the student's dissertation director, who chairs a committee of examiners (usually three) selected jointly by the dissertation director and the student according to the list's emphasis. Reading lists for this examination and the University oral generally cover all periods of Italian literature, with the student's area of specialization the primary focus of both examinations, covered in depth. Aside from this general guideline, students are given considerable latitude in establishing a list which reflects their individual scholarly concerns.

3. The University oral examination is taken two weeks after successfully passing the departmental written examination. It is divided into four sections. The first, 30 minutes, consists of a formal presentation addressing one of the questions that the student will have received the morning of the examination. The second, also 30 minutes, is a question and answer period concerning the student's presentation. The third, one hour, takes the form of an oral colloquy on the student's reading list as a whole. The fourth, lasting 30 minutes, is allocated to a defense of the student's dissertation proposal (a copy of which is submitted to the examiners one week in advance of the examination).

Dissertation—The student presents a dissertation proposal as part of the University oral examination. Successful completion of the examination constitutes approval of the proposal. The committee of readers for the dissertation is ordinarily drawn from the University oral examining committee. The fourth and (if necessary) fifth years of graduate study are devoted to writing and researching the doctoral dissertation.

JOINT DEGREES AND MINORS

A joint degree program in Humanities and Italian Literature is described in the "Humanities Special Programs" section of this bulletin. Minors are possible in a wide variety of related fields. Joint degree programs and minors frequently require 24 additional units of work, making completion of all course requirements in nine quarters difficult if careful advance planning is not done.

Ph.D. MINOR IN ITALIAN LITERATURE

A minor in Italian Literature is offered for students from other departments. The requirements for a graduate minor are: (1) a minimum of 24 units of graduate coursework in Italian literature, and (2) a sound reading knowledge of the Italian language.

COURSES

FRENCH DIVISION

Note—Changes in course offerings after Courses and Degrees has gone to print are sometimes necessary. Students are advised to consult the department bulletin board regularly.

GENERAL

These courses are open to all undergraduate and graduate students, are taught in English, and do not require a knowledge of the French language.

105. The Writings of Albert Camus—Reading and discussion of all the major works: novels, plays, short stories, essays. Lectures and readings in English.

4 units, Spr (Cohn)

106. Literature and the Institution of Literary Study—(Same as Comparative Literature 100, English 265B, German 179D.) Overview of the emergence of the phenomenon of literature, of the institution of literary study in general, and of theoretical approaches to literature in particular. From ancient Greek rhetorical and poetical theory, tracks the changing shapes of ideas of literature and literary study from the Middle Ages through the present. Topics: the material culture of literary study and production (scribal vs. print vs. media cultures), the emergence of the concept of "national" literatures by the Romantic period, its institutionalization in the contemporary university and progressive decline (as in the Stanford "Western culture" debate and in the recurrent crises of literary theory from Russian formalism to deconstruction).

5 units, Win (Gumbrecht, Schnapp)


4 units, Win (Cohn)

191T. The Short Story in France—(See Overseas Studies, Tours Program.)

4 units, Win (Newman-Gordon)
The Education of Women—What have women been supposed to grow up to become in France? How were they to be cultivated for these ideals? How have the ideals of the education of women changed in France between the 16th century and the present? Major literary works and educational treatises by Montaigne, Poullain de la Barre, Molière, Marivaux, Rousseau, Condorcet, Balzac, Goncourt, Montherlant, Colette, de Beauvoir, and Sarraute.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Instructor</th>
<th>Units</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 units, Win (Hullot-Kentor)</td>
<td>Seminar: Aesthetic Currents in 20th-Century Theater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 units, Spr (Apostolides)</td>
<td>Expression and Interpretation Variations of a Theoretical Motive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 units, Aut (Gumbrecht)</td>
<td>FIRST- AND SECOND-YEAR LANGUAGE</td>
<td>Th 3:15-5:30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 Friday, September 21. Language courses with an “X” suffix (1-X, 2-X) normally have the same curricular goals as the corresponding number course (French 1, French 2) but are conducted with an experimental teaching and learning component (computer-assisted instruction, use of video, etc.). Entrance and exit testing is conducted for evaluation purposes along with systematic student evaluation of new techniques. These special sections are open to all interested students moving through the first- and second-year language series. Student “+ /No Credit” option is available. For further information regarding specific experimental courses, when offered, consult the instructor. Auditing is not permitted in participation language courses.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. First-Year French (Part 1)</td>
<td>Systematic acquisition of basic French grammar and vocabulary in the immediate reality of the classroom. Only French is used by the instructor and students. Multiple approach: listening-comprehension, oral expression, original oral, and written composition.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 units, Aut, Win, Spr (Staff) MTWTThF</td>
<td>1R. First-Year French (Part 1 Accelerated)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 units, Aut, Win (Staff)</td>
<td>1C. First-Year French (Part 1 Accelerated)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 units, Aut, Win, Spr (Staff) MTWTThF</td>
<td>2C. First-Year Conversation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 units, Aut, Win, Spr (Staff)</td>
<td>3C. First-Year Conversation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 units, Aut, Win, Spr (Staff) MTWTThF</td>
<td>5. Intensive French for Beginners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-12 units, Sum (Staff)</td>
<td>10. Reading French</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 units, Aut (Staff)</td>
<td>20C. Second-Year Conversation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 units, Aut, Win, Spr, Sum (Staff)</td>
<td>21R. Grammar Review</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FRENCH AND ITALIAN 429
training in speaking. 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.

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

26. Intensive Intermediate French—(Equivalent to 22 and 23.) Complete grammar review in conjunction with reading of selected French texts. Classroom discussions, entirely in French, focus on the reading material and topics of current interest. Written exercises, oral reports, written compositions, and work in the language laboratory. Prerequisite: one year of college French or equivalent preparation. No auditors permitted.
6-8 units, Sum (Staff) MTWTh

29. Business French—(Graduate students register for 129.) For students interested in business who need to function and communicate in the French-speaking business world. Readings and acquisition of specialized vocabulary, discussions, written work, including translations and business letters. Prerequisite: 22, or equivalent.
3-4 units, Aut (Morran)

30C. Conversation and Culture—France as seen through the writings of French and foreign authors. Oral presentations and discussions. Prerequisite: 23 or equivalent. May be repeated once for credit after an interval of two quarters.
2 units, Aut, Win, Spr (Staff)

UNDERGRADUATE SEMINARS

60. Introduction to French Language—Maison Française.
1 unit, Aut (Marshall)

61. French Culture—Maison Française.
3 units, Aut (Staff)

62. French Films: Eric Rohmer—Fables of Love and Light—Films from all periods of the director's work, including several of the Six Moral Tales and the recent meditations on desire, culture, and individuality. Emphasis on the extreme subtlety of Rohmer's mise-en-scène and the camera's physical relation to nascent personal

4 units, Win (Winchell)

63. French Theater Workshop.
3 units, Spr (Staff)

UPPER DIVISION COURSE NUMBERING SYSTEM

Only courses numbered 120 and above qualify as Upper Division courses.

Advanced Language: 120; 123-125; 129; 200-204; 210, 211; 293
Undergraduate Literature, Survey Courses: 130 to 132
Undergraduate Literature, Genres: 150-189
Advanced Undergraduate and Graduate Literature, Authors, and Themes: 213/313 to 269/369
Advanced Undergraduate and Graduate Literature, Culture and Theory: 270/370-298/398
Special Topic Courses: 219/319; 229/329; 239/339; 249/349; 259/359; 269/369; 289/389
Individual Work: 199; 399

Where relevant, the language in which a course is given is indicated in parentheses.

ADVANCED LANGUAGE

120. Advanced Conversation — Conversation and discussion centered on contemporary problems and based on French newspapers, magazines, or films. Prerequisite: 24 or equivalent. May be repeated once for credit after an interval of two quarters.
3 units, Aut, Win, Spr (Staff)

121. Pronunciation and Phonetics—(Graduate students register for 201.)
4 units, Win (Staff)

123. Advanced Grammar and Syntax—Oral and written language, grammar, textual analysis. Prerequisite: 24 or equivalent.
4 units, Aut, Win (Staff)

124. Advanced Stylistics and Composition—Designed to achieve a high level of proficiency in written French. In-depth textual analysis of excerpts from various literary genres (novels, poems, essays); creative writing centered on specific subject matters; introduction to literary criticism. (French) Prerequisite: 123 or equivalent.
4 units, Win, Spr (Staff, Hullot-Kentor)

125. Contemporary French Usage, Spoken and Written—Prerequisites: 123 and 124, or equivalent.
4 units, Spr (Staff)
129. Business French—(See 29.)
3-4 units, Aut, Spr (Morran)

SURVEY COURSES

130. French Literature I: Middle Ages and
Renaissance—Introduction to the literature and
culture of France from the 11th to the 16th
century. Readings from the epics (Song of Ro-
land), medieval romances (Yvain by Chréti-en
de Troyes), post-Petrarchan poetics (Du Bellay,
Ronsard) and prose humanists (Rabelais, Mon-
taigne). (French) Prerequisite: 24 or equivalent.
(DR:2)
4 units, Aut (Gazelles)

131. French Literature II: 17th and 18th Cen-
turies—Introduction to works of two centuries
of canonized authors in French literature (Cor-
belle, Racine, Molière, Voltaire, Rousseau, the
Marquis de Sade) and to the historical contexts
in which they lived, wrote, and were received;
the “Age of Louis XIV” and the “Century
of Enlightenment” (including the French Rev-
olution). The material aspects of writing and
reading, of printing and of book-distribution;
the emergence of “literature” as a social in-
stitution, and the functions which many French
texts dating between 1600 and 1800 have been
fulfilling in the European cultures. (In French.)
Prerequisite: 24 or equivalent. (DR:2)
4 units, Win (Gumbrecht)

132. French Literature III: 19th and 20th Cen-
turies—Representative readings from Hugo,
Flaubert, Balzac, Breton, Père, Queneau,
Duras, Yourcenar, Sagan. (In French.) Prereq-
uisite: 24 or equivalent. (DR:2)
4 units, Spr (Apostolidès)

132T. French Literature III: 19th and 20th
Centuries—(See overseas Studies, Tours
Program.)
4 units, Win (Newman-Gordon)

LITERATURE

Note—Prerequisites for the following courses
are normally 130, 131, or 132, or equivalent.

135. See under “General Courses.”
136. See under “General Courses.”

136. Medieval French Lyrics—Survey of the lyr-
ic tradition from the Troubadours (12th cen-
tury) to François Villon (15th century). Readings
in translation of courtly love, quest of the self,
nature and culture, emphasizing the social and
political significance of this particular textual
corpus. (In French.)
4 units, Win (Cazelles)

140. Renaissance I—Introduction to the language
and literature of 16th-century France. Textual
analyses of particular prose and poetic works
combined with a discussion of more general
topics of the Renaissance (humanism, evan-
gelism, neo-platonism, reformism, and skepticism).
Readings: Rabelais, Marguerite de Navarre,
Calvin, Du Bellay, Ronsard, Labé, and Mon-
taigne. (In French.)
4 units, Aut (Ahmed)

160. 18th-Century French Novel—The world of
satire, elegance, and erotic sophistication caught
in the dilemma of emotional, social and political
change. Montesquieu, Crébillon fils, Rousseau,
Diderot, Laclos, Sade. (In French.)
4 units, Win (Weinstein)

172. 19th-Century Novels: Romance, Realism,
Decadence—Constant, Stendhal, Balzac, Flaub-
ert, Barby d’Aurevilly, Zola, Maupassant,
Huysmans. (In French.)
4 units, Spr (Winchell)

191T. See under “General Courses.”
197. See under “General Courses.”

198. Language Specials—With special permis-
sion of the department only.
1-5 units (Staff)

199. Individual Work—Open only to majors in
French with permission of the department.
Normally limited to 4-unit credit toward the
major. See instructor for section number.
1-4 units (Staff) by arrangement

ADVANCED UNDERGRADUATE
AND GRADUATE

LANGUAGE

200. Textual Analysis.
4 units, Aut (Bertrand)

201. Pronunciation and Phonetics—Theory study
and corrective work: articulation, intonation,
rhythm, phonetic alphabet, etc.
4 units, Win (Staff)

203. History of the French Language—Historical
survey of the development of the French lan-
guage, from its origin to the present, from a
linguistic and sociological perspective. Discus-
sion of the relationship between linguistics and
literary studies.
4 units, Spr (Ahmed)

210. Old French Language—Introduction to the
Translation of excerpts reflecting the various gen-
res, in verse and in prose, of vernacular liter-
ature. (In English.)
4 units, Aut (Cazelles)
LITERATURE

234A. Baroque and Classical French Literature—Study of major Baroque and Classical works, D’Urfe, Corneille, Sorel, Cyrano de Bergerac, Guilleragues, Molière, Racine, La Fayette, and Fenelon. The social transformation of the literary work in the context of the rise of absolutism (the increasing control of the self; the relation of secularization and the history of language; the construction of civility; the birth of the “writer” and the development of a public sphere; the changing concept of love). (In French.)
4 units, Win (Hullot-Kentor)

236. Pascal—Study of Pascal’s Pensées and Provincialles in their political and religious context. (In French or English.)
4 units, Spr (Hullot-Kentor)

244. Montesquieu and Rousseau—Readings from L’Esprit des Lois and Le Contrat Social; “Discours sur l’Inégalité” and “Discours sur l’Economie Politique.” (In English.)
2-3 units, Win (Dupuy)

254. Flaubert: Allegories of Form—Flaubert’s oeuvre as a range of sub-genres re-inscribed within an architectonics of allegories: socio-psychological (Madame Bovary), historical (Salammbo), initiatory (L’Education Sentimentale), religious (La Tentation de Saint Antoine) and epistemological (Bouvard et Pécuchet). Trois Contes, selected juvenalia, and letters provide keys to the writer’s supremely logical codes for illogic. (In French.)
4 units, Win (Winchell)

258. Symbolist Poets—Baudelaire, Mallarme, Rimbaud, Verlaine, Valéry, Laforgue, Rilke, etc. Readings in French or bilingual texts. Discussion in English.
4 units, Aut (Cohn)

269D. Contemporary Francophone Literature: Africa, Caribbean—Authors: Césaire, Senghor, Mohamed Dib, Driss Chraibi, Simone Schwartz Bart, Maryse Condé, Sembene Ousmane, Camara Laye. (In French.)
4 units, Aut (Serres)

272A,B. Introduction to Post-War European Thought—(See Overseas Studies-Paris program.)
4 units, Aut (Girard)

277. French Critical Theory: Complexity and Self-Reference in the Humanities and Social Sciences—(In English.)
2-3 units, Win (Dupuy)

279A. See under “General Courses”.

280. The Contemporary Social Novel in France—Recent novels presenting aspects of contemporary French society: women, age groups, religious and cultural clashes, immigration, micro-societies, class struggle, etc. Authors: Simone de Beauvoir, Patrick Modiano, Joseph Joffo, Geneviève Dorman, Christiane Rochefort, Dorothee Letessier, etc. (In French.)
4 units, Aut (Bertrand)

284F. The Politics of Literature—(In French)
2 units, Aut (Chluskman)

285A. Limits of Economic Rationality I: The Nature of the Social Bond—Confrontation of three ways to account for society in an individualistic framework: the social contract (Hobbes, Rousseau), the “invisible hand” of the Market (Smith, Walras); society as a crowd (Tarde, Freud, Keynes.) Comparison with the Durkheimian tradition. (In English.)
2-3 units, Spr (Dupuy)

290. French Cultural History from Louis XIV to 1789 Revolution—(In French.)
4 units, Win (Bertrand)

GRADUATE LITERATURE

315. The Romance of the Rose—Intensive reading of one of the most popular literary texts of the French Medieval tradition. Comparison between Guillaume de Lorris and Jean de Meung emphasizing the role of the Rose as a metaphor of the process of artistic creation. Topics: writing and self-discovery; the “Mirror of Narcissus;” the rhetoric of enclosure; writing as power, the “poetics of continuation.” (In French or in English.)
4 units, Win (Cazelles)

331A. Corneille—(In French.)
2 units, Aut (Serres)

331B. Corneille—(In French.)
2 units, Spr (Serres)

336. Pascal—(See 236.)
4 units, Spr (Hullot-Kentor)

339A. The Body on the Stage: Theater in France, Spain, and Italy from 1600 to 1650—(Same as Comparative Literature 339A, Spanish 392.) The first half of the 17th century in Paris and Madrid marks the moment for the emergence of nationally specific forms of dramatic writing and theatrical institutions. Under the influence of the Italian tradition of commedia dell’arte, the Italian artistic culture of body-performance was “domesticated” in highly divergent ways on the French and the Spanish stages. Theater in France, Spain, and Italy between 1600 and 1650 is seen as a historical key-paradigm for the branching of European Culture into separate “national traditions,” and for the theoretical problem of a phenomenology of “the body on the stage.” (In English.)
3-5 units, Aut (Gumbrecht)
350. Mallarmé—(In English.)  
4 units, Spr (Cohn)

354. Flaubert: Allegories of Form—(See 254.)  
4 units, Win (Winchell)

370. From Zola to Sartre: Failed Theories and Great Novels—Authors read: Emile Zola, Huysmans, Céline, Malraux, Sartre. (In French.)  
4 units, Spr (Bertrand)

LITERATURE, THEORY, AND CULTURAL STUDIES  
See courses numbered 270/370 to 279/379 and 280/380 to 289/389 listed above.

GENERAL GRADUATE STUDIES

383. Methods of Teaching French—Approaches, methods, and procedures in relation to foreign language acquisition theory; teaching practice regularly observed in demonstration class.  
4 units, Spr (Staff)

397. Colloquium on Research Methods in French and Italian Studies—Acquaints graduate students with general and specialized resources for French and Italian studies. Emphasis on overall strategy for research, but provides an opportunity to explore bibliographical sources in students' particular fields of interest.  
2 units, Aut (Parrine)

18. Tutorials—Initiated by a professor. Tutorials are intended for three or more graduate students who wish to study on an informal basis a subject or an area not covered by regular courses.  
4 units, Aut, Win, Spr, by arrangement

19. Individual Work—Exclusively for graduate students in French working on a thesis or engaged in special work. See instructor for section number.  
1-12 units, any quarter (Staff)

ITALIAN DIVISION

Note—Changes in course offerings are sometimes necessary after Courses and Degrees has gone to print. Students are advised to consult the department bulletin board on a regular basis.

GENERAL

These courses are open to undergraduate and graduate students, are taught in English, and do not require a knowledge of the Italian language.

333. Dante's Divine Comedy—(Graduate students register for 333.) Intensive study of Dante's poem in relation to the culture and history of Medieval Europe. Topics: concepts of modernity and antiquity in the Middle Ages; gender and genre in Dante's Christian poetics; medieval and ancient theories/theologies of history; writing as rewriting in the Comedy; Dante and the natural sciences; Dante's Christianization of classical epics (Virgil, Ovid, Lucan, Statius); the Comedy and the theory of universal monarchy. Open to all students. (In English.) (DR:2)  
5 units, Aut (Schnapp)

250. The Italian Renaissance—(Graduate students register for 350.) Introduction to the development of vernacular literature in Italy from the beginning of the 14th century to the end of the 16th century, based on a variety of perspectives: humanist learning and Renaissance notions of history, the rise of individualism, the court society, state-craft, and the questionable status of the vernacular language. Selected readings in Italian (for majors) and in English (for non-majors) include Petrarch, Bembo, Machiavelli, Ariosto, Pico della Mirandola, Castiglione, and Gaspara Stampa. (In English.) (DR:2)  
4 units, Win (Ahmed)

FIRST- AND SECOND-YEAR LANGUAGE

Note—Students registering for the first time in a first- or second-year course must see the instructor for proper placement if they have had any prior training in Italian.

1. First-Year Italian (First Quarter)—Introduction to the Italian language with emphasis on speaking and oral comprehension.  
5 units, Aut, Win, Spr (Staff) MTWThF plus language lab

2. First-Year Italian (Second Quarter)—Same as 1 with emphasis on the development of reading and writing skills, and on Italian culture. Prerequisite: 1 or equivalent.  
5 units, Aut, Win, Spr (Staff) MTWThF plus language lab

2A. Italy Today—Conversation course providing general introduction to contemporary Italian life (Italian politics, popular culture, media, film, literature, and art) through readings and lectures. Prepares students for study at the Florence center. May be taken concurrently with 2 or 3. Prerequisite: 1 or equivalent.  
3 units, Win, Spr (Staff) MWF

3. First-Year Italian (Third Quarter)—Same as 1 and 2 with additional cultural and literary readings. Prerequisite: 2 or equivalent.  
5 units, Aut, Win, Spr (Staff) MTWThF plus language lab

3F, 51F, 52F, 198F. Intensive and Accelerated Italian—Offered only at Florence Center (consult Overseas Studies catalogue). 198F is 3 units only.  
5 units, Aut, Win, Spr (Staff)

5. Intensive First-Year Italian—Accelerated course in which two or three quarters of First-
Year Italian may be covered. 5A counts for 8 units and covers Italian 1 and 2 in 5 and 1/2 weeks. 5B represents 4 additional units and covers Italian 3 in 2 and 1/2 weeks.

8-12 units, Sum (Staff) MTWThF 9-11:50
plus language lab

7A, B, C. Individualized First-Year Italian—Same as 1, 2, 3. For graduate and undergraduate students who, having conflicts with normally scheduled courses, wish to complete 5 to 15 units at their own pace in regular consultation with the instructor. Students must submit an application to instructor and coordinator of the Italian language program during first week of classes.

1-15 units, Aut, Win, Spr (Staff)

10. Reading Italian—Accelerated course designed for acquisition of reading skills in Italian. Open to advanced undergraduates with consent of instructor; primarily for graduate students seeking to fulfill University foreign language requirements for advanced degrees. No auditors.

3 units, Win (Staff) MW

30A, B. Italian Conversation—Intermediate and advanced level conversation to improve spoken Italian. 30A is for students who have completed, or are in the process of completing, the first year of Italian. 30B is for students returning from the Florence program and/or who have completed one quarter of second-year Italian. Subject matter varies each term; 30A or 30B may be repeated for credit. Satisfactory/No Credit basis only. Prerequisite for 30A: 2 or equivalent. Prerequisite for 30B: 51 or equivalent.

2 units, Aut, Win, Spr (Staff)

51. Second-Year Italian (First Quarter)—Comprehensive review of Italian grammar combined with further study of advanced grammar and Italian culture through literary texts. Prerequisite: 3 or equivalent.

3-4 units, Aut, Win (Decine) MWF

52. Second-Year Italian (Second Quarter)—Same as 51 with emphasis on translation, stylistics, and composition. Prerequisite: 51 or equivalent.

3-4 units, Win, Spr (Mussio) MWF

53. Second-Year Italian (Third Quarter)—Continuation of 52. Prerequisite: 52 or equivalent.

3-4 units, Spr (Napolitano) MWF

198. Language Specials—With permission of the department only.

1-5 units (Staff)
Italian Renaissance—See General Courses.

333F. Dante's Divine Comedy—(In Florence.) The success of Dante's poem, at the end of the Middle Ages, established Florence as the center of culture in Europe and established Tuscan as the language of the Italian peninsula. Survey Dante's poem, studying it not as a literary artifact but rather as an "event" of great cultural and linguistic importance, the first great Florentine "chronicle". (DR:2)
4 units, Aut (Freccero)

345. Petrarch and Petrarchism—Readings from the Canzoniere, Epistolae, De Vita Solitaria, and Secretum, studied in relation to later developments in Petrarchan poetics in Italy (Ariosto, Gaspara Stampa, Tasso), Spain (García, Quevedo, Gongora), England (Sydney, Shakespeare), and France (Ronsard). Topics: Petrarch and Dante, Petrarch and the aesthetics of fragmentation, Pietro Bembo and the Petrarchan canon. (In English.)
4 units, Spr (Freccero)

RENAISSANCE

250. Italian Renaissance—See General Courses.

FROM THE BAROQUE TO THE MODERN

272. Italo Calvino in Translation—(Graduate students register for 372.) Calvino's development as a writer, analyzing the increasing complexity of his experiments with narrative structure and literary language, and the enduring component of fantasy in all his narrative works. (In English.)
4 units, Win (Harrison)

286. Italian Dialectology—(Graduate students register for 386.) Survey of the dialects of Italy emphasizing their distinctive characteristics and their historical and linguistic relationships to Standard Italian and to the other Romance languages. (In English.)
4 units, Spr (Zatti)

ADVANCED UNDERGRADUATE AND GRADUATE LITERATURE

THE MIDDLE AGES

333F. Dante's Divine Comedy—(In Florence.) The success of Dante's poem, at the end of the Middle Ages, established Florence as the center of culture in Europe and established Tuscan as the language of the Italian peninsula. Survey Dante's poem, studying it not as a literary artifact but rather as an "event" of great cultural and linguistic importance, the first great Florentine "chronicle". (DR:2)
4 units, Aut (Freccero)

345. Petrarch and Petrarchism—Readings from the Canzoniere, Epistolae, De Vita Solitaria, and Secretum, studied in relation to later developments in Petrarchan poetics in Italy (Ariosto, Gaspara Stampa, Tasso), Spain (García, Quevedo, Gongora), England (Sydney, Shakespeare), and France (Ronsard). Topics: Petrarch and Dante, Petrarch and the aesthetics of fragmentation, Pietro Bembo and the Petrarchan canon. (In English.)
4 units, Spr (Freccero)

380. Italian Narrative: Neorealism to the 70s—Topics: the birth of realism, the struggle, hopes for a social awakening and the attempts to find a suitable language to express the needs of the novel. The aspects of north and south (Calvino, Pratolini, Rea, Levi, etc) and the critical debate on neorealism and the economic boom. The new avantguard and its critics (the Group of 1963, Sanguineti, Balestrini/Pasolini), Gadda's influence and neoexperimentalism (Manganelli, Volponi). Concentrates on different writings, views on literature that form the basis of literary research in Italy today. (In Italian.)
4 units, Win (Pfeiffer)

386. (See Intermediate Level Literature)

397. Reading Course on the History of the Italian Language—See 197 under Advanced Language and Civilization.

399. Individual Work—For undergraduates working on a special project (an honors essay) in the field of Italian studies. May be repeated for credit. See instructor for section number.
1-15 units, Aut, Win, Spr, Sum (Staff) by arrangement

GRADUATE

4 units, Spr (White)

430. A Reading of Orlando furioso and Gerusalemme liberata—Readings concentrate on the theoretical arguments of narrative style in the
mid-16th century. Analysis of the formal and ideological differences of knightly romance and modern epic poetry.

4 units, Spr (Zatti)

457. Writing and Cookery: Towards a Literary Anthropology of Food—(Same as Comparative Literature 457.) Graduate seminar tracks the literal and figurative overlap between the realms of writing and food. From Plato’s dialogues which link cookery to Sophistry through the Greco-Roman cook’s comedy to Roman satire (a genre rooted in a culinary analogy) and beyond. The role of food preparation, presentation, and consumption in a literary-anthropological light.

Topics: Petronius’s Banquet of Trimalchio, Goliardic song, devilry and cookery in Dante’s Inferno, food in Rabelais and “Macaronic” literature (Folengo). Brillat-Savarin’s La Physionomie du goût, Nietzsche’s notions of diet, and Marinetti’s Futurist Cookbook. Secondary readings: Levi-Strauss, Bynum, Elias, Detienne and Vernant. (In English.) Enrollment limited to 12.

3 units, Aut (Schnapp)

460. Graduate Workshop on Pedagogy—Introduction to the theory and practice of teaching Italian, with frequent observations of a demonstration class taught by the master teacher, and regular class visitations.

2 units, Spr (Napolitano)

462. Research Seminar on the Baroque—Baroque poetics studied within the broad setting of social and cultural history of the 17th century.

Topics: counter-reformation cultural politics; the growing impact of academics on the arts; the evolution of rhetorics of wit (Gracian, Pelligrini, Tesauro); and Baroque conceptions of aesthetic awe and monstrosity (Longinus). Authors and texts may include: Marino’s L’Adone, Gongora’s Soledades, Quevedo’s Buscon, a play by Lope de Vega and selected poems of John Donne. (In English.)

5 units, Win (Schnapp)

497. Colloquium on Research Methods in French and Italian Studies—Acquaints graduate students with general and specialized resources for French and Italian studies. Emphasis on overall strategy for research, but provides an opportunity to explore bibliographical sources in each student’s particular field of interest. Required of all first-year graduate students.

2 units, Aut (Parrine)

498. Ad Hoc Graduate Seminars—Initiated by a group of three or more graduate students, ad hoc seminars can be set up under the sponsorship of an interested faculty member to study a subject or an area not covered by the department’s regular offerings. Arrangements must be made at least one term in advance.

1-5 units, Aut, Win, Spr, Sum (Staff) by arrangement

499. Individual Work—For graduate students engaged in work on a special project in the field of Italian studies. May be repeated for credit. See instructor for section number.

1-15 units, Aut, Win, Spr, Sum (Staff) by arrangement

500. Dissertation Research—Exclusively for graduate students in Italian working on dissertations.

1-12 units, Aut, Win, Spr, Sum (Staff) by arrangement

OVERSEAS STUDIES

The following are approved for the Italian major and taught overseas at the campus indicated. Students discuss with their major advisor which courses best meet individual educational needs. Descriptions are in the “Overseas Studies” section of this bulletin or at the Overseas Studies Program office, 126 Sweet Hall.

3F. First-Year Italian, Third Quarter—Florence

5 units, Aut, Win, Spr (Staff)

51F. Second-Year Italian, First Quarter—Florence

5 units, Aut, Win, Spr (Staff)

52F. Second-Year Italian, Second Quarter—Florence

5 units, Aut, Win, Spr (Staff)

198F. Italian Language Specials—Florence

3 units, Aut, Win, Spr (Staff)

295F. The Country and the City in the Modern Italian Novel from Manzoni to Italo Calvino—Florence

4 units, Win (Freccero)

333F. Dante’s Divine Comedy: the Influence of Florence—Florence

4 units, Aut (Freccero)
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 in English and German literature is available, as are coterminal programs for the A.B. and A.M. degrees in German Studies, and joint programs for the Ph.D. degree with the Graduate Program in 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, and slides.

On the occasion of the U.S. Bicentennial, the Republic of Austria endowed the Distinguished Visiting Professorship in Austrian Studies. The Distinguished Visiting Professorship in Comparative Western European Studies is funded by the Federal Republic of Germany. There is also a Distinguished Visiting Professorship in Swiss Studies, funded in 1989 by sources in Switzerland. These three professorships rotate on a yearly basis through several departments. Haus Mitteleuropa, the German theme house at 620 Mayfield, is an undergraduate residence 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 German Culture Studies, as described below.

**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 Lohnes.

After completion of basic courses, majors normally select at least two German courses per quarter. The total requirement for the A.B. is a minimum of 50 units of work beyond the basic courses (1 through 22 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**—Required courses are 203 (History of the German Language), 211 (Syntax of Modern German), and 212 (Linguistics and the Analysis of German). Further coursework may fall into any one of the following fields or a combination of them: (1) contrastive linguistics and language pedagogy (teaching methods, curricular problems, error analysis); (2) historical German and Germanic linguistics (Introduction to the Germanic Languages, Old High German, Middle High German, Old Saxon, Old Norse, etc.); or (3)
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**—Required courses are 150 and at least three approved courses at the 160 level. 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 concentrating in this area should take 150 and must take the Geistesgeschichte series (241-243) and normally one seminar. Students may want to organize elective courses around certain themes or sets of problems according to their interests and choose from among the offerings of German, English, French, philosophy, history, religious studies, and other appropriate disciplines.

**German Culture Studies**—This program allows 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: (1) at least 30 units of German courses beyond the 22 level, including at least four approved courses at the 130 and 160 level (130 may not be counted toward this requirement); and (2) 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 normally participates in at least one Stanford Overseas Program.

**HONORS**

Majors with a minimum letter grade indicator of "B+" in German courses are eligible for departmental honors. In addition to requirements listed above, each honors candidate submits an essay representing 6 to 9 units of academic work. The essay topic is 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 chairman of both departments. See the "Department of English" section of this bulletin.

**MULTIPLE MAJORS**

Students can combine a major in German Studies with a major in any other field. By carefully selecting courses in such disciplines as history, international relations, or economics, students can prepare themselves exceptionally well in the area of Central Europe. Multiple majors are especially recommended for students spending one or more quarters at the Stanford Center in Berlin.

**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 center in Berlin is given in the bulletin Overseas Studies, including description of its courses in language, literature, culture, and other fields of Central European studies. Most credits earned in Berlin can be applied to the undergraduate major in German Studies. Students with the equivalent of two years of German are eligible to take courses at the Free University in Berlin.

**STANFORD TÜBINGEN GRADUATE EXCHANGE**

Annually one or two Stanford graduate students in German Studies are accepted as exchange students by the University of Tübingen, and their counterparts from Tübingen 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.

**CERTIFICATION OF PROFICIENCY IN GERMAN**

In accordance with standards developed by the American Council on the Teaching of Foreign Languages and the Educational Testing Service, the department certifies a student's proficiency on three levels: intermediate, advanced, and superior. This certification is not tied to the number of courses taken, but is a measurement
GRADUATE PROGRAMS

MASTER OF ARTS

This program is designed for those students who do not intend to continue 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:

1. 201 and 202. Language and Style.
2. 211/311. Syntax of Modern German.
3. A minimum of four courses, with at least one course in each of the three areas of concentration: 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 related courses in the Central European field, in such departments as Political Science, Economics, Anthropology, and History.

A. M. candidates must take an 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 this 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 "School of Education" section in this bulletin.

DOCTOR OF PHILOSOPHY

The requirements for the Ph.D. include: (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 language other than English and German, normally French; (3) a master's oral examination, unless the student already has an A.M. upon entering the program; (4) a qualifying paper; (5) a qualifying examination, (6) the University oral examination; and (7) a dissertation. Students in Medieval Studies must also have a reading knowledge of Latin.

The first year of work, which leads to the A.M. degree, is designed to introduce each student to the three major areas of study. During Spring Quarter of the first year, all students, except those admitted with a master's degree, must take an oral A.M. examination. During the one-hour examination, the student is questioned by three examiners, chosen by the student, on work undertaken in specific graduate courses.

During the summer following the first year of graduate study, students research and write a qualifying paper. Although ordinarily not meant to represent an original contribution to scholarship, it should demonstrate the candidate's ability to grasp complex subject matter with sufficient competence, to organize materials, and to present arguments in a clear and concise manner commensurate with scholarly standards. After completion, before the beginning of the fourth quarter of study, the paper is submitted to the department chair, who passes it on for approval by the student's faculty advisor and a second reader appointed by the chair in consultation with the advisor.

Students who enter the program with a master's degree from another institution must submit, in lieu of a qualifying paper, a master's thesis or a major research paper as evidence of ability to pursue advanced scholarly work.

At the end of the sixth quarter of study (and only if the qualifying paper has been accepted), the student takes a one-hour oral qualifying exam with two examiners, the student's chosen advisor and another faculty member appointed by the chair. The purpose of this examination is to demonstrate a broad familiarity with the literature of the major periods, movements, and some major figures. The department does not legislate a canonic list. Instead, the student should, upon consultation with faculty members, compose a list that displays broad coverage of the material. The length of the examination list varies, but 50 items of various sorts (novels, poems, philosophical excerpts, etc.) might serve as a target figure. Together, the qualifying paper and the qualifying exam constitute the departmental qualifying procedure. Only after successful completion of the qualifying procedure will the department approve the student's admission to candidacy.

A student who fails the qualifying examination may retake it once at the beginning of the seventh quarter. Students with heavy minor requirements (or in joint-degree programs such as the Graduate Program in Humanities) may postpone the qualifying examination from the end of the sixth to the beginning of the seventh quarter, thereby gaining additional summer reading time.

The University oral examination in the Department of German Studies consists of an area
examination; on consultation with the four prospective examiners, the student prepares a specialized list of relevant literature from an area of concentration, as well as appropriate secondary literature. The area of concentration will be considerably broader than a dissertation topic but nevertheless allows for intensive work. Examples of areas of acceptable scope are: a 100-year period with some thematic emphasis, problems emerging from a particular genre in various contexts, a major literary movement, institutional setting, or discursive structure.

At least two weeks before the examination date, the student distributes the definitive version of the bibliography as well as a “position paper,” approximately 25 pages in length, addressing a major issue in the area of study. The examination consists of questions regarding this paper and the area of bibliography. The examination lasts at least two hours, permitting each of the four examiners a 30-minute question period and reserving an optional 10 minutes for questions from the chair of the examination.

Within three months of successful completion of the University oral, the student must submit a dissertation proposal to the department, approved by all members of the reading committee. The topic of the dissertation normally is directly related to the area of concentration in the University oral.

Students, regardless of their future fields of concentration, are expected to acquire near-native proficiency in German and thorough knowledge of the grammatical structure of German. Students are urged to take 311, Syntax of Modern German. The department expects Ph.D. candidates to demonstrate teaching proficiency in German; 302, Methods of Teaching German, is required. The teaching requirement is six quarters during the second and third years of study.

The department expects candidates to demonstrate research skills appropriate to their special areas of study. The requirement can be fulfilled in the capacity of either a University Fellow or a Research Assistant.

Graduate students are also advised to start developing skill in the teaching of literature by participating in the teaching of undergraduate literature courses. Students can earn up to 3 units of graduate credit for practice teaching in literature.

During the first year, graduate students planning to continue through the Ph.D. take essentially 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 intellectual identity on the basis of actual experience.

Under any concentration, electives chosen from graduate-level courses in German or approved 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.

AREAS OF CONCENTRATION

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 comparative English-German linguistics, methods of teaching German, historical German 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:

201 and 202. Language and Style

203. History of the German Language

or 312. Linguistics and the Analysis of German

208A. Introductory Middle High German

304. Gothic or 305. Old Norse

or 306. Old High German

or 307. Old Saxon

311. Syntax of Modern German

313. Transformational Grammar of German

or 314. Phonology of German

Three courses in German Literature and in German Thought, with at least one course in each.

Literature—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 require final examinations but not term papers. Seminars, of which the student is expected to take a minimum of two after the first year, require research papers.

During the first year, students normally take:

201 and 202. Language and Style

208A. Introductory Middle High German

Two courses in German Literature, preferably in the 350-series. One seminar in German Literature.

Two courses in German Thought, preferably Geistesgeschichte I and II.

One course in German Language and Linguistics.

German Thought—Requirements are a minimum of two courses or seminars per quarter for at least four of the six quarters following the
first year, to include four courses or seminars in the 340 and 400 series and four courses or seminars in the 351-390 series. Lectures and colloquia require final examinations but not term papers. Seminars, of which the student is expected to take a minimum of two after the first year, require research papers. Students are advised to take some electives outside the department, related to their field of interest.

During the first year, students normally take:

201 and 202. Language and Style
203. History of the German Language
241. Deutsche Geistesgeschichte I
242. Deutsche Geistesgeschichte II
243. Deutsche Geistesgeschichte III

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).

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 “Humanities Special Programs” section 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, linguistics, or history. Students who are obtaining a Ph.D. in such combinations may require additional training.

COURSES

OVERVIEW

General Courses (given in English)
Introductory Courses (1-99)
Intermediate Courses (100-199)
Language (100-119)
Culture (130-139)
Literature (150-179)

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: 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)

Courses for Advanced Graduate Students (400-499):

Seminars and colloquia on special topics

Interdepartmental courses

Independent Study:
Undergraduates (199)
Graduates (298)
A.M.-level qualifying paper (301)
Dissertation research (400)

GENERAL

GIVEN IN ENGLISH

These courses do not require a knowledge of German, and are open to all students. German majors taking these courses as a part of their requirements must do the assigned reading in German.

31A-33A. German Culture and Civilization I-III—(See also 131-133.) 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. Students may enroll in any part of the series.

31A. Central Europe: Geography, Institutions, and Society—A survey of geography, people, and institutions of the German-speaking areas of Central Europe—contemporary situation and historical origins. Topics: recent developments in Central Europe (Mitteleuropa)—the “German Question”; Germany, Austria, and the nations of E. Central Europe; changes in the political geography since 1871; governments and political parties in Germany, Austria, and Switzerland. Social structure and demographic changes—Flüchtlinge, Aussiedler, Umsiedler, Gastarbeiter; Central Europe and the European Community; restructuring the Educational System. The German language—standard and dialects. (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, emphasizing literature, music, painting, and architecture. The connections to broad intellectual and historical developments. The works of Hofmannsthal, Mahler, Freud, Schönberg, Kandinsky, Gropius, Brecht, and Mann. (DR:2)

3 units, Win (Schmidt-Dengler)

33A. Democracy, Protest, and Political Culture in German-Speaking Europe—Central issues in German thought since 1945, with reference to the political context. “Overcoming the past,” the confrontation with the Holocaust, and the recent “historical debate.” The Adenauer years as a period of political and cultural restoration, challenged by the student protests of the 1960s. Terrorism, feminism, the Greens, peace movement, and
new sensibility. Marxism in the German Democratic Republic and dissident thought. The question of German (re)unification.

(DR:3)

3 units, Spr (Schlossbauer)

168A. Hesse, Kafka, Mann—(Same as 268A.) The three internationally best-known prose writers of German modernism. Their differences and resemblances, artistic heritages, major themes, styles, and contributions to the age of “Myth and Psychology.” Readings: selected short stories and the novels Steppenwolf, Buddenbrooks, Felix Krull, and The Trial.

3-5 units, Aut (Gillespie)

170A. Brecht and Modern German Drama—Plays by Austrian, Swiss, and German authors, concentrating on their contribution to contemporary political and cultural debates, and on their innovations of dramaturgy. Texts by We- dekind, Brecht, Dürenmatt, Weiss, H. Müller, Bernhard, and others. Readings and discussion in English.

3-5 units, Win (Schlossbauer)

268A. Hesse, Kafka, Mann—(Same as 168A.)

3-5 units, Aut (Gillespie)

284A. Joyce, Proust, Mann—(Same as 384A.) Themes-, structures, and mythopoetic dimensions of the novel in the context of Modernism. Joyce, Proust, and Mann as synthesizers and interpreters of the historical situation (“Decline of the West,” contending-isms, WWI, etc.), forms of consciousness (Bergson, Nietzsche, Freud, Jung, et al) and artistic expression (opera, painting, cinema, etc.) of their age.

3-5 units (Gillespie) given 1991-92

384A. Joyce, Proust, Mann I—(Same as 284A.).

3-5 units (Gillespie) given 1991-92

INTRODUCTORY

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

1,2,3. German Language and Culture—Comprehensive, balanced introduction to listening and speaking, and reading and writing.

5 units, Aut, Win, Spr (Staff)

2C. Conversational German—Enables the student to understand, and to express himself in simple, spoken German. Especially for students going to Berlin. Prerequisite: at least one quarter of first-year German.

3 units, Aut, Win Spr (Staff) MWF 10

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 (Petig) MWF 12

5. Intensive First-Year German—Equivalent of 1, 2, and 3 combined. Enrollment limited.

12 units, Sum (Staff) MTWThF 8:30-10 and 10:30-12

10. Elementary German for Seniors and Graduate Students—Intensive course 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.

4 units, Win (Petig) MTWTh 9

11P. Individually Programmed Beginning German—For those who wish to complete more or less than 5 units a quarter, or have a spotty background, or have scheduling conflicts, or 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.

3-12 units, Aut, Win, Spr (Staff)

15D. Beginning Dutch—(Enroll in Linguistics 640.)

3 units, Aut, Win, Spr (Staff)

HAUS MITTELEUROPA

20A. Beginning Conversation.

1 unit, Aut, Win, Spr (Staff)

20B. Intermediate Conversation.

1 unit, Aut, Win, Spr (Staff)

20C. Advanced Conversation.

1 unit, Aut, Win, Spr (Staff)

20M. Filmkunst aus Mitteleuropa.

1 unit, Aut, Win, Spr (Staff)

Other in-house courses will be announced.

SECOND-YEAR

21. Intermediate German I—Continues the balanced approach of 1, 2, and 3, including the systematic review of German structure, and the reading and discussion of short prose texts. Prerequisite: 3 or 4.

3 units, Aut, Win, Spr (Staff)

21C. Intermediate Conversation—Builds on the skills developed in 2C. Students are encouraged to develop fluency in expressing their own thoughts in German. Suggested continuation: 100C.

3 units, Aut, Win, Spr (Staff) MWF 10
22. Intermediate German II—Continuation of 21, with greater emphasis on reading and writing skills. It is the final course in the introductory sequence. Prerequisite: 21. Suggested continuation: 21C, 101, 130, or 150 series.
4 units, Aut, Win, Spr (Staff)

52A-F. Readings in Other Disciplines—For students with a knowledge of German (one year or equivalent) who want to acquire reading proficiency in various disciplines. Reading materials include excerpts from scholarly works and professional journals. Students may introduce material they need to read for their coursework or research. Some departments accept the course in lieu of the Ph.D. reading exam. Open to undergraduate and graduate students.

52A. Readings in Economics.
3-4 units (Staff) alternate years, given 1991-92

52B. Readings in History.
3-4 units (Staff) alternate years, given 1991-92

52C. Readings in Art History—(Same as Art 190X.)
3-4 units (Staff) alternate years, given 1991-92

52D. Readings in Political Science and International Relations—(Same as Political Science 112D.)
3-4 units, Aut (Staff)

52E. Readings in Music and Music History.
3-4 units, Win (Staff)

52F. Readings in Philosophy and Religious Studies—(Same as Religious Studies 52F.)
3-4 units, Spr (Staff)

65. Business German—Reading and discussions in German of texts dealing with the business world, i.e., economics, banking, stock market, import-export trade, Common Market. Includes a review of basic German structures. Prerequisite: 3 or the equivalent of one year of college German.
3-4 units, Spr (Petig)

60,70. Intensive German—Given only in Berlin. See “Overseas Studies” section in this bulletin.
Aut, Win, Spr

INTERMEDIATE

100C. Advanced Listening and Speaking Skills—Increases fluency and precision in speaking and builds listening comprehension. Audio- and videotapes, discussions, presentations, vocabulary building exercises, interviews with native speakers. May be taken twice for credit. Prerequisite: 21C or equivalent.
3 units, Aut, Win, Spr (Staff) MWF 10

101. Reading and Writing Modern German I—Short fictional and expository texts are read and discussed. Students write short essays. Exercises cover important points of grammar, idiomatic usage, and vocabulary building.
3 units, Win (Turneaure)

102. Reading and Writing Modern German II—Continuation of 101.
3 units, Spr (Turneaure)

103. Television News from Germany and Austria—Training in listening comprehension based on TV newscasts from Central Europe.
2 units, Spr (Lohnes)

118. Introduction to German Dialects—(Same as 218, Linguistics 176) Introduction to the major dialects of German-speaking Europe through texts, tapes, lectures, and presentations by native speakers; also, an introduction to the dialect geography. (DR:4)
3 units, Spr (Robinson)

130. German Newspapers—Articles of current interest in German newspapers read and discussed in German. May be taken twice for credit. Prerequisite: 22 or equivalent.
3 units, Aut (Strachota) Spr (Turneaure)

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 131, 132, or 133 and participate in a supplementary section in which further material is 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—Prerequisite: 22, or consent of instructor. (DR:5)
4 units, Aut (Lohnes)

132. The Culture of Modernism in Austria and Germany—Prerequisite: 22 or consent of instructor. (DR:2)
4 units, Win (Schmidt-Dengler)

133. Democracy, Protest, and Political Culture in German-Speaking Europe—Prerequisite: 22 or consent of instructor. (DR:3)
4 units, Spr (Schlossbauer)

150. Introduction to German Literature—Texts (short prose, poetry, and drama) ranging from the classical to the modern period. Introduction to key concepts of major literary periods and of literary criticism. Readings by Lessing, Goethe, Schiller, Hölderlin, Hoffman, Eichendorff, Büchner, Heine, Nietzsche, Thomas Mann, Kafka, Brecht, and Christa Wolf. (DR:2)
4 units, Aut (Turneaure)
151-157. The 150 series introduces German literature in various genres. Prerequisite: 22 or equivalent.

153. Contemporary German Drama—Study of selected plays representative of major authors and trends in German theater since 1945. Readings of Brecht, Dürrenmatt, Frisch, Weiss, Handke, Kroetz, and Plenzdorf. Performances, films, tapes, and videotapes. (DR:2)

4 units, Spr (Strachota)

154. Modern Short Prose—Readings reflect historical events and cultural tendencies of 20th-century Central Europe. Nietzsche, Mann, Rilke, Brecht, and contemporary authors, including women such as Wolf and Aichinger. (DR:2)

4 units, Win (Turneaure)

161. The Classical Period—Introduction to the major authors, works, and literary movements of the 18th century in historical context. Emphasis on the Enlightenment and the countermovements of “Storm and Stress.” Rise of Weimar classicism against the background of Winckelmann’s aesthetics of Greek art (“noble simplicity and quiet grandeur”). Examinations of dramas, narratives, lyric poetry, and essays by Lessing, Lichtenberg, Goethe, Lenz, Schiller, Hölderlin, and others.

4 units, Aut (Mommsen)

162. Romanticism and Realism—Introduction to the major literary trends of the 19th century in their historical context. Romantic lyric, novella, Kunstmärchen, cultural pessimism in the period after Goethe’s death, poetic theory and the critique of romanticism, the countermovements of Junges Deutschland and Vormärz; transition to realism, realist theory and prose, new literary forms. Readings from Novalls, Brentano, E. T. A. Hoffmann, Tieck, and others.

4 units, Win (Mommsen)

163. Naturalism to the Present—Introduction to major literary trends since the end of the 19th century emphasizing the changing status of the author. Aestheticism, and expressionism; literature in the Weimar Republic; the impact of fascism and exile culture; the writer in E. and W. Germany and current developments. Readings by Heinrich and Thomas Mann. Tucholsky, Brecht, Horvath, Böll, Becker, and Enzensberger.

4 units, Spr (Schmidt-Dengler)

171-178. Introduces the specific developments and topics of German literature and culture with some emphasis on methods of literary interpretation. Prerequisites: 22 and two additional courses or consent of instructor.

174D. Friedrich Nietzsche—(Same as Religious Studies 174D.) Theory of culture and religion.

5 units, Spr (Harsey)

179. Special Topics—Explores the possibility of interdisciplinary studies and research in areas of special interest: women authors, social satire, political speeches, Freud and literature, literature in the German Democratic Republic.

179D. Literature and the Institution of Literary Study—(Same as Comparative Literature 100, English 265B, French and Italian 106.) Overview of the emergence of the phenomenon of literature, of the institution of literary study in general, and of theoretical approaches to literature in particular. From ancient Greek rhetorical and poetical theory, tracks the changing shapes of ideas of literature and literary study from the Middle Ages through the present. Topics: the material culture of literary study and production (scribal vs. print vs. media cultures); the emergence of the concept of “national” literatures by the Romantic period, its institutionalization in the contemporary university and progressive decline (as revealed in the Stanford “Western Culture” debate and in the recurrent crisis of literary theory from Russian formalism to deconstruction).

5 units, Win (Gumbrecht, Schnapp)


4 units, Win (Hamrdla)

179Z. Nietzsche and the Politics of Post-Structuralism—(Same as Comparative Literature 101.) Rigorous introduction to Nietzsche’s semiotics of power and its influence on post-structuralist discourse (Foucault and Derrida). The politics of style, truth, knowledge, value, morality, subjectivity, and art through Thus Spoke Zarathustra. Limited to 15 students.

5 units, Spr (Brown, Franke)

199. Individual Reading—36 hours of reading per unit, weekly conference with instructor. May be repeated for credit. Enrollment only by permission of the department. Prerequisite: 22 or consent of instructor.

1-2 units, Aut, Win, Spr (Petig) by arrangement
ADVANCED UNDERGRADUATE AND GRADUATE

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, Win (Lohnes)

202. Language and Style II—Continuation of 201.
2 units, Spr (Lohnes)

203. History of the German Language—(Same as Linguistics 276.) Introduction to the phonological and syntactic development of modern German from the Germanic parent language. The analysis of selected texts and the consultation of linguistic works on the subject.
3 units, Aut (Robinson)

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 1991-92

208A. Introduction to the Middle High German—Emphasis on basics of grammar and rapid reading.
3-5 units, Win (Robinson)

208B. Advanced Middle High German—Readings in courtly epic and romance.
3-5 units, Spr (Andersson)

211. Syntax of Modern German—(Same as 311.) Contrastive analysis of English and German syntax.
3-5 units, Spr (Lohnes)

218. Introduction to German Dialects—(Same as Linguistics 176.)
3 units, Spr (Robinson)

222S. Seminar: Clause Subordination in Early High German—(Same as Linguistics 279.) Investigation of subordinate structures in Old High German primarily based upon a study of the Old High German Isidor translation. Secondary sources are also consulted.
3-5 units (Robinson) given 1991-92

241-243. The history of German thought from 1750 to the present and its significance for an understanding of modern culture. Authors: Herder, Hegel, Schiller, Marx, Nietzsche, Freud, Husserl, Wittgenstein, Marcuse, and Adorno. Given in German in alternate years (1990-91).

241. Deutsche Geistesgeschichte I—From Leibniz to Romanticism. Delineates major intellectual shifts of the 18th century; the concept of human knowledge, of religion, of history, of the nature of man, and of art were revolutionized and given a new basis. Centered on readings and detailed interpretations of texts by Lessing, Kant, Herder, Schiller, Fichte, Schlegel, and others.
3-5 units, Aut (Schlossbauer)

242. Deutsche Geistesgeschichte II—A study of key texts by Hegel, Marx, Nietzsche, and Weber.
3-5 units, Win (Rohrwasser)

3-5 units, Spr (Mueller-Vollmer)

248F. Freud and Literature—Study of the complex relationship between psychoanalysis and literature: literary influences on Freud, Freud's interpretations of literature, and the competition between psychoanalysis and literature as analytic vehicles. Readings include Freud's major texts on literature.
3-5 units, Spr (Rohrwasser)

248L. Goethe, West-östlicher Divan—(Same as 348L.) Explication and interpretation of Goethe's most extensive lyrical cycle, which grew out of his encounter with the Medieval Persian poet Hafiz. Seminar focuses on such themes as world wisdom, love, euphoria, and the importance of poetry for the spiritual well-being of the human race. The Noten und Abhandlungen is discussed as the sum of his insights on politics, forms of government, ethnology, religion, and the role of the poet within the society.
3-5 units, Spr (Mommsen)

251-259. German Literature and Culture I-IX—(Same as 351-359.) The major periods of German literature from the early Middle Ages to the present. Open to undergraduates by consent of instructor only.

256. Literature, Aesthetics, and the Process of Civilization—A new approach to literature, using Norbert Elias' theory of the process of civilization as its framework. Major changes in the perception and norms regulating the body, in the emotional, psychic, and intellectual constitution of the self in terms of their impact on literary aesthetics. Focuses on 16th-and 18th-century texts and issues of Grobianismus, grotesque, high-low-opposition, the
ugly, the controversy about imagination and the fantastic, the structural composition of literary texts, and the changing limits of poetic license.

3-5 units, Win (Schlossbauer)

258B. The Avant Garde in Austria—(Same as 358B.) The central role of the avant garde and its opponents in 20th-century Austrian literature; a reconstruction of the complex and repressed history of the avant garde; relations to the broader European context (dada, concrete poetry) and critical accounts (Enzensberger, Bürger). Readings of Austrian expressionism, experimental literature, and post-war developments (“Wiener Gruppe,” Jandl).

3-5 units, Win (Schmidt-Dengler)

258C. Contemporary Austrian Literature—(Same as 358C.) A study of the relative prominence of Austrian literature in the German publishing industry since the middle of the 60s. Individual texts analyzed with reference to the social and political situation in the 2nd Republic and with regard to their reception in Austria and abroad. Readings from Bernhard, Handke, Jelinek, Jonke, Mayröcker, Ransmayr, Wolfrüger, and Haslinger.

3-5 units, Spr (Schmidt-Dengler)

258G. Literature of the GDR—A retrospective consideration of German literature in the wake of the recent political transformation. Representations of GDR society and history, as in the novels of Christa Wolf; the status of myth in socialist literature.

3-5 units, Spr (Rohrwasser)

260-269. Major Authors—In-depth study of a major writer in his or her literary creativity, relation to age, or special achievements and significance. Writers include Walther von der Vogelweide, Grimmelshausen, Wieland, Lessing, Goethe, Novalis, Tieck, Kleist, Fontane, Nietzsche, Hofmannsthal, Thomas Mann, Kafka, Brecht, etc.

266. Heinrich Von Kleist—(Same as 366.) In depth study of Kleist’s works, including his letters and essays focusing on problems of genre, the constitution and self reflection of fiction, textuality and selfhood, aesthetic and psychic dichotomies evaluated in the context of intellectual and literary history.

3-5 units, Spr (Schlossbauer)

270-279. Genres—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 and autobiography.

274. The German Ballad from the 18th Century to the Present—Overview of the occurrence and function of the ballad within world literature, its most flourishing periods in various cultures and regions. Ballad theory; definition of the genre as a mixed form, blending epic, dramatic, and lyric features; distinctions between “folk ballad” and “literary ballad.” The influence of older Scottish and English models on the development of the German ballad in the 18th century. Ballads by Bürger, Goethe, Schiller, Heine, Mörike, Fontane, C. F. Meyer, Grass, Biermann, and others.

3-5 units, Win (Mommsen)

290-299. Special Subjects and Problems—Variable topics.

294. Stalinism and Literature—A study of the anti-fascist German exile with regard to the polarization caused by the Moscow Trials and the Hitler-Stalin Pact; the role of literature in the critique of Stalinism; comparisons to French and Anglo-American authors such as Gide, Dos Passos, Koestler, and Orwell.

3-15 units, Win (Rohrwasser)

298. Individual Work—Open only to German majors and to students who are working on special projects. Students taking honors in German use this number for the honors essay. May be repeated for credit.

1-15 units, each quarter (Staff) by arrangement

302. Methods of Teaching German—(Same as Education 291.)

2 units, Aut (Petig)

303. Curricular Problems—Given on request only.

3 units (Lohnes) by arrangement

306. Old High German—(Same as 206.) Introduction to the grammar and documents of the earliest attested stage of High German

3-5 units (Robinson) given 1991-92

311. Syntax of Modern German—(Same as 211.)

3-5 units, Spr (Lohnes)

342. Expression and Interpretation: Variations of a Theoretical Motive—(Same as Comparative Literature 369, English 369, and French and Italian 279A.) The concept “expression bears overlooked implications which have only recently been seen as a specific feature of Western culture. This has opened a new reading of theories of language, discourse, and literature.
Seminar focuses on different theories as variations of a motive. Topics: the romantic origins of academic literary criticism, Hermeneutics, New Criticism, psychoanalytical interpretation, Russian Formalism, deconstruction, and New Historicism.

5 units, Aut (Gumbrecht) Th 3:15-5:30

348L. Goethe, West-östlicher Divan—(Same as 438L.) Explication and interpretation of Goethe's most extensive lyrical cycle, which grew out of his encounter with the Medieval Persian poet Hafis. Seminar focuses on such themes as world wisdom, love, euphoria, and the importance of poetry for the spiritual well-being of the human race. The Noten und Abhandlungen is discussed as the sum of his insights on politics, forms of government, ethnicity, religion, and the role of the poet within the society.

3-5 units, Spr (Mommsen)

349B. Colloquium on Baroque World Theater—(Same as 449B.) Late Renaissance drama embodying characteristic Baroque experiments and concerns, e.g., theater of theater, dream structures, verbal magic, unveiling otherness, totalization. Works from Shakespeare, Lope, Calderón, Corneille, Rotrou, Tristan, Vondel, Gryphius, Lohenstein. For 3 units must be able to read original texts in English, and Dutch, French, German, or Spanish; for 5 units two languages besides English.

3-5 units, Aut (Gillespie)

349H. Rousseau, Herder, and Humboldt on Language and Culture—(Same as 449H.) Introduction to major writings on the study of languages as key to an understanding of culture and society, examined in relation to major 18th-century theories of language, 19th-century linguistics, and to 20th-century theories of culture and of language.

3-5 units, Win (Mueller-Vollmer)

349L. Goethe and Orientalism—(Same as 449L.) Introduction to the poet’s encounters and experiences with the world of the Hebrews, Arabs, Turks, Persians, Indians, Chinese, and other ethnic groups from the “Orient” through poetry, religious, and philosophical works, travel literature, etc. The impact of Oriental cultures on Goethe as a thinker and writer.

3-5 units, Aut (Mommsen)

349S. Colloquium: Semiotics—(Same as 449S.) Reading and discussion of essential texts as an introduction to current issues.

2 units, Aut (Mueller-Vollmer)

350. Methods of Teaching Literature—Students may enroll for practice in literature teaching on a voluntary basis.

1-3 units, Aut, Win, Spr (Staff)

by arrangement

351-359. German Literature and Culture I-IX—(Same as 251-259.) The major periods of German literature from the early Middle Ages to the present. The developing traditions that have shaped German literature. Focusing on a specific period, the literary and non-literary (cultural, social, political, philosophical) contexts are established within which individual authors, works, and movements are situated.

358B. The Avant Garde in Austria—(Same as 258B.) The central role of the avant garde and its opponents in 20th-century Austrian literature; a reconstruction of the complex and repressed history of the avant garde; relations to the broader European context (dada, concrete poetry) and critical accounts (Enzensberger, Burger). Readings of Austrian expressionism, experimental literature, and post-war developments (“Wiener Gruppe,” Jandl).

3-5 units, Win (Schmidt-Dengler)

358C. Contemporary Austrian Literature—(Same as 258C.) A study of the relative prominence of Austrian literature in the German publishing industry since the middle of the 60s. Individual texts analyzed with reference to the social and political situation in the 2nd Republic and with regard to their reception in Austria and abroad. Readings from Bernhard, Handke, Jelinek, Jonke, Mayröcker, Ransmayr, Wolfguber, and Haslinger.

3-5 units, Spr (Schmidt-Dengler)

360-369. Major Authors—In-depth study of a major writer in his literary creativity, relation to his age, or special achievements and significance, i.e., Walther von der Vogelweide, Grimmelshausen, Wieland, Lessing, Goethe, Novalis, Tieck, Kleist, Fontane, Nietzsche, Hofmannsthal, Thomas Mann, Kafka, Brecht.

366. Heinrich Von Kleist—(Same as 266.) In depth study of Kleist’s works, including his letters and essays focusing on problems of genre, the constitution and self reflexion of fiction, textuality and selfhood, aesthetic and psychic dichotomies evaluated in the context of intellectual and literary history.

3-5 units, Spr (Schlossbauer)

370-379. Genres—The development, contents, and formal characteristics of lyric poetry, epic, drama, novel, novelle, tale, short story, essay, etc., in various authors or periods. Focuses on medieval drama, baroque “metaphysical”
poetry, the diary as a literary form, and autobiography.

390-399. Special Subjects and Problems.

ADVANCED GRADUATE

Dissertation Research—Exclusively for graduate students in German working on dissertations.
1-12 units, Aut, Win, Spr, Sum (Staff)
by arrangement

449. Seminars.

449B. Colloquium on Baroque World Theater—(Same as 349B, Comparative Literature 349B.)
3-5 units, Aut (Gillespie)

449H. Rousseau, Herder, and Humboldt on Language and Culture—(Same as 349H.) Introduction to major writings on the study of languages as key to an understanding of culture and society, examined in relation to major 18th-century theories of language, 19th-century linguistics, and to 20th-century theories of culture and of language.
3-5 units, Win (Mueller-Vollmer)

449S. Colloquium: Semiotics—(Same as 349S.)
3-5 units, Aut (Mueller-Vollmer)
by arrangement

OVERSEAS STUDIES

These courses are approved for the German major and taught at the campus indicated. Students should discuss with their major advisors which courses would best meet educational needs. Course descriptions can be found in the "Overseas Studies" section of this bulletin or in the Overseas Studies Program office, 126 Sweet Hall.

60. Special Intensive German—Berlin.
10 units, Aut (Staff)

70. Intensive German—Berlin.
6 units, Aut, Win, Spr (Staff)

80. Intermediate German—Berlin.
4 units, Aut, Win, Spr (Staff)

2 units, Aut, Win, Spr (Staff)

90. Advanced German—Berlin.
4 units, Aut, Win, Spr (Staff)

2 units, Aut, Win, Spr (Staff)

129E. Modernism and Metropolis: Turn of the Century Culture in Berlin—Berlin. (DR:2)
4 units, Spr (Schutte)

HISTORY

Emeriti: (Professors) William C. Bark, Claude A. Buss, Gordon A. Craig, Carl N. Degler, Don E. Fehrenbacher, John J. Johnson, George H. Knobes, John C. Miller, Peter Paret, Wayne S. Vucinich, Gordon Wright, (Associate Professor) Rixford K. Snyder
Chairman: David. M. Kennedy
Associate Professors: Joel Beinin, Frederick P. Bowser, Judith C. Brown, Albert Camarillo, Kennell A. Jackson, Jr., Nancy S. Kollmann, Timothy Lenoir, Richard Roberts
Assistant Professors: Philippe Buc, Stephen H. Haber, James E. Ketelaar, Mary Louise Roberts, Karen Savislak
Courtesv Professors: Paul David, Albert E. Dien, Michael Jameson, Susan M. Treggiari, Gavin Wright
Senior Lecturer: Joseph J. Corn
Modern Europe Lecturers: Ronald K. Delph, Daniel L. Gordon, Margaret Malamud, J. Ronald Shearer, Mary N. Wessling
Lecturers: David Gress, Margo Horn, Robert Kleiman, Jack Kollman
Acting Assistant Professors: Michael Chamberlain, Kyongsu Lho, Diane C. Margolf
Visiting Professors: Tony R. Judd, Young Ick Lew, Reinhard Rürup
Visiting Associate Professor: Luis L. Arroyo, Ligia Prado, Steven Zipperstein
Mellon Fellow: Paul K. Longmore

The Department of History offers 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 in business.
The program for the undergraduate major in History emphasizes breadth of training, yet allows concentration of studies in a selected field of history.

As foundation requirements, 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 an introductory seminar; (3) must complete at least two additional small-group courses—undergraduate colloquia (reading and discussion involving explicit historical research) or undergraduate seminar (research and writing on an explicit historical topic); and (4) must complete at least 10 courses in history with a minimum of 3 units each, and passed with a letter grade indicator of "C" or higher. The capacity to write with ease and to express oneself with lucidity is an important skill and to gain that skill requires practice; therefore, it is required that each major do a substantial amount of writing (at least eight pages at a minimum) in at least six of the courses taken toward the fulfillment of major requirements. A minimum of five courses must be taken from members of the History Department faculty. Directed reading and undergraduate research may not count toward the 10 required courses in history and are given only for Satisfactory/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 three fields: (1) Western Europe (including Britain), and North America (especially the colonial and national history of the United States), all since 1700; (2) Africa and the Middle East, Asia, Latin America, Russia, and Eastern Europe; and (3) 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.

To encourage students to achieve some measure of expertise and to give the major a focus, it is required that a concentration of at least four courses be taken within one of the following areas and/or temporal divisions: (1) Africa, (2) Asia, (3) Eastern Europe and Russia, (4) Europe before 1700, (5) Europe since 1700, (6) Latin America, (7) the United States, or (8) a thematic subject treated comparatively, such as war and revolution, work, family history, popular culture/high culture, etc. The proposed concentration must be approved by the major advisor; a proposal for a thematic concentration must have the approval of both the advisor and the departmental Committee on Undergraduate Studies.

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.

Students planning to major in history must enroll at the History Department office, where detailed information on requirements is available.

**HONORS PROGRAM**

For a limited number of 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, complete an essay, the work for which normally begins in Spring Quarter of the junior year and is completed by mid-May of the senior year. Students take 12 to 15 units of honors work, excluding the colloquium, to be distributed as best fits their program. To enter this program the student must be accepted by a member of the department who agrees to advise on the essay, and must enroll in the Spring Quarter honors seminar. An exception to the latter requirement may be made for those going overseas Spring Quarter of the junior year, but such prospective honors students should consult with the director of the honors program, if possible, prior to going overseas. Under exceptional circumstances, students are admitted to the program in the Autumn Quarter of the senior year. In considering an applicant for such a project, the advisor and director of the honors program take into account general preparation in the field of the project and expects a letter grade indicator of at least "B+" in the student's previous work in history. Prospective honors students are urged to take an undergraduate seminar sometime in the junior year. Students satisfactorily completing the program are eligible for Honors in History, depending upon the quality of their work. To enter the honors program, apply at the History Department office.

James Birdsall Weter prizes are awarded each year for the outstanding honors essays.
SECONDARY (HISTORY) 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

The department admits each year a limited number of undergraduate History majors to work for coterminal A.B. and A.M. degrees in History. Applications for admission should be submitted during the Spring Quarter of the student’s junior year and must be submitted no later than November 1 of the senior year. Applicants must 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 three full-time quarters after completing 180 units, for a total of 216 units. During the 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

Applicants for admission to graduate work must take the General Test of the Graduate Record Examination. It may be taken at most American colleges and in nearly all foreign countries. For details see the “Guide to Graduate Admission,” available from the Graduate Admissions Office.

Students 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 Ph.D. degree, and may become candidates to receive the A.M. degree after completing three quarters of work.

MASTER OF ARTS

The department requires the completion of nine courses (totaling not less than 36 units) of graduate work; seven courses of this work must be History Department courses. Of the seven, one must be a 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 department. The department does not recognize for credit toward the A.M. degree any work that has not received the letter grade indicator of “A,” “B,” or “+.”

TERMINAL A.M. PROGRAM

Applicants who do not wish to continue beyond the A.M. degree are admitted to this program at the discretion of the faculty in individual fields (U.S., modern Europe, etc.). Students admitted may not apply to enter the Ph.D. program in History during the course of work for the A.M. degree.

A.M. 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 the “School of Education” section 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 student will have a member of the department designated as an advisor with whom to plan the Ph.D. program. Much of the first two years of graduate study is spent taking courses, and, from the outset, the student should be aware that the ultimate objective is not merely the completion of courses but 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. At the end of the first year of graduate study, students are evaluated by the faculty and given a progress report. A final decision as to whether they will be allowed to continue to work towards the Ph.D. is made early in the Winter Quarter of a student’s second year.

After the completion of certain further requirements, students must apply for acceptance for candidacy for the doctorate in the graduate division of the University.
REQUIREMENTS

1. In consultation with the advisor, students 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
   - Jewish History
   - Russia
   - Eastern Europe
   - Middle East
   - East Asia before 1600
   - East Asia since 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 students normally enroll during 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 are taken in the second year.

4. Each student, in consultation with the advisor, defines a secondary field. This requirement may be met in one of three ways: (1) a field selected from the list below; (2) 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; (3) a comparative study of a subject across countries or periods. The secondary fields are:
   - 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
   - Jewish History: Ancient and Medieval
   - Jewish History: Modern
   - 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 History of Science

   The secondary field may be satisfied by completing two graduate courses relevant to the field. The student must complete these required courses before taking the University oral examination.

5. Each student, in consultation with the 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 conferral of the Ph.D., 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 is a student 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 is done by the appropriate language department of the University. Certification of competence in other languages is 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 inquire in the department.
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 "Humanities Special Programs" section in this bulletin.

RESOURCES

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 or she 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 coursework 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, collection 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 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 other important personal papers. Other 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 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, 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 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.

COURSES

See Time Schedule for changes in course offerings each quarter. The department also maintains a bulletin board with updated information.

INTRODUCTORY

1, 2, 3. Europe: From the Middle Ages to the Present—This sequence fulfills the Cultures, Ideas, and Values Requirement. It explores the relationship between cultural, political, social, and economic developments in Europe and America since the Middle Ages. Emphasis is on the growth of European and American cultures from sources and influences within and outside Europe. Topics: Judeo-Christian heritage, rediscovery of classical learning in the Renaissance, social and religious upheavals of the Reformation, consolidation of the European state system, innovations emerging with modern industrial society, and global consequences of European and American developments. Meets three hours weekly with lecturers from the regular history faculty and two hours a week for colloquia in small groups led by postdoctoral fellows. Enrollment limited; students intending to apply the sequence toward their Requirement are given priority.

1. Europe: Late Antiquity, the Middle Ages, and the Renaissance—The emergence of European society from the fall of the Roman Empire to the discovery of the New World. Emphasis is on the interaction of diverse cultural elements—pagan, Judeo-Christian, Muslim, and others. Reading selections from Aristotle, Virgil, Augustine, Christine de Pisan, Dante, Machiavelli, and the Bible.

5 units, Aut (Brown) lectures plus a two-hour colloquium (DR:1, three-quarter sequence)

2. Europe and Beyond, 1500-1789—Survey of the intellectual and social currents from the Reformation to the American Revolution. Reading selections from Shakespeare, Mary Wollstonecraft, Montesquieu, and the Dec-
HISTORY 453

1.eration of the Rights of Man. (DR:1, three-quarter sequence)
5 units, Win (Baker) lectures plus a two-hour colloquium

3. Europe: 1789 to the Present—European and American history since 1789 has been a persistent attempt to come to terms with the promise and perils of the great revolutions of the 18th century. Emphasis is on the divergent paths of European and American democracies set against a variety of political, social, and ideological movements. (DR:1, three-quarter sequence)
5 units, Spr (Kennedy, Sheehan) lectures plus a two-hour colloquium

21. The World Outside the West: Change and Tradition before the Age of European Imperialism—(Same as Anthropology 21.) Comparison of the cultural heritages and dynamics of change in three non-Western societies before extensive contact with Western Europe. Environment, economy, social and political structures, and religious and ethical values in Japan, Nigeria, and Egypt. (DR:5*; also satisfies Area 3 when taken in sequence with History 22.)
6 units, Aut (Duus, R. Roberts, Chamberlain)

22. The World Outside the West in the Age of European Imperialism—(Same as Anthropology 22, Political Science 22.) Confrontation and accommodation as non-European societies respond to Western Europeans, and to Western institutions and ideas, from the early 19th century to the present. Changes in production and trade in social and political structures, and in religious and ethical values in Egypt, Japan, and Nigeria. Recommended: Anthropology/History 21. (DR:5*; also satisfies Area 3 when taken in sequence with 21.)
6 units, Win (Abernethy, Befu, Beinin)

24A. Russian Civilization I: The Shaping of Culture and Society from the 9th to 17th Century—Interdisciplinary approach to Russian history and culture; examines literature, society, institutions. (DR:5*)
5 units (Kollmann) given 1991-92

24B. Russian Civilization II: Society, Culture, and Politics in Imperial Russia—Interdisciplinary approach to Russian history and culture; examines literature, society, institutions. (DR:5) (Emmons) given 1991-92

64. Introduction to Chicano Life and Culture—(Same as Anthropology 110, Chicano Studies 110, Spanish 135.) Interdisciplinary focus on the history and culture of Mexican Americans from the settling of the Spanish borderlands to today. Historical Perspectives are balanced with anthropological and literary views of the cultural diversity of Mexicans in the U.S. (DR:5)
5 units, Aut (Arroyo) MWF 11

80. Culture, Politics, and Society in Latin America—(Same as Latin American Studies 80.) Interdisciplinary survey of the interaction of Amerindian, African, and European cultures in the creation of the New World societies from 1500 to the present. Introduction to the Latin American courses within several departments. (DR:5*)
5 units, Win (Haber) TTh 1:15-3:05

SEMINARS

These are intended to introduce the undergraduate major or prospective major to the processes of historical investigation and interpretation by which archival material becomes narrative description and explanation, and by which interpretation itself becomes open to disagreement and revision. The object is to take the beginning student into the historian's workshop and to provide first hand experience in interpreting documents, in constructing a coherent story from them, in interpreting their larger implications, and in discovering why it is possible to agree on the facts but to disagree on what they mean. These courses are numbered 1 through 99 followed by the letter "S."

7S. Introductory Seminar: Joan of Arc.
5 units, Win (Langmuir) T 2:15-3:05

11S. Introductory Seminar: Modernism and Medievalism in England, 1851-1945—How modern was artistic "modernism" in England? Does modernism represent a fundamental break with the past? The role romantic medievalism played in the writings of modern artists and critics and in the reception of modern art and design in England.
5 units, Spr (Staff) Th 3:15-5:05

15S. Introductory Seminar: The Medieval Church and Violence—Opposition and sanctification of war and violence, including early Christian pacifism, the origins of the idea of crusade and of knighthood, and the fate of the so-called Peace movement of the 11th century. Using primary sources and secondary works, seminar assesses ecclesiastical participation in military action and peace-making, and its causes and effects on the political and cultural order.
5 units, Aut (Buc)

16S. Introductory Seminar: The Society of Renaissance Florence—Takes the beginning student into the historian's workshop and provides first-hand experience in interpreting documents, in constructing a coherent story from them, in interpreting their larger implications, and in
discovering why it is possible to agree on the facts but not to agree on what they mean. Examines Florentine documents of the Renaissance from census records, analyzed with the help of a computer, to court records, letters, diaries. Students develop their own interpretations of what Florentines were like. Emphasis on social structure and everyday people.

5 units, Spr (Brown) Th 1:15-3:05

27S. Introductory Seminar: The Fall of the Roman Empire—Focuses on the debate about the degree of disruption caused by the Germanic invasions of the 5th century. Students examine contemporary law codes, histories, saints' lives, and religious treatises to discover how historians from Gibbon on have detected change and/or continuity in Western Europe during this period.

5 units, Spr (Staff) M 3:15-5:05

31S. Introductory Seminar: The France of Louis XIV—The Annales historians' particular "ménage à trois" (source, problem, technique) for transforming the past into history. Issues: the chances of escaping starvation, how people “made it” during the Old Regime, Foucault's guilt or innocence, what mattered at the court, why peasants rebelled, how people lived their religion. Prerequisite: year-long survey course in European history, History 1,2,3, or equivalent.

5 units, Aut (Loungee) T 2:15-4:05


5 units, Aut (M. L. Roberts) T 1:15-3:05

40S. Introductory Seminar: Ireland—Culture, Religion, and National Identity to 1920—The historical background of modern Ireland. Readings/discussion of primary and secondary sources. Traces themes that are key to Ireland's historical development: native Celtic culture, evolution of the Catholic Church, successive invasions and colonizations, its economic and demographic patterns, its relationship with England and growth of nationalism, achievement of political independence, and origins of the conflict in Ireland.

5 units, Aut (Swett) M 2:15-4:05

42S. Introductory Seminar: London—The Making of the Metropolis—Between 1570 and 1670 London grew faster than any city in the West and became the largest city in Europe. The causes of the growth and the changes that growth brought to late medieval London, the response of the monarchy to expansion, the nature of the urban community, and the nature of the new consumer culture generated by it. 18th- and 17th-century sources, from royal proclamations to Jacobean plays, and modern historical studies and interpretations, are subjected to critical examination.

5 units, Win (Seaver) T 2:15-4:05

52S. Introductory Seminar: Making of the Constitution—Examination of the debates surrounding the framing and ratification of the Constitution. Familiarizes students with the use of primary sources.

5 units, Win (Rakove) TTh 1:15-3:05

57S. Introductory Seminar: The American West—Provides students with a "hands on" experience as practicing historians using and interpreting primary historical documents. Exposure to a variety of primary sources on topics relating to the trans-Mississippi West.

5 units, Win (Camarillo) T 1:15-3:05

67S. Introductory Seminar: Social Change in Industrializing America—A Case Study of Chicago—Chicago offers a vivid context for an examination of the social and cultural transformations of American society between 1870 and 1920. Topics: immigration and assimilation; creation and experiences of a new industrial workforce; machine politics; architecture and city planning; social reform; and race relations. Readings from a variety of contemporary materials (fiction, photographs, memoirs, municipal records, and social criticism.)

5 units, Win (Sawislak) Th 1:15-3:05

76S. Introductory Seminar: Frontiers, Migration, and Creation of New Societies in the New World.

5 units, Aut (Wirth) T 3:15-5:05

80S. Introductory Seminar: Migrants, Shantytowns, and the Urban Poor in Latin America Since the 1930s—The role played by massive rural-urban migration in the transformation of Latin American society over the past 60 years. Historical causes of migration, formation of the squatter settlements, effect of politics and organized labor, emergence of new social movements, and growth of the underground economy of "informal sector."

5 units, Win (Parker) W 1:15-3:05
ADVANCED UNDERGRADUATE

100 through 199 are primarily lecture courses.

THE ANCIENT WORLD

See Classics, Ancient History section, for descriptions of the following, all of which are accepted for credit toward a major in History.

101. History of Greece—(Enroll in Classics 101.)
   (DR:5)
   4-5 units, Aut (Munn)

102. Greek and Roman History from Alexander to Caesar—(Enroll in Classics 102.) (DR:S)
   4-5 units, Win (Cherry)

103. History of the Roman Empire—(Enroll in Classics 103.) (DR:5)
   4-5 units, Spr (Cherry)

MEDIEVAL AND RENAISSANCE EUROPE

107. Politics and Society in the High Middle Ages: France and Germany, 950-1250—Analyzes the divergent fates of the two major politics borne out of the dissolution of the Carolingian Empire. The crisis of the 11th century (French feudal revolution and dissolution of the German synthesis), the origins of German particularism and of French centralism, ethnic and national consciousness, transformations in society, in lordship, and in administration. (DR:5)
   5 units, Win (Buc) MTWTh 11

108. The Christianization of Western Europe, 500-1350—How the Europeans came to believe in 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, Aut (Langmuir) MTWTh 10

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. The relation of the Reformation to the urban setting and the economic and social forces of the rising territorial and national states. (DR:3)
   5 units, Win (Spitz) MTWTh 11

HISTORY OF TECHNOLOGY

115. History of Technology in Western Society, 1500-1918—(Same as History of Science 121, VTSS 121.) The interplay of technological change and cultural developments from the late Middle Ages through WWI. Focuses on Europe and the U.S. with attention to contemporary technological developments in the non-Western world and to the consequences there of the adoption of western technologies. Topics: mechanization and labor, the changing relationship of technology to science, the industrialization of warfare, technology, and imperialism, and the cultural implications of innovations in communications. (DR:5)
   4-5 units, Win (J. Corn) TTh 10
   plus optional section

116A. History of Biological Thought—(Same as History of Science 62, Philosophy 62, VTSS 127.)
   4 units, Win (Smocovicas) MWF 9

EASTERN EUROPE AND RUSSIA

119. Aristocracy and Absolutism: Early Modern Eastern Europe, 1300-1850—Societies and cultures of E. Europe (Poland, Ukraine, Belorussia, Bohemia, Hungary) in the late medieval and early modern periods. The conflict of aristocratic parliamentary governments with absolutist states (Russia, Prussia, Austria-Hungary). Eastern Europe's close development is contrasted to the Russian historical experience. (DR:5)
   5 units, Aut (Kollmann) MTWTh 9

120C. Russia in Revolution, 1861-1930—Russian history from the abolition of serfdom to the first Soviet five-year plan and the collectivization of agriculture. The Russian Revolution of 1917 considered in this broader context. (DR:5)
   5 units, Win (Emmons) TTh 1:15-2:45

122B. Soviet Foreign Policy Since 1917—(Same as Political Science 136.) 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. (DR:5)
   5 units, Win (Dallin) MTWTh 11

123A. Soviet History—(Same as Political Science 119A.) (DR:5)
   5 units, Spr (Dallin) MTWTh 11

125. 20th-Century Eastern Europe—Major historical trends in 20th-century E. European history. Empires and national movements. The creation of independent Eastern Europe after WWI; social movements and the emergence of dictatorships and fascism in the interwar period. WWII, Stalinism, and de-stalinization in contemporary Eastern Europe.
   5 units, Aut (Naimark) MTWTh 10

188D. History of the Jews in Eastern Europe—The political, social, economic, and cultural history of the Jews in Poland, the Russian Empire and the Soviet Union, the Baltic lands, Czechoslovakia, Hungary, Rumania, and Yugoslavia to the present. The growth and decline of Jewish autonomy; modernization movements; Yiddish, Hebrew, and assimilationist cultures; Zionism and Jewish socialist movements; the Jews and
the Communist parties, Fascism and Nazism; the Holocaust, Stalinism, Soviet Jewry, and the remnants.

5 units (Mancall) given 1991-92

WESTERN EUROPE

127C. History of 19th-Century Germany.
5 units, Aut (Rurup) MTW 9

127D. 20th-Century Germany—German political, military, cultural history focused on three themes: how and why united Germany tried to dominate Europe before 1945; how divided Germany developed from 1945-90; how and why Germany is reuniting today.

5 units, Spr (Gress) MTWTh 10

131. Society and State in Early Modern France, 1500-1789—Surveys political, social, economic, and religious developments in early modern France from the Reformation up to the eve of the French revolution, emphasizing the formation of the "absolutist" French state.

5 units, Aut (Margolf) MTWThF 9

132. France in the 19th and 20th Centuries.
5 units, Win (M. L. Roberts) MTWTh 9

HISTORY OF SCIENCE

133. The Darwinian Revolution—(Same as History of Science 152; Human Biology 152; VTSS 130.)
4 units, Aut (Lenoir) TTh 2:15-3:30

133D. Origins of Life—(Same as History of Science 156.)
4 units, Win (Lenoir) TTh 11-12:15

138A,B,C. Introduction to Cosmology—(Same as History of Science 138A,B,C; Classics 138A,B,C; Philosophy 138A,B,C.) Three-quarter sequence on the history of the exact sciences emphasizing the field of cosmology. Technical aspects of the classical theories (Ptolemaic and Copernican), including mathematics, astronomy, physics, and chemical theory, together with more speculative aspects in natural philosophy and theology.

138A. Ancient Period—(DR:3; also satisfies Area 6 when taken in sequence with 138B or 138C.)
4 units, Aut (Knorr) MWF 2:15

138B. Middle Ages to Newton—(DR:3; also satisfies Area 6 when taken in sequence with 138A.)
4 units, Win (Knorr) MWF 2:15

138C. Newton to Einstein—(DR:3; also satisfies Area 6 when taken in sequence with 138A.)
4 units, Spr (Knorr)

138D. Topics in the History of Mathematics: From Antiquity to the 17th Century—(Same as History of Science 140, Philosophy 140.) Origins and development of concepts and techniques in their social and philosophical context. 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, Win (Knorr) TTh 2:30-3:45

139. Scientific Revolution—(Same as History of Science 145, Philosophy 145, VTSS 125.) Social, intellectual, and institutional background of the 17th-century period that established modern science. Theories of matter and motion, Descartes, Galileo, Newton, Boyle, Bacon. Historical controversies: Yates’ thesis on hermeticism and magic; Merton on Protestantism and science; Hessen on the economic basis of scientific change. Readings from era texts and modern historical studies. Interpretations of the revolution and what is meant by science and revolution.

5 units, Aut (Galison) TTh 11-12:15

BRITAIN

142. Revolutionary England, 1603-1689—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.

4-5 units, Aut (Seaver) MTWTh 11

145. Britain, 1851 to Present—Aspects of British society: political, cultural, social and literary, from the middle of the 19th century to the present.

5 units, Spr (Stansky) MTWTh 11

AFRICA

148C. Africa in the 20th Century—Transformation of African societies during colonial rule. Resistance to colonial conquest; decline of the old elite and rise of the new one; conflicting ideologies and consciousness; nationalism; decolonization.

5 units, Win (R. Roberts) MTWTh 11

149A. History of East Africa.
5 units, Aut (Jackson) MTWTh 10

THE UNITED STATES

151. American Labor History—The experiences of American working people in the 19th and 20th centuries, and their role in the social and political life. Topics: changing characteristics of work; working-class; trade unions and socialist movements; effects of mass immigration and migration; impact of race and gender in the workplace and the economy. Primary and secondary readings, lecture, and discussions.

5 units, Spr (Sawislak) MTWTh 10
152. Introduction to Material Culture—(Same as American Studies 152.) American history through the evidence of things. Introduction to methods of interpreting or "reading" artifacts and to different categories of material culture, including folk art, industrially produced artifacts, and vernacular architecture and landscape.

5 units, Spr (J. Corn) TTh 1:15-3:05

154. Peace Studies—(Same as Political Science 133, Psychology 142, Sociology 188, VTSS 143.) Interdisciplinary, dealing with the challenges of pursuing peace in a world where the sources of conflict are many and regional/ethnic/religious antagonisms are rising. Creating and maintaining peace is analyzed from historical, social, psychological, and moral perspectives. The nature of peace and peaceful processes (e.g., historical and political perspectives, questions of harmony and aggression at different social levels, and feminist analyses). Peace at the operational level (e.g., social-psychological analyses, studies of bureaucracy, theories of structural violence, analyses of the defense economy and economic conversion, and the making of "enemies.") Peace-Moral and normative considerations (e.g., pacifism and its critics, studies of moral disengagement and of concepts of responsibility. Hopeful developments and important successes.

5 units, Spr (Drekmeier, Ross, Moses, Bland, Dornbusch) TTh 2:15-4:05

155. Mexican American Politics and Organizations—(Same as Chicano Studies 155.) Examination of Chicano participation in the American political system and civic life. Theories of ethnic/racial minority politics and race relations illuminate: impact of conquest; creation of "peace structure", 19th-century electoral politics; historical and contemporary styles and strategies for political action; the Latino electorate; Chicano and Hispanic leadership; contemporary civic organizations; key policy issues for Chicanos and Latinos in the 1980s.

5 units, Spr (Arroyo) MWF 10


5 units, Spr (Carson) MTW 10

158. History of Education in the United States—(Same as Education 201.) Analysis of selected turning points in education in relation to religion, political socialization, race relations, immigration, and urbanization.

3 units, Spr (Tyack) MW 10

158B. American Education and Public Policy—(Same as Education 105, Political Science 186K.)

3 units (Kirst, Tyack) not given 1990-91

163A. Transformation of American Thought and Culture, 1865 to Present—(Same as American Studies 151.)

5 units, Win (Gillam) MTWTh 9

164. Race and Ethnicity in American Experience—How factors of race and ethnicity influenced the American experience and how prevailing attitudes about racial and ethnic groups over time have affected the historical and contemporary reality of the nation's major minority populations. Focuses on developments during the past two centuries.

5 units, Spr (Camarillo, Fredrickson) MTWTh 11-12:15

165A,B,C. United States History from the Revolution to the Present—An articulated general sequence with attention to political, social, and institutional history. Series gives a broad foundation in U.S. history on which to base further work in history, literature, economics, political science, religious studies, art history, etc. Three parts form an integrated whole; any portion may be taken independently.

165A. 18th-Century America—(DR:5)

5 units, Aut (Longmore, Rakove) MTWTh 11

165B. 19th-Century America—(DR:5)

5 units, Win (Fredrickson) MTWTh 11

165C. 20th-Century America—(DR:5)

5 units, Spr (Bernstein, Camarillo) MTWTh 9

172A. America Since 1945—Analyzes foreign policy and politics, and deals with social themes and intellectual history. (DR:5)

4-5 units (Bernstein) MTWTh 1:15-2:05

173B. U.S. Women's History, 1820-1980—(Same as Feminist Studies 122.) Surveys of women's economic, social, and political history, including impact of industrialization and wars; emergence of women's rights, suffrage and feminist movements; health and sexuality; race and class distinctions in female experience. Combines primary and secondary readings, lecture, and discussions. (DR:5)

5 units (Freedman) given 1991-92

173C. Introduction to Feminist Studies: Issues and Methods—(Same as Feminist Studies 101.) (DR:5)

5 units, given 1991-92

LATIN AMERICA

177. Modern Latin America—Survey of Latin American history since the 19th century, concentrating on the region's political, social, and economic development. Contemporary problems of inequality, political instability, and authoritarianism are studied in historical context,
emphasizing Mexico and Spanish South America. (DR:5)

5 units, Spr (Parker) MTWTh 11

179. History of Mexico.
5 units, Aut (Bouwer) MTWTh 10

180. History of Brazil.
5 units, Spr (Prado) TTh 1:15-3:05

MIDDLE EAST

5 units, Spr (Mancatt, Gupta) MTWTh 9

187A. Middle East 570-1718—From Late Antiquity to the decline of Ottoman absolutism. Emphasis on development and character of Islamic civilization, the place of the medieval East within world history, Middle East within world history, and shift in center of gravity from Central Asia to Western Europe. (DR:3*)
5 units, Win (Chamberlain) MTWTh 1:15

187B. The Modern Middle East: 1718-Present—From the emergence of regional Arab entities and the commercial penetration of Europe to the present. (DR:5*)
5 units, Aut (Beinin) MTWTh 11

187C. Women in the Contemporary Middle East.
5 units, Spr (Beinin) MW 1:15-2:05, Th 7:30-10 p.m.

188A,B,C,D. Jewish History from the Biblical Period to the Present—Courses are designed as a sequence, but each one may be taken independently.

188A. Jewish History from the Biblical Period to 1492—Social, political, institutional, and cultural history of the Jews from earliest times to the Arab conquest of Palestine in the middle of the 7th century; conquest and settlement of Canaan, the period of the Judges, the First and Second Commonwealths, the Jews in the Hellenistic and Roman periods, the Babylonian Exile, the Mishnaic and Talmudic periods, and Jewish society in Palestine in the first half-millennium after the destruction of the Second Temple; the social, political, institutional, and cultural history of the Jews in the Islamic world, Spain, and medieval Europe; the expulsion from Spain. (DR:5)
5 units, Aut (Mancall) MTWTh 9

188B. Jewish History from 1492 to the Present—The Jewish world in the Renaissance and Early Modern Western and Central Europe; Jewish communities in Palestine, Asia, Africa, and the New World; the Jewish world of Eastern Europe and its social and intellectual movements; the Emancipation, the Jewish Enlightenment, and the growing crisis of the E. European Jewish world; modernization and westernization; the "Jewish Problem" and its solutions; assimilation, emigration, Socialism, Zionism; the Hebrew revival; Yiddish popular and intellectual culture in Eastern Europe; the American Jewish community; France and the North African Jews; Fascism, Nazism, and WWII; Palestine and the State of Israel; the crisis of Jewish identity and cohesion in the contemporary world. (DR:5)
5 units, Win (Mancall) MTWTh 9

188C. East European Jewish History—Emancipation, the Jewish Enlightenment, and the growing crisis of the E. European Jewish world; modernization and westernization; the "Jewish problem" and its solutions; assimilation, emigration, Socialism, Zionism; the Hebrew revival; Yiddish popular and intellectual culture in Eastern Europe; the American Jewish community; France and the North African Jews; Fascism, Nazism, and WWII; Palestine and the State of Israel; the crisis of Jewish identity and cohesion in the contemporary world.
5 units (Mancall) given 1991-92

188D. History of the Jews in Eastern Europe—Political, social, economic, and cultural history of the Jews in Poland, the Russian Empire and the Soviet Union, the Baltic lands, Czechoslovakia, Hungary, Rumania, and Yugoslavia to the present. Growth and decline of Jewish autonomy; modernization movements; Yiddish, Hebrew, and assimilationist cultures; Zionism and Jewish socialist movements; the Jews and the Communist parties, Fascism and Nazism; the Holocaust, Stalinism, Soviet Jewry, and the remnants.
5 units (Mancall) given 1991-92

189. Zionism and the State of Israel.
5 units (Mancall) given 1991-92

EAST ASIA

192A. China from Earliest Times to the 9th Century—(Same as Asian Languages 156.) (DR:5*)
5 units, Aut (Kahn, Dien) MTWThF 11

192B. China from the 9th to the 19th Century—From late Tang to the Opium War. Emphasis on socio-economic rather than political history to expose students to a sophisticated society
very different from their own. Recommended:

192A. (DR:5*)
5 units, Win (Kahn) MTWThF 11

192C. Modern and Contemporary Chinese History—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. Structured around political history. Attention to social, economic, and cultural currents. Recommended: 192A, 192B, or Political Science 115. (DR:5*)
5 units, Spr (Van Slyke) MTWThF 11

193. Science and Technology in Traditional China—(Same as Asian Languages 153, History of Science 153.) Technological achievements and scientific undertakings of traditional China, and ideological and social factors which aided or hindered such enterprises. (DR:5*)
5 units (Dien) given 1991-92

194A. Early and Medieval Japan to 1500—Prehistoric origins of the people and culture, emergence of the first polity, Chinese influences, flowering of the native culture, the samurai, and feudal government.
5 units, Aut (Mass) MTWTh 9

194B. Late Medieval and Early Modern Japan 1500-1840—From the Warring States Period to the establishment and rise of the last Shogunal house, the Tokugawa. The social, religious, and political contours of the age.
5 units, Win (Ketelaar) MTWThF 9

195. Nomad Empires of Inner Asia—(Same as Asian Languages 152.) (DR:5*)
4 units, Spr (Dien) MTWThF 1:15

5 units, Win ( Lew) MTWTh 9

UNDERGRADUATE SEMINARS AND COLLOQUIA

Colloquia offered for History majors consist of reading and discussion on an explicit historical theme. Short papers, reports, and a final examination may be required. Seminars, which differ from colloquia principally by their concentration on materials and methods of historical research rather than on reading and discussion of a given body of historical literature, are also offered. The student, in writing a research paper based to a substantial degree upon original sources, learns how historians arrive at their conclusions, as well as what the results of their work are. In this sense, the subject matter is less important than the process of investigation, analysis, and writing. “How do you know?” becomes more important than “What do you know?”

Courses 200 through 299 are primarily for juniors and seniors majoring in history. Admission to seminars and colloquia is by permission of the instructor.

200A,B,C. Senior Honors.
units by arrangement (Staff)

200H. History Honors Colloquium.
3 units, Spr (Emmons)

200W. Undergraduate Directed Reading.
units by arrangement (Staff)

200X. Undergraduate Directed Research.
units by arrangement (Staff)

Directed Research: Martin Luther King, Jr.

202. Undergraduate Colloquium: Introduction to Problems of Historical Interpretation and Explanation.
5 units, Spr (Emmons) W 2:15-4:05

206S. Undergraduate Seminar: The Churches and the Kingdoms—Secular and Ecclesiastical Powers in Conflict and Dialogue, 300-1350—Open to advanced majors or by permission of the instructor. Focuses on the cosmic issue of “Church and State” and how to translate it into “religion and politics.” Also, the mundane routine interaction between clergy and lay rulers. The Roman papacy, religious criticism and hallowing of government, the so-called “Gregorian reform” and its effects, and the place of ecclesiastical lordship in the world of the secular aristocracy.
5 units, Win (Buc) Th 1:15-3:05

213. Undergraduate Colloquium: Renaissance Humanists and Reformers—(Same as Religious Studies 141.) The turning point from Ancient and Medieval times to Modern times was the era of the Renaissance and the Reformation, 14th-16th centuries, the hinge of all modern Western history. Readings/discussion of writings by the major Humanists and Reformers, whose thoughts are now having world impact.
5 units, Aut (Spitz) T 2:15-4:05

214B. Undergraduate Colloquium: Law and Society in the Roman Empire—(Enroll in Classics 187/387.)
5 units, Aut (Spitz) T 2:15-4:05

217. Undergraduate Colloquium: War and Postwar Poland—(Same as 317.) The problems of German and Soviet occupation, Polish resistance during the war, and the dilemmas of Polish politics, at the end of the war and beginning of the peace. The relationship between social changes and political movements. The complex nationality issues involving Poles, Jews, Germans, Russians and Ukrainians.
5 units, Win (Naimark) W 2:15-4:05
   5 units, Win (Dallin) T 2:15-4:05

227A. Undergraduate Colloquium: National Socialism—Why and how did the National Socialists come to power in Germany? The ideological origins and history of the National Socialist movement; the economic and political crises that made the seizure of power possible. Who led, who joined, and who voted for the Nazi party and why? How did the Nazi regime affect the daily lives of all Germans? How have historians interpreted the phenomenon?
   5 units, Aut (Staff) M 3:15-5:05

228S. Undergraduate Seminar: Democracy and Fascism—Studies in German History.
   5 units, Win (Rurup) T 2:15-4:05

230A. Undergraduate Colloquium: Women and Gender in Modern France—Women's lives and the importance of gender issues in French politics and society from the late 18th to the early 20th century. Topics: role of women in revolutionary and utopian politics, work and domesticity in an industrializing society, and changing notions of sexuality and sexual difference.
   5 units, Aut (M. L. Roberts) Th 2:15-4:05

   5 units, Spr (Lounge) W 1:15-3:05

233. Undergraduate Colloquium: From Prague to Paris—Aspects of European Politics and Culture—(Same as 333.) Topics in the political, intellectual, and cultural history of E. and W. Europe since the end of WWII. Readings: either Czechoslovakia or France, to show links and misunderstandings in the relations between the two halves of Europe during the past 40 years.
   5 units, Aut (Judt) M 2:15-4:05

233S. Introductory Seminar: Law and Society in Early Modern Europe—Introduction to themes, readings, and primary sources in the legal history of early modern England and France, focusing on how historians use legal documents, procedures, and institutions to study European society during this period.
   5 units, Win (Margolf) T 1:15-3:05

234. Undergraduate Colloquium: The Family in Early Modern Europe—Readings/discussion about the family in European history during the 16th- through the 18th-centuries, including marriage, childrearing, and the family's place in the political and economic structures of early modern society.
   5 units, Win (Margolf) Th 1:15-3:05

235. Undergraduate Colloquium: War and Society.
   5 units, Win (Sheehan) Th 2:15-4:05

235S. Undergraduate Seminar: Jewish Emancipation and Antisemitism—Comparative Studies in European History.
   5 units, Win (Rurup) W 2:15-3:05

236. Undergraduate Colloquium: Crime and Social Order in Early Modern Europe—(Same as 336.) Readings/discussion about crime in France and England during the 16th through the 18th centuries, focusing on how historians study criminality as a facet of early modern political and social relations.
   5 units, Spr (Margolf) M 2:15-4:05

248A. Undergraduate Colloquium: End of Slavery in Africa and Americas.
   5 units, Spr (Roberts) Th 1:15-3:05

249A. Undergraduate Colloquium: Africa Since 1945.
   5 units, Spr (Jackson) W 2:15-4:05

250A. Undergraduate Colloquium: The Constitution in American Politics.
   5 units, Spr (Rakove)

251S. Undergraduate Seminar: Poverty and Homelessness in America—Students participate in a research and/or administrative internship with the Emergency Housing Consortium, the primary agency providing shelter for homeless people in Santa Clara and San Mateo counties. They apply classroom learning about homelessness to the internship. Must interview with the professor before enrolling.
   5 units, Win (Camarillo) W 2:15-4:05

252. Undergraduate Colloquium: Technology and American Culture—(Same as American Studies 221, VTSS 157.)
   5 units, Aut (J. Corn) T 3:15-5:05

253. Undergraduate Colloquium: U.S.-European Relations, 1945-1990—Students analyze and debate case studies in American diplomacy and in the transatlantic policy issues of 1945-1990 that persist in: relations with Moscow; the 45-year division (and current reunification) of Germany and Europe; NATO’s strategy, burden-sharing, and build-up (and prospective build-down) of nuclear and conventional forces; negotiations on strategic arms and Star Wars; U.S. trade deficits, Europe’s Common Market and the roller-coaster dollar. Challenges ahead for Europe (and “declining” America): Gorbachev in the East, 1992 in the West and re-shaping of Europe, the roles of the U.S. and a reunified Germany after the Revolution of 1989
   5 units, Spr (Kleiman) Th 2:15-5:05

253A. Undergraduate Colloquium: Topics in the History of the American West—Thematic study of the American West since 1850, em-
phasisizing social and cultural history. Topics: Indian-Anglo relations; labor systems of a resource-intensive economy; the impact of federal policies; efforts to control the region's environment; the experience of Westward migration; the ideology of the frontier in American Culture.

5 units, Win (Sawislak) T 2:15-4:05

256S. Undergraduate Seminar: Technical Knowledge in the U.S.—(Same as American Studies 256S/356S, VTSS 221.) The production, dissemination, reception, and changing content of technical texts, including handbooks, household management guides, trade periodicals, popular science writing, owner's instruction manuals, and trade and engineering textbooks. Illuminates the history of education and the book, the experiences of users of technology, the culture of consumption, and cultural history generally.

5 units, Spr (Corn) W 3:15-5:05

257S. Undergraduate Seminar: The Emergence of the Modern American City—Examination of the social, political, economic, and spatial contours of American urban life between 1840 and 1900. Topics: structure of the national "urban system"; urban politics; social mobility as an urban phenomenon; the popular image of the city; experiences of ethnic and racial minorities; efforts of urban reformers.

5 units, Aut (Sawislak) T 1:15-3:05

258. Undergraduate Colloquium: Modern America in Historical Perspective—(Same as American Studies 211.) Contemporary American society in historical perspective. Topics: changes in political culture; race relations; the position of women; the condition of the family; immigration and ethnicity; America's international role; the economy; and alleged recent changes in American values.

5 units, Win (Kennedy)

258S. Undergraduate Seminar: America in Vietnam—(Enroll in Political Science 144J.)

5 units, Spr (Goldstein, Rakove) T

260S. Undergraduate Colloquium: The American 1960s: Thought, Protest, Culture—(Same as American Studies 214.)

5 units, Spr (Gillam)

261S. Undergraduate Seminar: The American Character—(Same as American Studies 200.)

5 units, Aut (Gillam)

Spr (Fliegelman)


5 units, Aut (Fredrickson) M 1:15-3:05

273. Undergraduate Colloquium: The Social History of Mental Illness in the U.S.—(Same as 373.) Mental illness as a medical and social phenomenon. English and European background in the 17th century; then the U.S. chronologically to the mid-20th century. The relativity of changing conceptions of madness and sanity by linking these to socially defined behavioral norms and notions of deviance. Cases of "madness in social context" to examine how certain types of behavior were interpreted in different historical periods, how specific settings promoted or found problematic certain symptoms or personality types. The rise of the scientific understanding of mental illness and medical therapies to treat it, and the emergence of institutions and professions to promote mental health and care for the mentally ill.

5 units, Win (Horn) T 3:15-5:05

278. Undergraduate Colloquium: Historical Aspects of Underdevelopment in Latin America.

5 units, Win (Haber) T 3:15-5:05

286S/386. Undergraduate Seminar: Domination, Subordination, and the Politics of the Peasantry in Colonial India—(Enroll in Anthropology 213.) Domination of the peasantry and forms of peasant politics studied through secondary and primary texts. The invariables of "peasant insurgency." Official, nationalist, and judicial discourse on peasant political action. Insurgency as a "semiotic break," rumor as carrier of belief and as subversive trigger, the production of judicial truths and the construction of the testimony of peasant rioters in courts of law. Relationship between popular religion and the "message" of Mahatma Gandhi. Structure and process of small-peasant production.

5 units, Spr (Amin) MW 1:15-3:05

287. Undergraduate Seminar: Imperialism, Underdevelopment, and Revolution in the Modern Middle East—(Same as 387.) The integration of the Middle East into the world capitalist market on a subordinate basis and the impact on economic development, class formation, and politics. Alternative theoretical perspectives on the rise and expansion of the international capitalist market are combined with possible case studies of Egypt, Iraq, and Palestine.

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

288. Undergraduate Colloquium: Palestine and the Arab-Israeli Conflict—The Palestine-Zionist
conflict from 1882 to the present through reading and comparing representative expressions of competing historical interpretations. U.S. policy towards the conflict since 1948.

5 units, Aut (Beinin) W 2:15-4:05

288C. Undergraduate Colloquium: Russian and Soviet Jewish History—Themes in Russian and Soviet Jewish historiography; emphasizing social and cultural trends, e.g., the transformation of leadership, occupational, and demographic patterns, from late 18th century until consolidation of Stalinism in 1929. Emergence of modern Jewish social and political ideologies (e.g., Jewish socialism, Zionism) with attention to the social background to ideological change.

5 units, Spr (Zipperstein) MTWTh 9

289. Undergraduate Colloquium: Religion and Society in Early Islamic Arabia—Situates the rise of Islam in its Late Antique environment. Religion and society in Late Antiquity. Standard sources in translation of life of Muhammad. Modern scholars' interpretations of those sources. Aims to give a sense of how narratives are constructed, appropriated, and deployed in social relations.

5 units, Win (Chamberlain) Th 2:15-4:05

291S. Undergraduate Seminar: History and the Humanities—Orientalism—The literary, religious, diplomatic, military, and cinematic constructions of the “Orient.” The history of the idea of the “Orient” and methodologies and strategies inherent to writing this history. Using the “Orient” as a leitmotif in the writing of history, examines a particular historical issue and issues particular to history.

5 units, Aut (Ketelaar) T 1:15-3:05

295. Undergraduate Colloquium: A History of Japanese Religion—Pre-modern in focus, examines Japanese religion in terms of doctrinal, political, social, military, and economic history. Primary sources in translation. Structures of belief and practice and the synchronic interaction of such with the contemporaneous ideological environment.

5 units, Spr (Ketelaar) Th 1:15-3:05

296. Undergraduate Colloquium: Ordinary Lives—The Social History of Early Modern China—Explores ways of studying people who were not prominent in the conventional spheres of authority of high culture. Topics: migrations, disease, production and consumption, gender and family, popular culture and entertainments, the politics of banditry, etc, during Ming–Qing, i.e., 16th-19th centuries. Prerequisite: consent of instructor.

5 units, Win (Kahn) T 1:15-3:05

297. Undergraduate Colloquium: South Korea’s Emergence in the Postwar International System.

5 units, Spr (Lho)

298. Undergraduate Colloquium: Yugoslavia—A Country in Crisis—Yugoslavia’s experience as a federal state since the end of the WWII has not been successful. The reasons for this failure and possibilities for other forms of Yugoslav state organization. The dynamics of national conflict, and economic and social problems.

5 units, Win (Vucinich) T 1:15-3:05

298A. Undergraduate Colloquium: Visions of Utopia—Travelers to China—Examines the predispositions and reflections of travelers to China from the 9th to the 20th century. Is China re-invented every time a foreign traveler brings home a description? What, if anything, did a medieval Japanese monk, a British diplomat, a woman missionary, an aesthete, and adventurer have in common? Prerequisite: consent of instructor.

5 units, Aut (Kahn) T 1:15-3:05

299. Undergraduate Colloquium: The Institutions of Medieval Japan.

5 units, Spr (Mass) W 2:15-4:05

299A. Undergraduate Colloquium: From Classical to Medieval Japan—(Same as 399A.).

5 units, Win (Mass) W 2:15-4:05

GRADUATE

300W. Graduate Directed Reading.

units by arrangement (Staff)

302A. Graduate Colloquium: Introduction to Problems of Historical Interpretation and Explanation.

5 units, Spr (Emmons) W 2:15-4:05

304A. Graduate Colloquium: Historiography of Colonial Spanish America.

5 units, Aut (Bowser)

304B. Graduate Colloquium: Historiography of 19th-Century Spanish America.

5 units, Win (Bowser) W 2:15-4:05

304C. Graduate Core Seminar in Latin American Studies—(Same as Latin American Studies 250.) Introduction to Spanish-American civilization.

5 units, Aut (Bowser) M 2:15-4:05

304D. Graduate Colloquium: Core Seminar in Latin American Studies.

5 units, Win (Bowser) M 2:15-4:05

307. Graduate Core Colloquium in Medieval History.

5 units, Aut (Langmuir) T 2:15-4:05
308. Graduate Colloquium: The Religious Crisis of the 11th and 12th Centuries.
5 units, Spr (Langmuir) T 2:15-4:05

313. Graduate Colloquium: The Renaissance.
5 units, Win (Brown) T 1:15-3:05

317. Graduate Colloquium: War and Postwar Poland.
5 units, Win (Naimark) W 2:15-4:05

319. Graduate Colloquium: Humanism and the Reformation.
5 units, Aut (Spitz) W 2:15-4:05

321. Graduate Colloquium: Sources and Methods in Early Modern Russian History.
5 units, Aut (Kollmann) T 2:15-4:05

330. Graduate Colloquium: The Old Regime and the French Revolution.
5 units, Aut (Baker) T 1:15-3:05

331D. Graduate Core Colloquium on Modern Europe.
5 units, Aut (Baker) W 2:15-4:05

331E. Graduate Core Colloquium on Modern Europe.
5 units, Win (Sheehan) W 2:15-4:05

331F. Graduate Core Colloquium on Modern Europe.
5 units, Spr (M. L. Roberts) W 2:15-4:05

5 units, Aut (Judd) M 2:15-4:05

335. Graduate Colloquium: War and Society.
5 units, Spr (Sheehan) W 2:15-4:05

336. Graduate Colloquium: Crime and Social Order in Early Modern Europe—(Same as 226.)
5 units, Spr (Margoloff) M 2:15-4:05

341A. Graduate Colloquium: Topics in the Culture and Society of Early Modern England.
5 units, Spr (Seaver) TTh 1:15-3:05

344A. Graduate Colloquium: Problems in Modern British Society.
5 units, Aut (Stansky) T 2:15-4:05

348A. Graduate Colloquium: End of Slavery in Africa and the Americas.
5 units, Spr (R. Roberts) Th 2:15-4:05

349C. Graduate Colloquium: Problems in the Economic History of West Africa.
5 units, Aut (R. Roberts) Th

349A. Graduate Colloquium: Africa Since 1945.
5 units, Spr (Jackson) W 2:15-4:05

351A, B, C, D, E, F. Graduate Core Colloquium in American History.
30 units

351A. Graduate Core Colloquium: American History—Part I.
5 units (Ravoke) given 1991-92

351B. Graduate Core Colloquium: American History—Part II.
5 units (Degler) given 1991-92

351D. Graduate Core Colloquium: American History—Part III.
5 units, Aut (Kennedy) TF 2:15-4:05

351E. Graduate Core Colloquium in American History.
5 units, Win (Carson) TF 2:15-4:05

351F. Graduate Core Colloquium in American History.
5 units, Spr (Bernstein) T 2:35-4:30

5 units, Spr (Kleiman) Th 2:15-5:05

356. Graduate Seminar: Technical Knowledge in the United States—(Same as 256S, American Studies 231, VTSS 221.)
5 units, Spr (J. Corn) W 3:15-5:30

373. Graduate Colloquium: The Social History of Mental Illness in the U.S.—(Same as 273.)
5 units, Win (Horn) T 3:15-5:05

377. Graduate Colloquium: Regionalism in the Americas.
5 units, Win (Wirth)

381. Graduate Colloquium: Agrarian Structure and Agrarian Change in Europe and Latin America.
5 units, Aut (Haber) M 1:15-3:05

382. Graduate Colloquium: Labor in Brazil—Workers, labor, and culture in Brazil.
5 units, Spr (Prado) W 1:15-3:05

387. Graduate Colloquium: Imperialism, Underdevelopment, and Revolution in the Modern Middle East.
5 units, Win (Beinin) W 2:15-4:05

388A. Graduate Colloquium: Problems in Jewish History.
5 units, Aut (Mancall)

390A. Graduate Colloquium: Japan.
5 units, Spr (Mass) W 2:15-4:05

390B. Graduate Colloquium: Topics in Late Traditional and Modern Chinese History.
5 units, Win (Van Slyke) T 1:15-3:05

390C. Graduate Colloquium: Topics in Contemporary Chinese History.
5 units, Spr (Van Sluke) T 1:15-3:05
395A. Graduate Colloquium: Early and Medieval Japan.
5 units, Win (Mass) W 2:15-4:05

395B. Graduate Colloquium: Medieval and Early Modern Japan—Examination of historical and historiographical issues, orthodox and heterodox, germane to the period and its modern interpretations.
5 units, Spr (Ketelaar) Th 1:15-3:05

395C. Graduate Colloquium: Modern Japan.
5 units, Aut (Duus) Th 1:15-3:05

399. Graduate Colloquium: The Institutions of Medieval Japan.
5 units, Spr (Mass) W 2:15-4:05

ADVANCED GRADUATE

Courses numbered 400 to 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)

5 units, Win (Jackson) Th 3:15-5:05

403. Graduate Seminar: The Language of Politics in the Western Middle Ages.
5 units, Spr (Buc)

410. Graduate Seminar: Topics in Renaissance and Reformation in Europe.
5 units, Win (Spitz) W 2:15-4:05

5 units, Spr (Brown) W 2:15-4:05

420. Graduate Seminar: Topics in Modern East European History.
5 units, Win (Naimark) W 2:15-4:05

421B. Topics in Russian History.
5 units, Spr (Emmons)

422A. Introduction to Graduate Research on Russian Politics.
5 units, Spr (Dallin) T 2:15-5:05

429. Graduate Seminar: History of German Democratic Republic.
5 units, Spr (Naimark) Th 1:15-3:05

433A. Graduate Seminar: 19th-Century Europe.
5 units, Aut (Sheehan)

5 units, Win (Stansky) T 2:15-4:05

5 units, Spr (Fredrickson) Th 2:15-4:05

479. Graduate Seminar: History of Mexico.
5 units, Spr (Haber) M 1:15-3:05

486. Graduate Seminar: Dominance, Subordination, and the Politics of the Peasantry in Colonial India—(Enroll in Anthropology 213.)
5 units, Spr (Amin) MW 1:15-3:05

490A. Graduate Seminar: Modern China.
5 units, Win (Van Slyke) W 3:15-5:05

490B. Graduate Seminar: Research in Modern and Contemporary China.
5 units, Spr (Van Slyke)

OVERSEAS STUDIES

These courses are approved for the History major and taught overseas at the campus indicated. Students should discuss with their major advisors which courses would best meet individual needs. Descriptions in the "Overseas Studies" section of this bulletin or at the Overseas Studies office, 126 Sweet Hall.

106V. Italy from Agrarian to a Post Industrial Society—Florence.
4 units, Win (Mammarella)

117V. The History of Polish Soviet Relations: The Issue of the "Blank Spots"—Krakow.
5 units, Spr (Naimark)

120V. Comparative History of Eastern Europe—Krakow. (DR:5)
4 units, Spr (Baran)

130V. Survey of French History, 1715 to the Present—Tours. (DR:5)
5 units, Win (Green)

131V. France and European Fascism From the Thirties to 1945—Tours.
4 units, Aut (Labussiere)

135V. U.S. and Western Europe After World War II—Florence. (DR:5)
4 units, Spr (Mammarella)

143V. Urban History—(Same as Urban Studies 146U.) Oxford. (DR:5)
5 units, Win (Tyack)

144V. The British Empire and the Commonwealth—Oxford. (DR:5)
4 units, Win (Rizvi)

190V. French Images of Asia—Tours.
4 units, Spr (Duus)

227V. Introduction to German History: Politics and Culture from the Middle Ages to the Unification of Germany, 900 to 1870—Berlin. (DR:5)
4 units, Aut (Neckenig)
PROGRAM IN THE HISTORY OF SCIENCE

Professor: Peter Galison
Associate Professors: Peter Galison, Wilbur Knorr, Timothy Lenoir
Committee in Charge: Peter Galison (Philosophy and Physics), Wilbur Knorr (Classics and Philosophy), (Co-Chairs), James Adams (Engineering), Barton Bernstein (History), Nancy Cartwright (Philosophy), John A. Dupré (Philosophy), Francis Everitt (Physics), Marcus W. Feldman (Biological Sciences), Alexander Fetter (Physics), Timothy Lenoir (History), Burton Richter (SLAC), James J. Sheehan (History)
Affiliated Faculty: Raymond Clayton (VTSS), Joseph J. Corn (VTSS), Albert E. Dien (Asian Languages), Henry Lowood (Bibliographer, Stanford Libraries)
Visiting Faculty: Vassiliki Smocovitis

The Program in the History of Science serves as a focus for activities at Stanford relating to the historical and contemporary aspects of science. This includes sponsoring a series of colloquia in which speakers from history of science and technology, history, philosophy, medicine, and the sciences address current problems in the history of science. Further, the program collaborates with the University libraries’ special collections in the history of science and cooperates with other departments and programs in the administration of undergraduate and graduate majors. History of Science courses at the graduate and undergraduate level are offered covering the period from antiquity through the 20th century. Instruction is designed to accommodate a wide range of students’ preparations in the humanities, social sciences, and sciences.

The structure of the program requires 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. It is also possible for students with philosophical interests to concentrate in history and philosophy of science as a sub-major of Philosophy; see the “Philosophy” section of this bulletin.

Members of the History of Science Committee are available to serve as a faculty advisor 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, Bldg. 200, room 33.

COURSES

60. The Growth of Scientific Knowledge—(Same as Philosophy 60.) Introduction to the philosophy of science, especially the nature of scientific theory change, and the idea of scientific progress. Readings by prominent 20th-century philosophers (Hempel, Popper, Kuhn, Lakatos, and others). Case studies of actual historical scientific/philosophical debates. Writing focus course. (DR:3)
5 units, Spr (Horan) MWF 10

62. History of Biological Thought—(Same as Philosophy 62, History 116A, VTSS 127.) Central issues in biological thought since Darwin focusing on: teleological versus mechanistic explanations, vitalism, reductionism, the units and levels of biological organization, the origins of life, development, inheritance, and evolution.
4 units, Win (Smocovitis) MWF 9

121. History of Technology in Western Society, 1500-1918—(Same as History 115, VTSS 121.) The interplay of technological change and cultural developments, from the late Middle Ages through WWI. Focus is on Europe and the U.S. with some attention to contemporary developments in the non-Western world and to the consequences of adopting western technologies. Topics: mechanization and labor, the changing relationship of technology to science, the industrialization of warfare, technology and imperialism, and the cultural implications of innovations in communications. (DR:5)
4-5 units, Win (J. Corn) T/Th 10
plus optional section


138A. Ancient Period—(DR:3; also satisfies Area 5 when taken in sequence with 138B or 138C.)
4 units, Aut (Knorr) MWF 2:15
138B. Middle Ages to Newton—(DR:3; also satisfies Area 6 when taken in sequence with 138A.)
4 units, Win (Knorr) MWF 2:15

138C. Newton to Einstein—(DR:3; also satisfies Area 6 when taken in sequence with 138A.)
4 units, Spr (Knorr) MWF 2:15

140. Topics in the History of Mathematics: From Antiquity to the 17th Century—(Same as Classics 140, History 138D, Philosophy 140.) Origins and development of concepts and techniques in their social and philosophical context. 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, Win (Knorr) TTh 2:30

145. Scientific Revolution—(Same as History 139, Philosophy 145, VTSS 125.) The social, intellectual, and institutional background of the 17th-century period that established modern science. Theories of matter and motion, Galileo, Descartes, Bacon, Boyle, 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 era texts and modern historical studies. Interpretations of the revolution and what it meant by science and revolution. (DR:3)
5 units, Aut (Galison) TTh 11-12:15

147. Science in the Enlightenment—Scientific ideas and institutions in Europe during the 18th century, from Newtonianism to criticisms of Enlightenment science based on romanticism and historicism. The expression of the "analytic spirit" in rational mechanics, chemistry, geology, and systematic biology, including interactions with philosophy and literature. Relationship of science to the Intellectual Revolution. The social diffusion of science through academies, societies, popularization, and new publishing forms; the Encyclopédie and the moral weeklies. Enlightened absolutism and the camera! sciences in Germany. Readings from 18th-century texts and recent historical studies (Hankins, Hahn, Baker, Darnton, Gillispie, Paul, Hufbauer.) (DR:3)
4 units, Win (Lowood) MWF 10

152. The Darwinian Revolution—(Same as History 133, Human Biology 152, Philosophy 152, VTSS 130.) Conceptual developments leading to the establishment of the major unifying paradigm of biological science, the theory of evolution by natural selection. Biological thought before Darwin, 1750 to 1836. The formation of Darwin's thought in terms of its broader intellectual and social context; attention to the Origin of the Species. The difficulties the theory had to overcome and their resolution in the union of evolutionary biology and population genetics.
4 units, Aut (Lenoir) TTh 2:15-3:30

153. Science and Technology in Traditional China—(Same as Asian Languages 153, History 193.) The technological achievements and scientific undertakings of traditional China, and the ideological and social factors which aided or hindered such enterprises. (DR:5*)
5 units (Dien) given 1991-92

154. The Rise of Scientific Medicine—(Same as History 133A, Human Biology 151, VTSS 128.) Intellectual, social, and institutional dimensions of the rise of scientific medicine in the 19th century. How did medicine become "scientific"? What differences did it make to the physician? Why did scientific medicine display other approaches to medicine? Focus is on France, Germany, and England from 1750 to 1912, and on U. S. from 1890 to 1912. The development of experimental physiology and biomedical technology and their contributions to the medical revolution. The concrete relationships of scientific developments in physiology, pharmacology, and bacteriology to changes in medical practice and therapy. Patterns of professionalization of medicine in different nations. Were the forces driving the professionalization of medicine in these contexts the same or different? How the institutional structure of the medical profession differed according to its local context.
4 units, Win (Lenoir) TTh 2:15-3:30

155. The Sociology of Scientific Knowledge—(Same as Anthropology 158, VTSS 138.) Some of the classical problems in the sociology of knowledge as represented in the writings of Marx, Durkheim, and Mannheim. Recent work in the social construction of scientific knowledge. Emphasis on recent studies in the historical sociology of experimental science and laboratory practice. Using detailed case studies and drawing on anthropological approaches in the works of Mary Douglas, Pierre Bourdieu, etc., a theory of practice and a critique of historically situated practical reasons is explored as the foundation for the sociology of scientific knowledge.
4 units (Lenoir) given 1991-92

156. Origins of Life—(Same as History 133D.) The assumptions underlying research and debate on the origins of life from the mid-19th through the late 20th century. The role of representations in authorizing frameworks for interpreting the origins of life. The two main lines of research, one originating with A. I. Oparin's (1924) "The Origins of Life" emphasizing a biochemical-metabolic approach to life, the sec-
and emphasizing a genetic-informational approach beginning with H. J. Muller's (1926) "The Gene as the Basis of Life." Tracing these two sides of the debate to the present, compares reductionist strategies with recent attempts to articulate a concept of "autopoeisis"—the notion that living systems are self-assembling, self-enclosing networks of production.

4 units, Spr (Lenoir) TTh 2:15-3:30

159. Neurosciences, Technology, and Values—(Same as VTSS 148.) Historically based discussion on the neurosciences in relation to the concept of human personality. Emphasis on the emergence of modern views of the structure and function of the brain, related diagnostic and psychotherapeutic technologies, and the implications of these developments for human values. Limited enrollment, consent of instructor.

4 units (Clayton)

168. History and Philosophy of Physics—(Same as Philosophy 168, VTSS 126.) The philosophical questions raised by historical developments in 20th-century physics. Late 19th-century reductionist world-views leading to special and general relativity. Einstein's response. How did early workers in quantum mechanics attack the wave-particle duality? The problem of scientific realism in quantum mechanics. Nuclear fission, the bomb, and growth of large-scale experimental high-energy physics. What is meant by "unified" field theories in contemporary physics? Readings: scientific, historical, and philosophical texts. (DR:3)

5 units, Win (Galison) TTh 11-12:15

237A,B,C. Graduate Colloquium: Methods in History and Philosophy—(Same as Philosophy 237A,B,C.) Contemporary methodological and historiographical problems in the history of science based on readings from the history of physics, biology, chemistry, and medicine. Diverse approaches: "internal," philosophical, institutional, Marxist, sociological, and anthropological. Guest lecturers from a variety of specialties. After an introduction of core material, students pursue individual research topics in consultation with the instructor.

3 units each quarter

Aut, Win (Lenoir, Dupré) Th 4:15-6:05
Spr (Galison) Th 4:15-6:05

238A. Graduate Seminar: Instruments, Experiments, and Realism—(Same as Philosophy 238A.) How do the first preliminary, fragile results of experiments become transformed into the shared foundation of modern science? Using methods from philosophy, history, and sociology of science, explores experimentation and instrumentation from a variety of times and disciplines, with physical sciences as primary domain of study. Topics: realism and social constructivism, the role of social history in the history of science, and changing standards of argumentation within modern physical experimentation. Enrollment limited to 15.

5 units, Aut (Galison) T 3:05-5:15

270. Undergraduate Colloquium: The Early Nuclear Age, 1939-1953—(Same as History 270A.)

5 units, Spr (Bernstein) W 1:15-3:30

OVERSEAS STUDIES


4 units, Aut (Guarnieri)

PROGRAM IN
HUMAN BIOLOGY

Chairman: H. Craig Heller
Faculty: Sandra Archibald (Food Research Institute), Brian Arthur (Food Research Institute), J. Myron Atkin (Education), Clifford Barnett (Anthropology), Carol Boggs (Biological Sciences), Gail Butterfield, Sylvia Cerel, Roland Claramello (Psychiatry), Rachel Cohon (Philosophy), Julian Davidson (Medicine), William Dement (Psychiatry), Carl Djerassi (Chemistry), Sanford Dornbusch (Sociology), William H. Durham (Anthropology), Anne Ehrlich, Shirley Feldman (Center for Youth Development), James Fox (Anthropology), Dolores Gallagher-Thompson (Education), Henry Greeley (Law), Albert H. Hastorf (Psychology), H. Craig Heller (Biological Sciences), Holly Jimison, Herant Katchadourian (Psychiatry), Donald Kennedy (President), Abby King (Stanford Center for Research in Disease Prevention), James Lawry, Timothy Lenoir (History of Science), Seymour Levine (Psychology, Psychiatry), Sharon Long (Biological Sciences), Michael Marmor (Ophthalmology), Reynaldo Martorell (Food Research Institute), Sherri Matteo (Institute for Research on Women and Gender), Thomas McBride (Health and Safety), Joseph Miller (Biological Sciences), Lorraine Morgan, Ellen Porzig, Thomas Raffin (Medicine), John Rick (Anthropology), Mark Rosekind (Psychiatry), Robert Scott (Center for Advanced Study in the Behavioral Sciences), Robert Siegel, Frank Stockdale (Medicine), Larry Thompson, Arthur B. Wolf (Anthropology), Donna Wong (Psychiatry)

Director of Academic Programs: Lorraine Morgan
Student Advisors: Melissa Buckley, Wendy Drucker, Olivia Lang, Sandy Ramirez, John Scott, Serena Spudich, Mark Whitley.

The Program in Human Biology is an inter-school, interdepartmental, undergraduate major designed to integrate natural and social science approaches to the study of humans. Its curriculum offers a strong background in basic biological sciences and it enriches by exposure to a variety of fields in the social sciences. This combination develops a broad perspective on crucial problems faced by humans worldwide. For example, Human Biology students address issues of interactions between biological and cultural evolution, between biological and psychological development, and interactions of human populations with each other and with their environments. Study of such considerations gives an appreciation and understanding of the problems and process in the development, analysis, and implementation of public policy.

The program offers excellent preparation for advanced study in specific natural and social science disciplines and related professions such as medicine, law, and education, but it also is a superb, broad, liberal arts education for responsible citizens and those who plan to pursue careers in public policy.

The curriculum is designed for students who desire a knowledge of the science of biology integrated with an understanding of the behavioral and social sciences. It draws faculty from various University departments and schools. To complete the requirements for the major, students must take courses from the offerings of the program and from the listings of other University departments. The program culminates in an A.B. in Human Biology.

Although there is no graduate program in Human Biology at Stanford, students are well prepared for advanced training in biology, the behavioral and social sciences, medicine, law, education, or public policy, depending on their choice of upper division courses. Undergraduates in Human Biology can enter co-terminal master degree programs in a number of other University departments.

A computer facility for the use of majors is in Building 80, Inner Quad.

Additional information about the major may be obtained from the program’s offices.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The A.B. in Human Biology requires a minimum of 83 units in the major divided between four levels of courses:

1. **Introductory Level**—At least 35 units, to be taken from:
   - Human Biology Core 24
   - Statistics 3-5
   - Policy Course 3-5
   - Human Biology 197 4

   Statistics requirements are: Statistics 60, Psychology 60, or Biological Sciences 141. A list of courses which may satisfy the policy requirement may be obtained from the department offices.

   All the components of the fundamental program, the core, a public policy course, and a statistics course, must be taken for a grade by majors, with the exception of 197 (internship) which is taken for Satisfactory/No Credit.

   The internship requirement (Human Biology 197) is an independent field experience project, planned in consultation with the Director of Internships.

2. **Foundation Level**—20-unit minimum. Courses vary, depending on the program designed by the student, and are selected in consultation with a faculty advisor.

3. **Area of Concentration**—A minimum of five courses totaling at least 20 units. This in-depth area of study should enable the student to focus on educational and post-baccalaureate goals. All but one course in the concentration must be listed by, or cross-listed with, other University departments. Each course must be taken for a minimum of 3 units. In select cases, up to 5 units of honors units may be included. Final approval of the concentration rests with the student’s faculty advisor. All area of concentration courses must be taken for a grade.

4. **Upper-Division Courses**—Students must take three Human Biology upper-division courses. Students are expected to enroll in courses not directly related to the area of concentration. One upper-division course may be taken Satisfactory/No Credit. Each course must be taken for a minimum of 3 units. An upper-division course used to fulfill the program’s policy course requirement may not be used in the student’s foundation or area of concentration or as one of the three required upper-division courses.

A prospective major should consult with the advisors to obtain detailed information about the program and guidance in the development of an individual course of study. At the time the major is declared, the student must submit a brief written statement of academic and long-term goals and a proposed roster of courses satisfying the requirements for the major. The proposal is reviewed by the student advisors.
who then help select an appropriate faculty advisor. Final approval of the proposed course of study rests with the faculty advisor.

Students who plan to pursue graduate work should be aware of admission requirements of the schools to which they intend to apply. Early planning is advisable to guarantee completion of major and graduate school requirements.

The honors program provides majors an opportunity to do individual research and write a thesis for up to 15 units of credit (see 198 under "Courses").

Application to the honors program must be made by the third quarter of the junior year after completion of the Human Biology core requirements and the internship. The honors thesis must be submitted by the middle of Spring Quarter of graduation year.

COURSES

INTRODUCTORY

Core sequences (2A and 2B, 3A and 3B, and 4A and 4B) introduce the biological and social sciences, and most importantly, relationships between the two. Classes meet MWF from 9-10:50 throughout the academic year. Students must register concurrently for the A and B series and take the core in sequence. Students should initiate the core in Autumn Quarter of the sophomore year. Any deviation from the core sequence must have the consent of the program chairman. Freshmen are not permitted to enroll. To fulfill requirements for DR:4, 5, and 7, the entire core (2A, 2B, 3A, 3B, 4A, 4B) must be completed. Majors must take core courses for a grade.

2A,B. Genetics, Evolution, and Ecology—2A: Introduction to basic principles of Mendelian genetics, evolutionary theory, and population biology. Topics: population genetics, population dynamics, and community ecology with emphasis on genetics of the evolutionary process and applications to human populations. 2B: Introduction to evolutionary study of human diversity. Hominid evolution, the origins of social complexity, and contemporary diversity with emphasis on concept of culture and its influence on human differences.

2A. Genetics, Evolution, and Ecology—(DR:7; entire sequence 2A, 3A, 4A, must be completed.) 4 units, Win (Stockdale, Staff) MWF 9

2B. Culture, Evolution, and Society—(DR:4 and DR:5; entire sequence 2B, 3B, 4B must be completed.) 4 units, Win (Feldman, Hastorf) MWF 10

3A. Properties of the Individual: Adaptation and Development of Social Processes—3A: Basic principles of biology of cells, including biochemistry of energetics and metabolism, nature of membranes and organelles, molecular genetics, and mechanisms of gene expression. Also, human developmental biology, emphasizing principles. 3B: adaptation and maladaptation during infancy, childhood, and adolescence. Concepts from social and developmental psychology, and sociology are introduced as individual, institutional, and societal contributors to adaptation. Prerequisite: 2A,B.

3A. Properties of the Individual—(DR:7; entire sequence 2A, 3A, 4A, must be completed.) 4 units, Win (Stockdale, Staff) MWF 9

3B. Adaptation and the Development of Social Processes—(DR:4 and DR:5; entire sequence 2B, 3B, 4B must be completed.) 4 units, Win (Feldman, Hastorf) MWF 10

3X. Practicum—(Practicum experience at Children's Health Council for 3.5 hours/week. Must be taken concurrently or subsequent to 3B. Satisfactory/No Credit exclusively. Enrollment limited to 35. 1 unit, Win (Feldman, Rothenberg) by arrangement

4A,B. The Human Organism, Adaptation, and Social Control—4A: organ system physiology, beginning with coverage of basic principles of neurobiology and endocrinology and the functions of body organs. The understanding of neurobiology and endocrinology leads to discussion of mechanisms of control, regulation, and integration of organ systems function. 4B: defense mechanisms and adaptation at individual and social levels. Interaction between 4A and 4B is illustrated by physiological and behavioral homeostasis, relationships between hormones and behavior, policies of drug regulation, and issues of health care.

4A. The Human Organism—(DR:7; sequence 2A, 3A, 4A must be completed) 4 units, Spr (Heller, Staff) MWF 9

4B. Adaptation and Social Control—(DR:4 and DR:5; sequence 2B, 3B, 4B must be completed.) 4 units, Spr (Katchadourian, Staff) MWF 10

ADDITIONAL OFFERINGS

1. Genes, Culture, and Human Diversity—(Same as Anthropology 2.) Introduction to genetic and cultural evolutionary theory as applied to the analysis of human diversity. Case study approach illustrates principles of evolution and similarities and differences between genetic and cultural change. Topics: Mendelian genetics, molecular biology, Darwinian theory, modern synthesis, the concept of culture, cultural diversity, marriage and kinship, and cultural evo-

11. Sleep and Dreams—(Same as Psychology 140.) Multi-media lecture/survey format. Provides understanding of research on how sleep affects our daily life. Topics: physiology of NREM and REM sleep, daytime sleepiness and performance, circadian rhythms, dreaming (i.e., content, psychophysiological correlates, lucidity, etc.), sleep disorders (insomnia, narcolepsy, sleep apnea, sleepwalking, jet lag, sleeping pills, sleep deprivation, developmental and phylogenetic aspects, sleep and memory, and other areas. 3 units, Win (Dement, Rosekind)

40. Public Decision Making Regarding Human Health—(Same as Health, Research, and Policy 220.) Goals: understand the role of health care and disease prevention in maintaining health; develop a working knowledge of the organization, financing, and regulation of health care in the U.S.; learn and carry out analyses of health policies and to assess validity of analyses carried out by others; and understand the logical basis for decision making in health policy. Overview of health policy formulation from several perspectives. Social, ethical, political, legal, and economic implications. Group research project is a major part of course. Small sections meet weekly. Prerequisite: Human Biology core or equivalent. 4 units, Spr (Jimison, Staff) MWF 11

41. Public Decisionmaking Regarding the Human Environment—Introduces and sensitizes students to the complexion of public decision-making in national and international environmental arena; how biological information is accommodated in policy-making and how technically-trained people contribute to the policy process. Required section exercises and policy research projects. Prerequisite: Human Biology core. 4 units, not given 1990-91

60. Colloquium on Population Studies—(Same as Biology 183, Food Research 188/288.) Distinguished speakers introduce students to a variety of topics in population studies. 1 unit, Win (Feldman, Arthur) W 4:10-5:30

ADVANCED

Open to non-majors with the proper prerequisites. Human Biology majors have preference when enrollment is restricted.

101. Medical and Social Impact of Disease—Lectures, discussions, and student projects explore medical, emotional, and societal costs of eight common diseases selected from etiologic groups: infectious, traumatic, metabolic, degenerative, toxic, neoplastic, drug induced, and genetic. Readings from current and historical primary medical, psychological, economic, and policy literature supplement lectures and projects. Prerequisites: Human Biology core and upper division status. Recommended: background in Human Physiology. 3 units, Spr (Lawry)

102. Evolutionary Ecology—(Same as Biology 115.) Fundamental concepts of evolutionary ecology, including population growth equations, foraging, reproductive and life history strategies, predator/prey, and competitive and mutualistic interactions among species; and basic principles of biogeography. Discussion sections apply concepts to contemporary environmental and agricultural problems. Prerequisites: Human Biology core, Biology core, or equivalent; calculus through Math. 20 or 41 or equivalent; or consent of the instructor. Enrollment limited to 75. 4 units, Aut (Boggs) MWF 1:15

104. Psychosocial Aspects of Aging—(Same as Education 104.) Survey of common stressors of middle age and later life, and coping strategies. Depression and dementia: how they are manifested, what is known about etiology and treatment, and what research gaps are. Students are exposed to successful interventions used with individual patients and/or family members to reduce burden and stress. Also, the interface between physical and mental health through topics (e.g., nutrition) by guest lecturers. Alternatives to long term care for those in need of extensive physical and emotional support. Hypothesizes why some middle aged and older adults develop significant psychosocial problems while others with the same kinds of stressors do not. Field work optional. 3 units, Spr (Gallagher-Thompson)

105. Ethno-Gerontology and Mental Health—Key sociocultural aspects of aging process; issues involved in assessment and treatment of mental health problems of identified ethnic groups. Hands-on experience with older ethnic patients in faculty associated settings. Enrollment lim-
108. Sociology of Mental Health—(Same as Sociology 107/207.) Sociological perspectives on mental illness and the organization of mental health services. Topics: epidemiological, psychosocial, and sociocultural approaches toward mental illness; socioenvironmental factors that influence use of the response to mental health services; patient-program relationships, and the evaluation of mental health services. Depression disorders, alcohol and drug abuse, psychosomatic disorders, and schizophrenia.

4 units, Win (Cronkite)

109. Human Behavioral Biology—(Same as Biology 163/263.) Biological bases of normal and abnormal human behavior are examined. Trains students to approach complex behaviors in a multidisciplinary way. Relevant disciplines (sociology, ethology, neuroscience, and endocrinology) are integrated in examining behaviors such as aggression, sexual behavior, language use, and mental illness.

4 units (Sapolsky) not given 1990-91

110. Nutritional Problems of Developing Nations—(Same as Food Research 250, Anthropology 250.) Malnutrition syndromes common in developing countries, emphasizing protein-caloric malnutrition, nutritional anemias, and vitamin A deficiency. Infection as a contributor to malnutrition. Methods and techniques of nutritional assessment applicable for use in developing nations. Effects of malnutrition throughout the life cycle. Prerequisites: 120 or equivalent.

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

111. Human Physiology—(Same as Biological Sciences 112.) The functioning of organ systems, emphasizing mechanisms of control and regulation. Topics: structure and function of the endocrine and central nervous systems, cardiovascular physiology, respiration, salt and water balance, exercise and gastrointestinal physiology. Lectures and discussion. Prerequisite: Biology or Human Biology core. Limited to 120. Registration required.

4-5 units, Win (Heller, Lawry) MWF 9

112. Educational Policy—Factors which influence the decisionmaking process at local, state, and federal levels of American public and private education. Writing intensive course; students utilize peer review and collaborative techniques to develop papers which confront contemporary issues. Students plan and participate in a simulated, video-taped, professional conference. Lectures/discussion. Prerequisite: Human Biology core.

3 units, Aut (Morgan)

113. Biology and Evolution of Language—(Same as Anthropology 5, Linguistics 5.) Language as an evolutionary adaptation. Comparison of communicative behavior in humans and animals, and the inference of evolutionary stages. Structure, linguistic functions, and evolution of vocal tract, ear and brain with associated disorders (stuttering, dyslexia, autism, schizophrenia) and therapies. Controversies over language "centers" in the brain and the innateness of language acquisition. Vision, color terminology, and biological explanation in linguistic theory. (DR:4) 4-5 units, Spr (Fox) MWF 11

114. Evolutionary Anthropology—(Same as Anthropology 181.) Seminar on relationships between genetic and cultural evolution in human populations. Reviews major new works relating genes, culture, and human diversity (including sociobiology, cultural transmission theory, Darwinian culture theory, and coevolution) emphasizing theoretical issues and empirical case studies. Students teams conduct original research projects and report to the class. Prerequisite: Human Biology 1 or consent of the instructor.

4 units, Spr (Durham)

115A. Humans and Viruses—Overview of human virology and selected topics to illustrate important concepts in biology and the social sciences. Focuses on viral classification, vaccination, and eradication of disease, AIDS, herpes viruses, cancer viruses and viral evolution. Broad perspective: e.g., molecular biology of genetic shift and drift in influenza virus, cellular tropism of HIV (AIDS virus), development biology of virally induced birth defects, clinical aspects of infantile diarrhea, social aspects of the common cold, policy issues of blood antibody tests, cultural factors in transmission of kuru. Prerequisite: Human Biology core or consent of instructor.

4 units, Win (Siegel)

115B. Seminar: The Vaccine Revolution—Advanced seminar: human aspects of viral disease, focusing on recent developments in the area of vaccines. Journal club format: students select articles from primary scientific literature, write formal summaries, and synthesize into literature review on a specific topic. Emphasis on development of critical reading, analysis, and interpretation of data. Students give 3-5 oral presentations based on their reading. Discussion on student questions and critique.

3 units, Spr (Siegel)
116. Eye and Implications of Vision—Seminar on workings of the eye, and how vision influences human endeavors. Compares the human eye to the specialized eye of animals. Visual illusions and influences of the eye on visual physiology in art, history, and literature. Prerequisite: Human Biology core, Biology core, or consent of instructor. (Non-science majors welcome.)  
3 units, Aut (Marmor)

117. Policy and Research in Science Education—(Same as Education 355B.) Controversial topics in science education (e.g., teaching of evolution, teleology and anthropomorphism, gender bias, text selection, recruiting and retraining qualified teachers, goals of science teaching for different populations). The substance and style of formulating policy for science education in the U.S., now and in recent past. Emphasis on issues for local, state, and federal authorities, particularly appropriate governmental roles in selection of content, improvement of teaching, and research. Attention to primary, secondary, and the undergraduate programs; and use of museums and media in programs to improve science education. International comparisons where appropriate.  
3 units, Win (Atkin)

119. Conservation Biology—(Same as Biology 180.) Introduction to the science of preserving biological diversity, its principles, policy, and applications. Topics: biology of small populations, extinction, minimum viable population analysis, habitat fragmentation, reserve design and management, the endangered species act, and conflict mediation. Case studies illustrate topics. Prerequisites: 33, Biology 2A, or consent of instructor.  
3 units, Win (Boggs)

119L. Conservation Biology Laboratory—(Same as Biology 180L.) Introduction to the practice of conservation biology; preparation of biological portions of EIRs, field trips highlighting local conservation issues, computer exploration of population dynamics, techniques of data analysis, small projects with direct application of scientific principles to solve problems in conservation biology. Corequisite: 180. Prerequisites: 2A or Biology 33.  
2 units, Win (Boqqs)

120. Human Nutrition—(Same as Food Research 119.) Introduction to human nutrition including the function, digestion, absorption, and metabolism of nutrients; dietary recommendations and standards; and an overview of national and international nutrition problems. Prerequisites: Human Biology core or consent of instructor.  
4 units, Aut (Butterfield, Martorell)  
MWF 11

122. Biological and Social Perspective on Tobacco—(Same as Biology 67/167.) Tobacco is an instructive example of how biology and culture interact. Tobacco and tobacco use from the perspectives of biology, medicine, history, economics, psychology, and law. Topics: botany and biochemical properties of tobacco plant families Solanaceae; physiological effects of tobacco use, and nature of limits of epidemiological evidence of those effects; agricultural, industrial, and financial history of tobacco product manufacture and distribution; legal, policy and political issues presented by tobacco problem in the U.S. Enrollment limited to 50.  
3 units, Spr (Long, Greely)

124. Neural Basis of Sleep and Circadian Rhythms—Underlying neurophysiology, neurochemistry, and behavioral biology of sleep/wake and circadian processes. Prerequisite: 4A or Biology 32, or consent of instructor.  
3 units, Aut (Miller, Heller)

125. Legal and Political Perspectives on Biology and Technology—(Same as VTSS 150.) How legislatures, courts, and regulatory agencies deal with issues related to biology and technology. Issues: computers and privacy; carcinogens and legislation; tobacco and the law; risk-benefit analysis and politics; workplace issues of equal pay and job safety; government and corporate accountability in a time of rapid technological and scientific change. Introduction to workings of law, politics, and regulation. Emphasis on research. Find library and live data, analyze it, understand how the government works and why interests compete, and use the skills of written and oral presentation to educate and persuade. Limited to 40 students.  
4 units (McBride) not given 1990-91

128. Biosocial Aspects of Sexually Transmitted Diseases—Evolution of policy and research in the field of STDs. The term "Venereal disease" was once limited to only a few conditions; now STDs number more than 20 including chlamydia, herpes, human papilloma virus, and AIDS. The historical, legal, and psychological implications of these diseases and syndromes provides a perspective on current political and social problems of STDs. Basic understanding of the biology, epidemiology, and impact of health of STDs is necessary for intelligent discussion. Leaders in their fields present their perspectives on STD policy, research, history, anthropology, sociology, law, special populations, or diseases. Format is lecture or debate, with discussion following, to present areas of active controversy in strategies for control and research. In-depth understanding on one interface between social policy and the biology and ep
Challenges of a disease gained by writing and presenting a required policy-oriented paper. Evening sessions may be required. Enrollment limited to 25. Prerequisite: Human Biology core or consent of instructor.

3 units, Win (Cerel, Katchadourian)

139. Human Sexuality in Medicine—(Same as Molecular and Cellular Physiology 212.) Multidisciplinary survey of physiological and psychosocial determinants of sexual behavior, basic concepts, and clinical approaches to diagnosis and therapy of sexual dysfunction, and related topics (sexual differentiation and sexually transmitted diseases).

2 units, Aut (Davidson)

141. The Great Neglected Diseases of Mankind—Ancient diseases are the major cause of disability and death in the Third World in spite of medical advances resulting in unprecedented improvement of health and longevity in the developed world. Commitment to obtain permanent solutions for eradication requires multidisciplinary approaches including scientific research and public policy issues of cultural and socioeconomic conditions of developing nations. Course participants are scientists, historians, public servants, government officials, private sector, and physicians dedicated to the improvement of world health.

3 units (Heller, Staff) not given 1990-91

134. Ecological Anthropology—(Same as Anthropology 164.) Seminar on ecological analysis in anthropology, emphasizing patterns of co-variation between social systems and eco-systems. Sample societies from diverse habitats (arctic, desert, tropical rain forest, ocean islands, mountain tops) motivate the exploration of theoretical topics, including population growth and regulation, carrying capacity, niche analysis, resource competition, optimal foraging, resource management, and evolutionary culture theory.

3 or 5 units (Durham) not given 1990-91


5 units, Spr (Arthur) MW 1:15-3:05

138. Cross-Cultural Approach to Human Development in Infancy, Childhood, and Adolescence—Examines ways culture frames human development in infancy, childhood, and adolescence. Topics: emotional development and attachment in infancy and pre-school year development of self, school as socialization agent, identity and adolescence, morality and cultural relativism, values and ethics in social sciences. Prerequisite: Human Biology Core or consent of instructor.

4 units, Aut (Mont-Reynaud, Randy)

142. The Impact of AIDS—Focuses on AIDS as a viral infection, particularly in terms of disease pathology and spread of the virus, providing a solid foundation for understanding the impact of AIDS upon biology, medicine, and society. Provides tools for thinking of ways to stop the transmission of the AIDS virus, emphasizing education. Cultural aspects of AIDS, including perspectives from sociology, law, economics, and politics. Students use their knowledge to help teach elementary and high school students about AIDS as part of a student speaker bureau. (Non-science majors welcome.)

4 units, Spr (Siegel)

143. Early Experience—(Same as Psychology 190A.) Experimental literature related to effects of pre- and postnatal environmental factors on development and adult function. Animal and human research, and behavioral and psychological function. Prerequisite: Human Biology Core or consent of instructor.

3 units (Lecine) not given 1990-91

147. Controversies in Human Nutrition—(Same as Food Research 114.) Two weeks of lectures, followed by student participation in discussions. Research paper on topics chosen with instructor's guidance and approval.

2-3 units, Spr (Butterfield, Martorell)

148. Environmental Policy—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. Focuses on the U.S.; international perspective when appropriate. Main points: definition and description of environment and environmental impact, history of human impact on environment, causes of increased human impact, history of environmental protection, decisionmaking and resolution of issues, future environmental issues. Two discussion hours. Enrollment limited to 15 Human Biology seniors. Prerequisites: Human Biology core or 40 or 41, or consent of instructor.

3 units, Spr (Ehrlich, Anne)

150A. Biosocial Aspects of Birth Control—(Same as Chemistry 137A.) Introducing a new, practical birth control agent or procedure involves legal, political, cultural, and economic factors in addition to purely biological ones, and illustrates how components enter into major policy deci-
sions. Critical evaluation of logistic aspects of human fertility control and "hardware" and "software" aspects of birth control. Groups of five to eight students of diverse backgrounds develop a series of position papers dealing with new birth control procedures suitable for populations of different cultural and socioeconomic backgrounds. First half: lectures, selecting the population groups and task forces; and individual discussions with each task force. Task forces are selected to create a multidisciplinary student group (divided between males and females) with different undergraduate backgrounds (pre-medicine, pre-law, biological sciences, anthropology, chemistry, economics, political science, psychology, etc.) Part II: library and field work, writing task force reports, and oral presentations. Focus is on logistic aspects of a common topic in birth control field. Enrollment limited to 35. Pre-registration essential; use questionnaires available from Human Biology office. Prerequisite: at least junior standing.

6 units (Djerassi) not given 1990-91

150C. Gender-Specific Perspectives of Birth Control—(Same as Feminist Studies 145.) In most societies human fertility control responsibilities rests predominantly with women. Is this desirable and realistic, or should changes be instituted? Students choose aspects of this problem and address themselves, in the form of research papers, to possible answers. Preregistration essential; use special forms available from Human Biology office. Prerequisite: at least junior standing.

6 units, Win (Djerassi)

151. The Rise of Scientific Medicine—(Same as VTSS 128, History 133A, History of Science 154.) Intellectual, social, and institutional dimensions of the rise of scientific medicine in the 19th century. How did medicine become "scientific"? What differences did it make to the physician? Why did it displace other approaches to medicine? Focus is on France, Germany, and England from 1750 to 1812 and U.S. from 1890 to 1912. Development of experimental physiology and biomedical technology and claimed contributions to the 19th-century medical revolution. Concrete relationships of scientific developments in physiology, pharmacology, and bacteriology and effects on medical practice and therapy. Patterns of professionalization of medicine in different national contexts. Were forces driving professionalization of medicine in these contexts the same or different? How institutional structure of the medical profession differed according to local context.

4 units, Win (Lenoir) TTh 2:15-3:30

152. The Darwinian Revolution—(Same as History 133, History of Science 152, VTSS 130.) Conceptual developments leading to establishment of the major unifying paradigm of biological science, the theory of evolution by natural selection. Biological thought before Darwin, 1750 to 1836. Formation of Darwin's thought in terms of its broader intellectual and social context; attention to Origin of the Species. Difficulties the theory had to overcome and their resolution in the union of evolutionary biology and population genetics.

4 units, Aut (Lenoir) TTh 2:15-3:30

153. Interaction of U.S. Agriculture with the Environment—(Same as Food Research 145.) Agriculture in U.S. is shaped by biological and economic influences. Issues: plants and genetic manipulation, soil and water conservation, pest control, agroecosystems, and food processing and preservation technologies. Focus: assessing long-run biological, environmental, and economic consequences of agricultural practices, their interactions, and how policy affects these practices. Prerequisite: Economics 1.

3-5 units, Win (Archibald) MW 9-10:50

154. The Biosocial Aspects of Cancer—(Same as Radiation Oncology 154.) Aspects of cancer as a biological phenomenon and as a clinical, emotional, and societal problem. Diagnosis and treatment of human neoplasms, their psycho-social and economic impact, and organization of cancer care and research. Emphasis on specific control mechanisms operative in vitro and/or in vivo and delineation of their influence in an attempt to characterize differences between normal and malignant growth. Prerequisite: Human Biology core or equivalent.

4 units (Staff) not given 1990-91

155. Biological, Medical, and Social Aspects of Normal and Abnormal Human Development—The human as a developing biological system. Topics: specification of cell fate, aneuploidy, sex determination and differentiation, eye development, limb pattern formation, growth control and dwarfism, fertilization, embryo transfer and aging. Enrollment limited to 30. Prerequisite: Human Biology core or Biology core. Preference given to Human Biology seniors.

3 units, Spr (Porzig)

157. Animal Behavior—(Same as Psychology 147.) Ethology, its physiological mechanisms, ecology, and evolution. Introduction to the phylogeny, genetic basis, and adaptive function of species-typical behavior in animals.

3 units, Spr (Fernald) TTh 11-12:15

Emphasis on diverse ecological niches, social adaptations, and reproductive strategies of living primates. Unique features of the primate brain and endocrine system with respect to physiological basis of behavior. Approaches to conserving and breeding primates for the future. Prerequisite: Human Biology core or consent of instructor.

3 units (Staff) not given 1990-91

163. Introduction to Psychopharmacology—Molecular, cellular, and systematic psychopharmacological mechanisms integrated with principles of human neurophysiology, diagnosis and treatment of common neuro psychiatric disorders, and social problems of drug use and dependency. Prerequisite: Human Biology core or consent of instructor.

3 units, Aut (Lawry)

166. Cardiovascular Disease Prevention and Epidemiology—Epidemiological, biological, and behavioral perspectives of cardiovascular disease and assessment and modification of risk factors relating to it. The potential for disease prevention examined in context of major preventive trials. Public policy ramifications. Topics: weight control, smoking, Type-A behavior, and exercise. Enrollment limited to 35. Prerequisite: Human Biology core or consent of instructor.

4 units, Aut (King)

167. Molecular Biology of Central Nervous System Development—Molecular events underlying development of the mammalian central nervous system (CNS). Topics: embryogenesis and morphogenesis of the CNS, neuronal development lineage and pluripotential of developing neurons and molecular controls which determine CNS development. Control of biochemical events taking place in neurons as development unfolds. Genetic diseases in animals and humans illustrate the critical role of heredity in CNS maturation. Draws heavily on principles of regulatory biochemistry, neurobiology, and molecular biology. Prerequisites: 3A, 4A or Biology 31, 32. Recommended: Biology 153 and/or 154; prior coursework in cell biology, biochemistry, neurobiology, and molecular biology.

5 units (Ciaranello, Wong) not given 1990-91

168. Medical Anthropology—(Same as Anthropology 168, VTSS 156.) Western and non-western cultural systems of health; sociocultural correlates of health; illness experience; medicine as a social institution. Designed for students with interests in health care, any major.

5 units, Aut (Becker) TTh 11-12:30


4 units, Spr (Matteo)

170. Human Ecology—Focus: Earth as a mosaic of varied modes of human resource use, interactions among different modes, and prospects for the future. Organized in five "modules": the setting, characteristics of different modes of resource use, ideologies of resource use, global ecological history, and prospects of our common future.

3 units, Spr (Gadgil)

171. Adolescence—Adolescence from anthropological, sociological, psychological, and psychiatric perspectives. Topics: physical, physiological, and cognitive development; identity, peer group, parent/child relations, impact of school and college, vocational development, and problem outcomes. Prerequisites: Human Biology core or Psychology III, and a statistics course.

4 units, Win (Feldman)

173. Medical Ethics—(Same as Philosophy 78.) Philosophical analysis of moral dilemmas in health care from perspectives of health care professionals, and concerned laymen (patients, family members, or observers.) Traditional insights about rights, compassion, respect for persons, and other moral matters illuminate such issues as euthanasia, informing vs. lying to seriously ill patients, treatment of deformed newborns, and the just allocation of scarce lifesaving therapies.

4 units, Spr (Cohon) MWF 10

176. Child, Family, and State—Introduction to family law issues; how law distributes power and responsibility among child, family, and state. Moral, philosophical, and legal issues relating to newborns, child abuse, and neglect; problems relating to divorce, child custody, and child support; adolescent's rights emphasizing policy relating to teenage pregnancy, contraception, and abortion. Prerequisite: Human Biology core or consent of instructor.

3 units (Mnookin) not given 1990-91

177. Social Psychology of Physical Deviance and Disability—(Same as Psychology 177.) Issues faced by the disabled and the physically deviant. Focus: interaction problems, short and long term. Emphasis on data needed to formulate policy changes. Enrollment limited.

4 units, Aut (Hastorf, Scott)

178. Aging: From Biology to Social Policy—(Same as Anthropology 140.) What can we expect when...
we join the ranks of the elderly? What are the biological processes of aging? Are they the same for all populations and cultures? What is the interaction between biological processes of aging and social status of the elderly in various cultures? What are the cultural, social, and economic consequences of a large population of elderly people? What implications do they have for social policy? Questions are addressed through readings, lectures, films. Students are assisted in research projects and working with the elderly. Those with strong clinical interests should enroll in Medicine 210.

3-5 units (Barnett) not given 1990-91

183. Hunter-Gatherers in Archaeological Perspective—(Same as Anthropology 187.) Organization and subsistence of band-level hunter-gatherers as approached through archaeological investigations. Survey of modern hunter-gatherers, providing background for prehistoric groups. The archaeological record of Africa, Europe, and New World provides examples of how data reconstructs the cultural systems of extinct hunter-gatherers. Artifact typology, settlement pattern analysis, modeling approaches, ethnoarchaeological methods, and other techniques determine similarity of early groups to modern counterparts. (DR:5*)

5 units (Rick) not given 1990-91

184. Intensive Life Support Systems: Present Practice and Moral Issues—Investigation of life support systems used in intensive care units (ICUs). Topics: state of the art of critical care medicine. Focus: function, need, productivity, and national costs of intensive care units. Examples of how basic understanding of physiology can be translated through bioengineering into life support systems. 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." Students spend time in ICUs. Enrollment limited to 30. Prerequisite: Human Biology core.

3 units (Raffin) not given 1989-90

188. The Evolution of Prehistoric Civilizations—(Same as Anthropology 198.) Radical transitions in the evolution from original non-complex societies to complex state organizations. Basic problems: change from food collecting to food-producing societies, evolution of rank and stratification in society, and the role of trade, interaction, mobility, population growth, and ideology in the development of civilizations. Theories of state evolution examined in the context of prehistoric Mesoamerican and South American complex societies. (DR:5)

5 units (Rick) not given 1990-91

189. Behavioral Endocrinology—(Same as Psychology 189.) Behavioral and environmental influences on endocrine regulation, particularly those hormones related to responses to stress. The basic endocrinology and neuroendocrine regulation of stress-related hormones. Emphasis: interaction of psychological variables and activity of the pituitary-adrenal system; also, a detailed examination of concepts of stress, and coping from a theoretical perspective. Prerequisite: Human Biology core, or consent of the instructor.

3 units (Levine) not given 1990-91

196A. Molecular Neurobiology Seminar—(Same as Psychology 270.) Advanced topics in neurochemistry emphasizing molecular biological approaches to studying the nervous system. Students select topic, critically read the cited literature and additional relevant papers, and prepare a presentation reviewing the primary references listed. Prerequisite: introductory course in neurochemistry (i.e., 167, Neurobiology 200).

3 units, Spr (Ciaranello, Wong)

197. Internship in Human Biology—Required of all program majors. Combines coursework with a supervised field, community, or laboratory experience of their own choosing. Must be arranged in advance and initiated at least three quarters prior to graduation. Limited to Human Biology majors. Satisfactory/No Credit only.

4 units (Staff) by arrangement

198. Honors Program—In-depth research on a question that needs to be answered or a problem that needs to be solved. Students explore research interests and available opportunities with faculty advisor and director of the honors program when they declare the major. Two sponsors, one a member of Human Biology faculty, are required to approve a project and written proposal. Students attend periodic seminars. At project conclusion, a final paper providing evidence of rigorous research, fully referenced, and written in an accepted scientific style is submitted to the program. At honors symposium students give a 20-minute oral presentation followed by a brief question and answer session.

1-15 units (Morgan)

199. Directed Reading/Special Projects—Independent study. Students must consult with program's academic assistant for requirements.

(Staff) by arrangement
HUMANITIES SPECIAL PROGRAMS

Emeriti: (Professors) Paul H. Kocher, Lawrence V. Ryan
Acting Chair: Susan Stephens
Professor: Kurt Mueller-Vollmer (German Studies and Humanities)
Teaching and Program Coordinator; Lecturer: Helen Brooks

Honors Program Committee in Charge: Susan Stephens (Chair); Helen Brooks, Edwin Good, Marsh McCall, Alice Raynor, James Winchell
Graduate Program Committee in Charge: Susan Stephens (Chair); Karol Berger, Helen Brooks, Eckart Förster, Hester Gelber, Suzanne Lewis, Kurt Mueller-Vollmer

Humanities Special Programs include:
1. Honors Program in Humanities
2. Graduate Programs in Humanities
   a) Master of Arts
   b) Joint Ph.D.
3. American Studies. (See “American Studies” in this bulletin.)
4. Medieval Studies. (See “Medieval Studies” in this bulletin.)

HONORS PROGRAM

The Honors Program in Humanities aims to heighten a 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

Interested freshmen and sophomores may obtain information from the program office. Applications should be submitted at the earliest opportunity, preferably during the freshman year, and in every case before the junior year.

The program is open to majors in every field and may be taken in addition to a departmental major.

Students admitted to the program may enroll as Humanities majors:
1. If they choose a major in Humanities concentrating in Comparative Literature (see “Comparative Literature” in this bulletin).
2. If they choose a major in Humanities concentrating in Modern Thought and Literature (see “Modern Thought and Literature” in this bulletin).
3. If they are granted permission, through petition to the Honors Committee, to plan a 40-unit concentration of interdepartmental coursework constituting a unified program of study.

Students who wish to major in Humanities should 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 Cultures, Ideas, and Values (CIV) Requirement: 15 units freshman year with letter grade indicator (LGI) of at least “B,” and an “A-” or better in at least one quarter of the sequence. Students who expect to enroll in the program are urged to select Humanities 61, 62, 63 to fulfill the CIV Requirement.
2. Humanities 90: 5 units, sophomore year.
3. Unless students have strong intellectual reasons for doing otherwise, they should choose non-Western required courses from Areas 2 or 3.
4. In addition to the required Humanities courses, students must also take courses in disciplines of their interest in order to develop the requisite knowledge and methodological background to write an honors essay.
5. Two different Humanities seminars in the series 190-197: 10 units, junior year.
6. A critical honors essay on a topic of general importance and approved by the committee (2 units Spring Quarter, junior year; 5 units Autumn Quarter, and 5 units Winter Quarter, senior year). A grade of at least “B” is required on the essay for graduation with Honors in Humanities.
7. Students must maintain a minimum average LGI of “B” in all coursework in order to remain in the program.

GRADUATE PROGRAMS

MASTER OF ARTS

Application is made through the Graduate Admissions Office. The Master of Arts program in Humanities normally requires a two-year residency at Stanford, begun Autumn Quarter of the first year and completed the end of Spring Quarter of the second year.

During the first year, the typical candidate for the A.M. degree takes 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 takes 304-306 (the remaining three courses in “The Western Traditions”) and at least one of the three required seminars or proseminars in the chosen 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 is required.

The minimum number of units for the A.M. degree is 36. Additional elective units may be taken at the option of the student.

Under Statement of Purpose on the application form, the candidate must indicate the established field from which the three required seminars will be chosen. Once admitted the student submits a proposed study program to the chairman, specifying the courses chosen to fulfill the seminars or preseminars requirement.

The proposed program is approved on its own merits to ensure that the chosen seminars and preseminars 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 must be noted on the application form.

**JOINT Ph.D.**

The Graduate Program in Humanities (G.P.H.) supplements the Ph.D. programs of certain students, especially in the Departments of Art, Classics, Drama, Education, English, French and Italian, German Studies, History, Modern Thought and Literature, Music, Philosophy, Religious Studies, Slavic Languages and Literatures, and Spanish and Portuguese, with an interdepartmental program devoted to the study of the Western tradition. Although the G.P.H. draws upon the important texts and ideas which have traditionally been of common concern and interest to all humanistic disciplines, seminars usually focus on specific topics or sets of problems and then attempt to strike a balance among historical, literary, philosophical, and other possible orientations. The degree offered is a joint Ph.D. in Classics and Humanities, English and Humanities, German Studies and Humanities, etc.

Because the G.P.H. 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 should be made to the chairman; 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 culminating in the G.P.H. student symposium. Students must have the chair's permission to take seminars out of sequence.

Graduate students who are not G.P.H. members may enroll, by consent of the chairman, in offerings whose enrollments are not filled by G.P.H. members.

**REQUIREMENTS**

1. Continued satisfactory work in the student's major field, in accordance with departmental requirements.

2. Completion of the six historical seminars (301–306) in the Western Traditions series. To qualify for candidacy, students should complete at least three of these seminars in the first two years of graduate residence. Exemption from, or permission to audit, one or two of the seminars may be secured by petition to the Committee in Charge if the student can show coverage of the material at an advanced level.


4. At least one quarter of teaching for the Humanities Department, normally a teaching internship in the third or fourth year; 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 G.P.H. representative, designated by the chairman, as a member of the examining committee.

7. Submission of a Ph.D. dissertation acceptable to a committee which includes one representative of the G.P.H., designated by the chairman.

**COURSES**

See quarterly Time Schedule for changes in listings.

61, 62, 63. Literature and the History of Ideas—Introduction to fundamental ideas of the past. Emphasis is on the interconnection of literature, the arts, and philosophical and social thought in shaping the cultural traditions from the ancient to the contemporary world. The sequence also gives attention to non-European cultural traditions.

61. **The Ancient Near East, Greece, and Rome—The Epic of Gilgamesh.** The Bible, Homer, Sappho, Aeschylus, Sophocles, Euripides, Plato, Aristotle, Epicetetus, Virgil. (DR:1; three-quarter sequence) 5 units, Aut (Edwards, Staff) MTW 11 plus 2 hours by arrangement

62. **The Middle Ages and the Renaissance—** St. Augustine, Boethius, Beowulf, Marie de
France, Dante, Chaucer, Machiavelli, Montaigne, Shakespeare, Milton, More. (DR:1; three-quarter sequence)
5 units, Win (Evans, Staff) MTW 11 plus 2 hours by arrangement

5 units, Spr (Lindenberger, Staff) MTW 11 plus two hours by arrangement

90. Introduction to the Humanities Honors Program—Basic themes and issues as treated in important works from various humanistic disciplines. Prerequisites: completion of CIV requirement and enrollment in Humanities honors program.
5 units, Aut (Yearley) MW 3:15-5:05
Win (Mueller-Vollmer)

175. Individual Work—For students in the Humanities honors program who have objectives not met by current course offerings.
2-5 units, any quarter (Staff) by arrangement

190-197. Interdepartmental Seminars on the Nature of the Humanities—Students in the Humanities honors program must complete two seminars; other students may enroll only by consent of the director. Prerequisite: 90.
191 History and the Humanities.
5 units, Aut (Ketelaar) T 1:15-4:05
192. The Arts and the Humanities.
5 units, Aut (Good) T 7-10 p.m.
Spr (Rayner) MW 1:15-3:05
193. Philosophy and the Humanities.
5 units, Win (Hampshire) MW 1:15-3:05
194. Literature and the Humanities—Critical study of major texts; theory and practice of criticism.
5 units, Win (Brooks) TTh 2:15-4:05
Spr (Winchell)
197. Modernism and the Humanities.
5 units, Aut (Stansky) W 2:15-5:05
Spr (Perloff) TTh 1:15-4:05

200A, B, C. Honors Essay—A critical essay of about 15,000 words. Limited to Humanities honors students.
200A. 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. Honors Essay: Continued Study and Writing—Regular meetings with tutor. Prerequisite: 200A.
5 units (Staff) by arrangement

200C. Honors Essay: Conclusion—Regular meetings with tutor; submission of complete first draft to tutor by end of quarter. Prerequisite: 200B.
5 units (Staff) by arrangement

GRADUATE

275. Directed Reading.
2-5 units (Staff) by arrangement

299. Internship.
1-3 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 Greek Period.
4 units, Aut (Stephens) TTh 4:15-6:05
302. The Roman Period.
4 units, Win (Gelber) TTh 4:15-6:05
303. The European Middle Ages.
4 units, Spr (Lewis) by arrangement
304. From Renaissance and Reformation to the Enlightenment.
4 units, Aut (M. Ryan) MW 4:15-6:05
305. From Enlightenment to Modernism: The 18th and 19th Centuries.
4 units, Win (Fristor) MW 4:15-6:05
306. The 20th Century.
4 units, Spr (Mueller-Vollmer)
MW 4:15-6:05

INTERNATIONAL POLICY STUDIES (IPS)

Co-Chairmen: Barton V. Bernstein (History),
David J. Holloway (Political Science)

The IPS program is administered through the International Relations Program.

GRADUATE PROGRAM

MASTER OF ARTS

The IPS program is an interdisciplinary curriculum designed to provide a liberal education and to prepare students for an internationally-oriented career in the private sector or in government. It requires that the student complete an unusual number of prescribed courses during his or her undergraduate career.

The program is designed to provide: an understanding of the historical development of the modern world; training in economics and politics, with emphasis on the study of international relations; and work in greater depth on either a major region such as East Asia or Latin America, or a major issue such as economic devel-
opment. Training in accounting and computer science and proficiency in one modern foreign language are also elements of the program.

IPS requires the completion of 45 units of approved courses (which may include accounting and computer science but not course credit for foreign language), at least 25 units of which must be at the graduate level.

ADMISSION

New enrollment in the program is limited annually to about 15 students. Admission requires a letter grade indicator average of 3.5 or higher in the major and overall.

Students may enter the program in two different ways:

Early Admission for Stanford Undergraduates—Undergraduates at Stanford may apply for admission during their senior year. Those admitted are regarded as participants in a coterminal degree program involving their undergraduate major department and this program. Application requires an up-to-date transcript, two letters of recommendation from university-level instructors, a course paper of at least 10 pages, and a statement of relevant personal, academic, and career plans and goals. Application is made through the International Relations office, Bldg. 200, room 17. Before making formal application, students should review a statement entitled “The Master of Arts Program in International Policy Studies,” available in this office. Students should obtain from the Graduate Programs Office, Bldg. 590, room 104: a “Petition for Admission to Coterminal Degree Program,” and enough copies of the “Coterminal Degree Program Yearly Program Sheet” to chart their proposed course list from the present to the point at which they will qualify for the master’s degree. Once completed and approved by the undergraduate departmental representative, the petition, yearly program sheets, and transcript should be filed at the International Relations/International Policy Studies office, Bldg. 200, room 17. The closing date for filing applications and supporting credentials is November 16th of the senior year.

Admission at the Graduate Level—Applicants from schools other than Stanford or applicants from Stanford who did not apply in their senior year 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, including a statement setting forth relevant personal, academic, and career plans and goals. Applicants are expected to have an A.B. or B.S. degree from an accredited school. Applications for admission at the graduate level are accepted only for the Autumn Quarter and must be filed together with supporting credentials, including, among other materials, one paper of at least 10 pages and three recommendations, by the preceding January 1.

DEGREE REQUIREMENTS

The degree of Master of Arts in International Policy Studies is awarded to the student who has fulfilled the following requirements:

1. Met satisfactorily all departmental, University, and program requirements for the A.B. degree. 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 aforementioned statement on International Policy Studies, and set forth in “Degree Requirements: Fields and Courses.” The requirements involve specified courses and seminars normally to be completed in the space of five years (four undergraduate and one graduate). Forty-five of these units must be completed while enrolled for three terms with graduate standing at Stanford. Coursework done in fulfillment of requirements for the undergraduate major may not be used to meet the 45-unit master’s degree requirement. Twenty-five of the 45 units used to complete the master’s degree must be at the graduate level; these are normally taken during a coterminal student’s fourth or fifth year. 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. Students are expected to include in their program at least one graduate-level course or seminar that requires a substantial research paper.

3. Completed and filed at the Graduate Programs Office the “Program Proposal for the Master’s Degree” before the last day of classes of the first quarter of enrollment as a graduate student. On this form, students should list no more than 45 units fulfilling the IPS field requirements. Coterminal students must be sure to list 45 unduplicated
units, i.e., units for courses not counted to-
ward the undergraduate degree.
4. Completed and filed at the Graduate Program
Office, by the appropriate deadline, the No-
tice of Intention to Complete Advanced De-
gree Requirements.

FINANCIAL AID
Undergraduate financial aid is not normally
available for coterminal students completing the
fifth year. University-based financial aid is not
available for graduate students entering the IPS
program.

GRADE REQUIREMENTS
During enrollment in the IPS program, stu-
dents may take only one of the two required
"skills" courses for Satisfactory/No Credit,
and they may also take one other course in IPS
for Satisfactory/No Credit. Not counting
"skills" courses, IPS students must maintain
at least an average letter grade indicator of
"B-," and grades under "B-" except in
"skills" courses cannot be used toward the
45 units normally required in IPS.
The records of IPS students are normally re-
viewed during the summer after the beginning
of their coursework, and students who are not
making adequate progress will receive a warn-
ing. In cases where the record is poor, the stu-
dent's participation in the program may be
terminated.

INTERNATIONAL RELATIONS

Committee in Charge: Barton J. Bernstein (His-
tory), David J. Holloway, (Political Science)
Co-Chairmen; Partha Dasgupta (Philosophy
and Economics), Peter Duus (History), Terry
Karl (Political Science), Stephen Krasner (Po-
litical Science), Richard Lyman (Institute for
International Studies), Scott Pearson (Food
Research Institute), Jeffrey Williams (Food
Research Institute)

Affiliated Faculty: Elie Abel (Communication),
David Abernethy (Political Science), Shahid
Amin (Anthropology), Julie Anderson (Eco-
nomics), W. Brian Arthur (Food Research
Institute), Harumi Befu (Anthropology), Joel
Beinin (History), Barton J. Bernstein (His-
tory), Albert Camarillo (History), George
Collier (Anthropology), Alexander Dallin
(History and Political Science), Partha Das-
gupta (Philosophy), Sanford Dornbusch (So-
ciology), Charles Drekmeyer (Political
Science), Peter Duus (History), Marcel Fa-
champs (Food Research Institute), Richard
Fagen (Political Science), Walter Falcon (Food
Research Institute), Geoffrey Garrett (Pol-
tical Science), Kurt T. Gaubatz (Political
Science), James Gibbs (Anthropology), David
Gress (History), Avner Greif (Economics),
Judy Goldstein (Political Science), Akhil
Gupta (Anthropology), Stephen Haber (His-
tory), Nina Halpern (Political Science), Robert
Hamerton-Kelly (International Strategic In-
stitute), C. Robert Hamdrla (German Stud-
ies), Donald Harris (Economics), David
Holloway (Political Science), Harry Huizinga
(Economics), Kennell Jackson, Jr. (History),
Timothy Josling (Food Research Institute),
Harold Kahn (History), Terry Karl (Political
Science), Anjini Kochar (Economics), Stephen
D. Krasner (Political Science), Gavin Lang-
muir (History), John Lewis (Political Science),
Walter Lohnes (German Studies), Bruce Lu-
signan (Electrical Engineering), Mark Mancall
(History), Robert McGinn (VTSS), Ronald I.
Mckinnon (Economics), Lincoln Moses (Sta-
tistics), Norman Naimark (History), Robert
North (Political Science), Daniel Okimoto
(Political Science), Robert Packenham (Pol-
litical Science), Scott Pearson (Food Research
Institute), Bill Perry (Engineering-Economic
Systems), Clark Reynolds (Food Research In-
stitute), Richard Roberts (History), Renato
Rosaldo (Anthropology), Lee Ross (Psychol-
ogy), Philippe Schmitter (Political Science),
Clint Smith (Latin-American Studies), Robert
Staiger (Economics), Hans Weiler (Political
Science), Jeffrey Williams (Food Research
Institute), Sylvia Wynter (Spanish and Portu-
guese), Pan Yotopoulos (Food Research
Institute)

Affiliated Visiting Faculty: Luis Arroyo (History),
Michael Chamberlain (History), Naushad
Forbes (VTSS), Elemer Hankiss (Political
Science), Robert Kleinman (History), Kyongsoo
Lho (History), Stephen Zipperstein (History)

This program is an undergraduate major de-
signed 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 doing creative work in the international arena.
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, International
Politics. Following that, prospective majors de-
velop 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 50 units in the major, including both Political Science 35, International Politics, 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 have an overseas study experience (as in the Stanford Overseas Studies Program) or its equivalent. International Relations majors are also required to take at least two courses from the Economics Department. To fulfill this requirement, both courses may be in Cluster C, or one may be in Cluster C and either Economics 51 or 52, or both, may be counted in "related" work. Economics 51 or 52 may not be counted in Cluster C. One course within the major may be taken for a Satisfactory/No Credit grade. Finally, International Relations majors are required to complete a minimum of 10 units in related work either in social science or history courses dealing with the student's geographical or topical area of concentration, or in economic analysis (Economics 51, 52 or both).

Other course requirements depend on the cluster which the student chooses as the focus for his or her program. Cluster A includes courses that emphasize political and historical aspects of international relations. It is strongly recommended that at least one course on security issues be taken in Cluster A. Cluster B focuses on humanistic aspects of relations among national cultures. 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.

Each student develops a program in conjunction with a faculty advisor. The International Relations major must be declared before the senior year by submission of an acceptable proposal to the chairman of the program. Students completing a double major or 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 for courses not listed in this section of the bulletin or in the updated course lists in the International Relations office. 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 more than half the course work deals with international materials. ("International" here means "transactional," 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.) Extramural courses and freshman and sophomore seminars are not counted toward the major.

Students are encouraged to shape their programs so that coherent central themes 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 skills in research and writing. In their junior year, students should consult with prospective honors advisors, choose the courses that will provide academic background in their areas of inquiry, demonstrate an ability to conduct independent research, and write a formal thesis proposal. In their senior year, students write the thesis with a first draft due early in the Spring Quarter. Seniors are expected to discuss in a series of informal sessions with other students in the program and faculty sponsors, their research methods, problems, and findings. Prerequisites for participation include: a 3.5 letter grade indicator in International Relations courses, an overall strong academic record, successful experience in writing a research paper, and submission of an acceptable thesis proposal. Normally, students receive 15 units of credit, spread over three quarters, for the honors project. Five of these units may count toward the required 50 units in the major; an additional 5 may be used toward the requirement of 10 units of related coursework.

Further details of the International Relations Honors Program are available from the program office.

**GRANTS**

The International Relations program invites its undergraduate students, particularly juniors, to apply for funds to finance research or intensive study on forces that transcend national borders.
These grants are intended primarily for use during the summer between the junior and senior year by students writing senior honors theses in international relations. Application forms are available in the Winter Quarter in the International Relations office.

The grants 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 creativity 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 fulfill the degree requirements in both fields. For information on the A.M. program in International Policy Studies, see the “International Policy Studies” section in this bulletin.

**COURSES**

Course offerings often change after this bulletin is sent to the printer. For updated information, see the quarterly Time Schedule and course lists available in the International Relations office. See department listings for (DR) notations.

Political Science 35, International Politics, (Cluster A) is required for all majors.

**CLUSTER A: POLITICAL-HISTORICAL EMPHASIS**

22. The World Outside the West in the Age of European Imperialism—(Enroll in Anthropology 22, History 22, Political Science 22.) Confrontation and accommodation as non-European societies respond to Western Europeans, and to Western institutions and ideas, from the early 19th century to the present. Changes in production and trade in social and political structures, and in religious and ethical values in Egypt, Japan, and Nigeria. Recommended: Anthropology/History 21. (DR:5*)

6 units, Win (Abernethy, Befu, Beinin)

25. Colonialism and Nationalism in the Third World—(Enroll in Political Science 25.) 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 system. (DR:5*)

5 units (Abernethy) given 1991-92

35. International Politics—(Enroll in Political Science 35.) A variety of approaches to the study of world politics including realism, idealism, Marxism, and bureaucratic politics. WWI, the nuclear arms race, and international economic relations. The normative and policy implications of different theories. Enrollment limited to 450. (DR:5)

5 units, Aut (Krasner)

52D. Readings in Political Science and International Relations—(Enroll in German Studies 52D, Political Science 112D.) For students with a knowledge of German (one year or equivalent) who want to acquire reading proficiency in international relations. Reading materials include excerpts from scholarly works and professional journals. Students may introduce material they need to read for coursework or research. Open to undergraduates and graduate students.

3-4 units, Aut (Lohnes)

113A. Politics and Development in Latin America—(Enroll in Political Science 113A.) Survey of major political systems in Latin America (normally Brazil, Mexico, Cuba, and Argentina), the patterns of economic and social development associated with them, and their historical and international contexts. (Counts for Cluster A or C.) (DR:5)

5 units, Spr (Packenham)

115. European Economic History—(Enroll in Economics 115.) General trends and detailed analysis of specific topics emphasizing organization and the growth of trade and industry in Western Europe from the 11th century. Prerequisites: Economics 51 and 52. (Counts for Cluster A or C.)

5 units, (Staff) not given 1990-91

116A. European Politics and Society—I—(Enroll in Political Science 116A.) First of a two-quarter series introducing diversity and complexity in European politics from the 16th century to WWI: Italian city-states and Cantonal Switzerland to Republican France, the German Reich, and British constitutional monarchy. Emphasis on the interrelated processes of capitalist development, nation-building, state formation, and democratization. The state: how this form of political organization emerged in Western Europe and how the system of unequal competing states conditioned economic, social, and political outcomes up to its collapse in WWI. Substantial reading required. (DR:5)

5 units (Schmitter) given 1992-92

5 units (Schmitter) given 1992-93

116C. The Integration of Europe—(Enroll in Political Science 116C.) Analysis of efforts reducing national barriers to trade and investment, promoting social exchange and geographic mobility, creating common institution and supra-national authorities in Europe since the 1950s. Emphasis on the European Coal and Steel Community, the European Economic Community, the European Free Trade Association, and to the recent commitment to “complete Europe’s Internal Market” by 1992. Lectures/discussion sections: computer-assisted instruction introduces the quantitative analysis of data on the unity and diversity of European countries. (Counts for Cluster A or C.)

5 units, Aut (Schmitter)

117A,B. Eastern Europe in Transition—(Enroll in Political Science 117A,B.) Analyzes the social, political, and economic development of European societies since 1945. Hungary is focus and serves as reference point for the analysis of similar and contrasting developments in Poland and Czechoslovakia, and to the Soviet Union and other E. European countries.

5 units, Win, Spr (Hankiss)

118A. Political Change in Tropical Africa—(Enroll in Political Science 118A.) The colonial situation, the growth of nationalism, the achievement of political independence, ethnic patterns in new states, civilian and military leadership, the role of party and bureaucracy, problems in stimulating economic development, and cases of cooperation and conflict among African states. (DR:5*)

5 units, Spr (Abernethy)

118B. Politics of Race and Class in Southern Africa—(Enroll in Political Science 118B.) The political history of the region’s 10 countries, emphasizing relations among racial and ethnic groups. Diplomatic, economic, and military interactions among these states. The impact of movement, corporations, and international organizations based outside the regions. Attention to domestic politics and foreign policy of South Africa. (DR:5*)

5 units (Abernethy) given 1991-92

119. Aristocracy and Absolutism: Early Modern Eastern Europe—(Enroll in History 119.) Societies and cultures of E. Europe (Poland, Ukraine, Belorussia, Bohemia, Hungary) in the late medieval and early modern periods. The conflict of aristocratic parliamentary governments with absolutist states (Russia, Prussia, Austria-Hungary). Eastern Europe’s close development is contrasted to the Russian historical experience. (DR:5)

5 units, Aut (Kollman)

122G. Problems in Contemporary European Politics—(Enroll in Political Science 122G.) Analysis of two issues of fundamental importance in contemporary W. European politics: political responses to economic decline and the balance of power between Left and Right—Thatcherism, Mitterrand’s socialist experiment, and the decline of Scandinavian social democracy; and the politics of economic integration and the European free market of 1992—the tensions between domestic politics, the dynamics of the European Community, and broader international competition (the U.S. and E. Asia).

5 units, Win (Garrett)


5 units, Win (Amin)

124. Seminar: Latin American Dependency—(Enroll in Political Science 124.) Basic concepts and theoretical frameworks, single-country case studies, and research and political strategies regarding dependency and development in Latin America. (Counts for either Cluster A or C.)

5 units, Win (Packenham)

125. 20th-Century Eastern Europe—(Enroll in History 125.) Major historical trends in 20th-century E. European history. Empires and national movements. The creation of independent Eastern Europe after WWI; social movements and the emergence of dictatorships and fascism
Perspective. Traditional and modern theories of nuclear and conventional strategy in historical contexts of moral disengagement and of concepts of reformation (e.g., pacifism and its critics, studies of conversion, and the making of politics at different social levels, and feminist analyses). Interdisciplinary, dealing with the complex relationship between aid providers and recipients; ethical problems posed in the allocation, monitoring, and evaluation of development assistance; international disaster relief operations. (Counts for either Cluster A or C.)

5 units, Aut (Okimoto, Lau, Lho, Raphael, Lewis)

27D. 20th-Century Germany—(Enroll in History 127D.) German political, military, cultural history focused on: how and why united Germany tried to dominate Europe before 1945; how divided Germany developed from 1945-90; how and why Germany is reuniting today. 5 units, Spr (Gress)

123D. Political and Ethical Aspects of Foreign Aid—(Enroll in Political Science 132D.) General case study materials examine the characteristics of bilateral and multilateral "official development assistance"; trends in its volume and composition; the complex relationship between aid providers and recipients; ethical problems posed in the allocation, monitoring, and evaluation of development assistance; international disaster relief operations. (Counts for either Cluster A or B.)

5 units, Spr (Abernethy)

133. Peace Studies—(Enroll in Political Science 133, Psychology 142, Sociology 108, VTSS 143, History 154.) Interdisciplinary, dealing with the challenges of pursuing peace in a world where the sources of conflict are many and regional/ethnic/religious antagonisms are rising. Creating and maintaining peace is analyzed from historical perspectives. The nature of peace and peaceful processes (e.g., historical and political perspectives, questions of harmony and aggression at different social levels, and feminist analyses). Peace at the operational level (e.g., socio-psychological analyses, studies of bureaucracy, theories of conversion, and the making of "enemies." Peace-Moral and normative considerations (e.g., pacifism and its critics, studies of moral disengagement and of concepts of responsibility). Hopeful developments and important successes.

5 units, Spr (Drekmeier, Ross, Moses, Bland, North, Dornbush) TTh 2:15-4:05


5 units (Sagan) given 1991-92

134P. The Role of Technology in National Security—(Same as Political Science 134P.) Examines critical decisions made by the U.S. including development of the A-bomb and H-bomb, the crash development of the ICBM and SLBM after Sputnik, the decisions made in the wake of the energy crisis in the 70s, the space program, and current issues, e.g., high-density TV, the human genome project, and the SDI program. Also, briefly, how decisions to develop the A- and H-bombs were made in the U.S.S.R. and China, and comparison of the role of the U.S. and Soviet governments in their respective space programs. Focus: the process by which technical issues are synthesized into the decision process, and how they are explicated for the policymaker with no background in technology; the role of technical agencies, governmental committees, and science advisory boards and the way these groups interact to bring a broad spectrum of informed advice to the senior policymaker. Guest specialists from business, technological, and government areas provide key lectures. (Counts for either Cluster A or C.)

3 units, Aut (Perry)

136. Soviet Foreign Policy—(Enroll in Political Science 136, History 122B.) Foreign and domestic determinants of policy; intentions and capabilities; continuity and change since 1917; institutions and personnel; war and peace: perceptions, priorities, and attitudes; alternative futures. (DR:5)

5 units, Win (Dallin)

138A. Arms Control and Disarmament—(Enroll in Political Science 138A.) International security relations since 1945, from the breakdown of WWII alliances to recent political and military changes in the Soviet Union, Europe, and Asia. Development of nuclear weapons, arms competition, and efforts at arms control and disarmament in post-WWII period. The political, technological, and conceptual problems of security policies and arms control.

5 units, Win (Lewis)

138B. Seminar: Arms Control—(Enroll in Political Science 138B.)

5 units, Spr (Lewis)

139. Seminar: Chinese Foreign Policy—(Enroll in Political Science 139.) Chinese foreign policy and its sources: historical, ideological, strategic,
political, economic, and the decision making process. Relations with the two superpowers and the Third World. Crisis behavior. Prerequisite: Political Science 115 or permission of the instructor.

5 units, Win (Halpern)

139A. Japanese Foreign Policy—(Enroll in Political Science 139A.) The origins of WWII in the Pacific; Japan’s role in international security and U.S.-Japan trade conflict. (DR:5*)

5 units, Win (Okimoto)

143K. Seminar: Public Opinion in International Relations—The role of public opinion in the formation and conduct of foreign policy. The relationship between domestic opinion and international pressures on decision-makers. The influence of democracy and democratization on international relations. Prerequisite: Political Science 35 or consent of instructor.

5 units, Spr (Gaubatz)

144J. America in Vietnam—(Enroll in Political Science 144J.) The history and politics of American involvement in the Vietnam War. Emphasis on the historic roots of the war, its impact on politics in the 1960’s, disengagement and the long term effects of the war on contemporary foreign policy.

5 units, Spr (Goldstein)

145K. American Foreign Policy—(Enroll in Political Science 145K.) Introduction to American foreign policy, its formulation and implementation, and specific problems which have been influential in its development in the post-WWII era. Topics: origins of cold war, containment, Vietnam, and foreign economic policy. Prerequisite: 35 or equivalent.

5 units (Goldstein) given 1991-92


5 units, Spr (Eden)

148C. 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; conflicting ideologies and consciousness; nationalism; decolonialization. (DR:5*)

5 units, Win (Roberts)

149A. History of East Africa—(Enroll in History 149A.)

5 units, Aut (Jackson)

165C. 20th-Century America—(Enroll in History 165C.) (Fulfills the American Foreign Policy Requirement in 1990-91.)

5 units, Spr (Bernstein, Camarillo)

172A. America Since 1945—(Enroll in History 172A.) Analyzes foreign policy and politics, and deals with the intellectual history and social themes. (Fulfills the American foreign policy requirement.) (DR:5)

4-5 units, Win (Bernstein)

176. International Communications: Structures and Issues—(Enroll in Communication 176.) Comparative survey of national media systems and the policy issues arising from existing imbalances between developed and developing countries. Seminar examines new technologies that have transformed the global flow of news, economic data, and cultural and technical information. Prerequisite: Communication 1. Seniors and graduate students in communication and international relations have first priority with consent of instructor.

4 units, Aut (Abel)

177. Modern Latin America—(Enroll in History 177.) Survey of Latin American history since the 19th century, concentrating on the region’s political, social, and economic development. Contemporary problems of inequality, political instability, and authoritarianism are studied in historical context, emphasizing Mexico and Spanish South America. (DR:5)

5 units, Spr (Parker)

179. History of Mexico—(Enroll in History 179.)

5 units, Aut (Bowser)


4 units, Win (Hamrdla)

Indian history. (Counts for either Cluster A or B.)

5 units, Spr (Gupta, Mancall)

187A. The Middle East, 570-1718—(Enroll in History 187A.) From Late Antiquity to the decline of Ottoman absolutism. Emphasis on development and character of Islamic civilization, the place of the medieval East within world history, Middle East within world history, and shift in center of gravity from Central Asia to Western Europe. (DR:3*)

5 units, Win (Chamberlain)

187B. The Modern Middle East, 1718 to the Present—(Enroll in History 187B.) From the emergence of regional Arab entities and the commercial penetration of Europe to the Present. (DR:5*)

5 units, Aut (Beinin)

188D. History of the Jews in Eastern Europe—(Enroll in History 188D.) The political, social, economic, and cultural history of the Jews in Poland, the Russian Empire and the Soviet Union, the Baltic lands, Czechoslovakia, Hungary, Rumania, and Yugoslavia to the present. Growth and decline of Jewish autonomy; modernization movements; Yiddish, Hebrew, and assimilationist cultures; Zionism and Jewish socialist movements; the Jews and the Communist parties, Fascism and Nazism; the Holocaust, Stalinism, Soviet Jewry, and the remnants.

5 units (Mancall) given 1991-92

189. Zionism and the State of Israel—(Enroll in History 189.) The condition of the Jews in the 19th century, origins and development of the Zionist movement and alternatives to it, Jewish settlement in Palestine, and foundation and growth of the State of Israel. The relationship of ideology and action.

5 units (Mancall) given 1991-92

195. Nomad Empires of Inner Asia—(Enroll in History 195, Asian Languages 152.) Inner Asia as an arena of conflict between agricultural and nomadic societies and the traces of cultural diffusion. (DR:5*)

4 units, Spr (Dien)

212P. The Politics of Regional Cooperation and Integration—(Enroll in Political Science 212P.) Theory and practice of "regionalism"; bilateral and multilateral efforts to resolve conflicts between countries peacefully, to increase mutual exchanges, and to create supra-national institutions. The European Community, the U.S.-Canadian Free Trade Area, and recent experiences in Latin America. Open to advanced undergraduates and graduate students.

5 units (Schmitter) given 1992-93

217. Undergraduate Colloquium: War and Postwar Poland—(Enroll in History 217.) The problems of German and Soviet occupation, Polish resistance during the war, and the dilemmas of Polish politics, at the end of the war and beginning of the peace. The relationship between social changes and political movements. The complex nationality issues involving Poles, Jews, Germans, Russians and Ukrainians.

5 units, Win (Naimark)

221. Education and Political Change—(Enroll in Political Science 221, Education 306B.) The relations between education and politics from a comparative perspective. Topics: different theoretical approaches to the study of education and politics; problems of legitimacy in educational policy; international factors in educational development; the politics of educational reform; processes and conditions of political learning.

5 units, Win (Weiler)

227H. Seminar: The Rise of New Elites in East European Societies—(Enroll in Political Science 227H.) The fall of ancient regimes and the rise of new ruling elites or classes in E. European societies. Focuses on Hungary in the 1980s with systematic references to similar and contrasting processes in European history and in other E. European societies.

5 units, Spr (Hankiss)

227P. Seminar: Democratization East and West—(Enroll in Political Science 227P.) Comparison of political changes leading to more democratic institutions in Eastern and Southern Europe, with reference to Latin America and perhaps Asia: differences in previous regimes and economic systems; in levels of development and international context; in eventual institutions and practices. Open to advanced undergraduates and graduate students.

5 units (Schmitter) given 1992-93

233. Undergraduate Colloquium: From Prague to Paris—Aspects of European Politics and Culture Since 1945—(Enroll in History 233.) The political, intellectual, and cultural history of E. and W. Europe since WWII. Readings: Czechoslovakia or France to show links and misunderstandings in the relations between the two halves of Europe during the past 40 years. (Counts for either Cluster A or B.)

5 units, Aut (Judit)

236. The Soviet Union and the International System—(Enroll in Political Science 236.) The emergence of the Soviet Union as a superpower, and its possible decline. Domestic sources of Soviet power and policy, and the effects of international rivalry of the Soviet System. Topics: economic and technological bases of power, ide-
ology and foreign policy, the armed forces and military doctrine, the Soviet Union in the world economy, Gorbachev's "new thinking", Eastern Europe and Soviet security. Prerequisites: Political Science 136, History 122B, or consent of instructor.

5 units, Spr (Holloway)

243. International Relations Theory—(Enroll in Political Science 243.) Introduction to contemporary theories of international politics. Micro and macro approaches to the study of conflict and cooperation in world politics, including the works of Carr, Waltz, Gilpin, Keohane, and Bueno De Mesquita. Class format emphasizes student oral and written presentation of assigned readings.

5 units, Spr (Holloway)

249A. Africa Since 1945—(Enroll in History 249A.) Africa's political and economic evolution since WWII; nationalism and decolonialization.

5 units, Spr (Jackson)


5 units, Spr (Jackson)

270A. Undergraduate Colloquium: The Early Nuclear Age, 1939-1953—(Enroll in History 270A.)

5 units, Spr (Bernstein)

287. Colloquium: Imperialism, Underdevelopment, and Revolution in the Modern Middle East—(Enroll in History 287.) The integration of the Middle East into the world capitalist market on a subordinate basis and the impact on economic development, class formation, and politics. Alternative theoretical perspectives on the rise and expansion of the international capitalist market are combined with possible case studies of Egypt, Iraq, and Palestine.

5 units, Win (Beinin)

288. Undergraduate Colloquium: The Palestine and Arab-Israeli Conflict—(Enroll in History 288.) The Palestine-Zionist conflict from 1882 to the present through reading and comparing representative expressions of competing historical interpretations. U.S. policy towards the conflict since 1948.

5 units, Spr (Beinin)

CLUSTER B: HUMANITIES EMPHASIS

64. Introduction to Chicano Life and Culture—(Enroll in History 64.) Interdisciplinary focus on the history and culture of Mexican Americans from the settling of the Spanish borderlands to today. Historical perspectives are balanced with anthropological and literary views of the cultural diversity of Mexicans in the U.S. (DR:5)

5 units, Win (Arroyo, Rosaldo)

77. Ethics in International Relations: Topic—World Destitution—(Enroll in Philosophy 77.) Focuses on the phenomena of hunger and malnutrition in poor countries, including analytical and empirical material drawn from moral and political philosophy, economics, and nutritional science. Develops methods of quantitative assessment of the extent and distribution of well-being and basic needs in a society. Readings from contemporary sources.

4 units, Win (Dasgupta)

80. Culture, Politics, and Society in Latin America—(Enroll in History 80, Latin American Studies 80.) Interdisciplinary survey of the interaction of Amerindian, African, and European cultures in the creation of New World societies from 1500 to the present. Basic introduction to the Latin American courses within several departments. (DR:5*)

5 units, Win (Haber)

103. Mesoamerican Communities, Ethnicities, and Nations—(Enroll in Anthropology 103.) Survey of the Maya, the Aztecs, and their prehistoric neighbors; of how they fared under Spanish colonial rule; and of what their descendants are like today.

3-5 units, Aut (Collier)

108. The Christianization of Western Europe, 500-1350—(Enroll in History 108.) How the Europeans came to believe in 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 religiously.

5 units, Aut (Langmuir)

109. African Societies in a Changing World—(Enroll in Anthropology 108.) Lectures, discussions, and films introduce the social institutions and cultural forms of Black Africa in the wider context of colonialism, political independence, and national strategies of development. Topics:
shifts in patterns of marriage and family life, the emergence of new classes, the impact of Islam and Christianity. (DR:5*)

5 units, Aut (Gibbs)

110. Philosophical and Ethical Issues in Public Policy—(Enroll in VTSS 110.) Philosophical and ethical issues in science and technology-related public policy conflicts. Develops the capacity for rigorous critical analysis of complex, value-laden policy disputes. Topics: the nature of ethics and morality; the nature of and rationales for liberty, justice, and human rights; the use and abuse of these concepts in recent and current policy disputes. Cases from biomedicine (euthanasia, pre-determination of sex of offspring, and genetic testing); environmental affairs (endangered species, wilderness and landmark preservation, and high-rise proliferation); the technical professions ("whistle-blowing," fraud, human subjects research); and international relations (warfare, technology transfer, immigration, and repatriation of artistic patrimony). For I.R. credit, course term paper must be on an international topic. (Counts for either Cluster B or C.) (DR:3)

5 units, Win (McGinn)

115. Peoples of Island Southeast Asia—(Enroll in Anthropology 115.) Topics: 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, Win (McGinn) given 1991-92


5 units (Befu) given 1991-92

121W. Seminar: Politics, Literature, and Film in Germany—(Enroll in Political Science 121W.) Writers and filmmakers reveal different aspects of politics and social change, and provide new and often startling interpretations. Uses (in English translation) novels by Grass, Böll, Wolf, Lenz, Heym, and others, and contemporary German films, to analyze key political issues in both German states: the legacy of the past; the changing role of women; and challenges to secular and religious authority.

5 units, Spr (Weiler)

126F. Seminar: Politics and the Novel—(Enroll in Political Science 126F.) Examination of "realist" 20th-century works of fiction that deal with key political "realist" issues of our time. American and European novels are read with a view to understanding the conditions which produced them and their impact. Open only to junior and seniors. Preference given to Political Science and International Relations majors.

5 units, Spr (Fagen)

127F. Seminar: Approaches to the Holocaust—(Enroll in Political Science 127F.) Through reading/discussion of memoirs, fiction, poetry, drama, social science, seminar attempts a fuller understanding of the Holocaust. Readings highlight the human beings and the choices involved, for victims, perpetrators, and bystanders. Students of Stanford's program in Krakow, Poland, given preference.

5 units, Win (Fagen)

132D. Political and Ethical Aspects of Foreign Aid—(Enroll in Political Science 132D.) General and case study materials examine the characteristics of bilateral and multilateral "official development assistance": trends in its volume and composition; the complex relationship between aid providers and recipients; ethical problems posed in the allocation, monitoring, and evaluation of development assistance; international disaster relief operations. (Counts for either Cluster A or B.)

5 units, Spr (Abernethy)

141K. Ethics and International Relations—(Enroll in Political Science 141K.) How moral claims function in the foreign policy process and in relations between states. Arguments for and against normative approaches to making and studying policy. Consideration of the moral dimensions of selected foreign policy issues. Paper required. Limited enrollment. Prerequisites: Political Science 35, 243, or consent of instructor.

5 units, Spr (Gaubatz)


5 units, Spr (Gupta, Mancall)

188A,B,C. Jewish History from the Biblical Period to the Present—(Enroll in History 188 A,B,C.) Courses are designed as a sequence, but may be taken independently.
188A. Jewish History from the Biblical Period to 1492—Social, political, institutional, and cultural history of the Jews from earliest times to the Arab conquest of Palestine in the middle of the 7th century: conquest and settlement of Canaan, the period of the Judges, the First and Second Commonwealths, the Jews in the Hellenistic and Roman periods, the Babylonian Exile, the Mishnaic and Talmudic periods, and Jewish society in Palestine in the first half-millennium after the destruction of the Second Temple; the social, political, institutional, and cultural history of the Jews in the Islamic world, Spain, and medieval Europe; the expulsion from Spain. (DR:5)

5 units (Mancall)

188B. Jewish History from 1492 to the Present—The Jewish world in the Renaissance and Early Modern Western and Central Europe; Jewish communities in Palestine, Asia, Africa, and the New World; the Jewish world of Eastern Europe and its social and intellectual movements; the Emancipation, the Jewish Enlightenment, and the growing crisis of the European Jewish world; modernization and westernization; the "Jewish Problem" and its solutions: assimilation, emigration, Socialism, Zionism; the Hebrew revival; Yiddish popular and intellectual culture in Eastern Europe; the American Jewish community; France and the North African Jews; Fascism, Nazism, and WWII; Palestine and the State of Israel; the crisis of Jewish identity and cohesion in the contemporary world. (DR:5)

5 units, Win (Mancall) MTWTh 9

188C. Eastern European Jewish History—Emancipation, the Jewish Enlightenment, and the growing crisis of the E. European Jewish world; modernization and westernization; the "Jewish problem" and its solutions: assimilation, emigration, Socialism, Zionism; the Hebrew revival; Yiddish popular and intellectual culture in Eastern Europe; the American Jewish community; France and the N. African Jews; Fascism, Nazism, and WWII; Palestine and the State of Israel; the crisis of Jewish identity and cohesion in the contemporary world. (DR:5)

5 units, Win (Mancall) given 1991-92

201. Ethics, International Security, and Arms Control—The nature of moral reasoning in the context of the discussion of grand strategy; the case for and against arms control; weapons of mass destruction; the moral evaluation of strategic alternatives, with reference to the actual decisions made by major participants in the debate; special reference to the thought of Kennan, McNamara, and Drell.

5 units, Spr (Hamerton-Kelly)

233. Undergraduate Colloquium: From Prague to Paris—Aspects of European Politics and Culture—(Enroll in History 233.) Topics in the political, intellectual, and cultural history of E. and W. Europe since the end of WWII. Readings: either Czechoslovakia or France, to show links and misunderstandings in the relations between the two halves of Europe during the past 40 years. (Counts for either Cluster A or B.)

5 units, Aut (Judit)


5 units, Win (Gibbs)

248. The Caribbean Americas: An Introduction to Their Literature, Thought, and Cultural Worlds—(Enroll in Spanish 248.)

3-5 units, Aut (Wynter)

288C. Undergraduate Colloquium: Russian and Soviet Jewish History—(Enroll in History 288C.) Themes in Russian and Soviet Jewish historiography, emphasizing social and cultural trends, e.g., the transformation of leadership, occupational, and demographic patterns, from late 18th century until consolidation of Stalinism in 1929. Emergence of modern Jewish social and political ideologies (e.g., Jewish socialism, Zionism) with attention to the social background to ideological change.

5 units, Spr (Zipperstein)

289. Undergraduate Colloquium: Religion and Society in Early Islamic Arabia—(Enroll in History 289.) Situates the rise of Islam in its Late Antique environment. Religion and society is Late Antiquity. Standard sources in translation of life of Muhammad. Modern scholars' interpretations of those sources. Aims to give a sense of how narratives are constructed, appropriated, and deployed in social relations.

5 units, Win (Chamberlain)

298A. Undergraduate Colloquium: Visions of Utopia—Travellers in China—(Enroll in History 298A.) Examines the predispositions and reflections of travelers to China from the 9th to the 20th century. Is China reinvented every time a foreign traveler brings home a description? What, if anything, did a medieval Japanese monk, a British diplomat, a woman missionary, an aesthete, and adventurer have in common? Prerequisite: consent of instructor.

5 units, Aut (Kahn)
CLUSTR C: POLITICAL-ECONOMIC ISSUES AND POLICY ANALYSIS

103. The World Food Economy—(Enroll in Food Research 103, Economics 106.) Interrelationships among food, population, and economic development. Agricultural and rural development in achieving economic and social progress in low-income nations. Emphasis on public sector decision-making as it relates to food policy. Prerequisite: Economics 1 or equivalent understanding of economics. 5 units, Win (Falcon)

106. The Political Economy of Commodity Markets—(Enroll in Food Research 106, Economics 127.) History, politics, and theoretical analyses of domestic and international markets for basic commodities. Topics: government regulation of private trading, public trading through buffer stocks and marketing boards, international commodity agreements, and the changing views of the social value of private speculation. Examples from 18th century to present. 5 units, Spr (Williams)

110. Philosophical and Ethical Issues in Public Policy—(Enroll in VTSS 110.) Philosophical and ethical issues in science and technology-related public policy conflicts. Develops the capacity for rigorous critical analysis of complex, value-laden policy disputes. Topics: the natures of ethics and morality; the natures of, and rationales for liberty, justice, and human rights; and use and abuse of these concepts in recent and current policy disputes. Cases from: biomedicine (euthanasia, pre-determination of sex of offspring, and genetic testing); environmental affairs (endangered species, wilderness and landmark preservation, and high-rise proliferation); the technical professions ("whistle-blowing," fraud, human subjects research); and international relations (warfare, technology transfer, immigration, and repatriation of artistic patri-mony). For I.R. credit, term paper must be on an international topic. (Counts for either Cluster A or C.) (DR:3) 5 units, Win (McGinn)

113. Technology and Modern Industrial Society—(Enroll in Economics 113, VTSS 107.) The interplay of technology and the process of economic development from 1870 to the present. Topics: the origins of modern industry in the U.S. and Europe, factors affecting the rate and direction of technological change and diffusion, technology and the growth of large-scale organizations, the spread of industrialization to less-developed countries, late-comers to industrialization (the cases of Japan and newly industrializing countries), and the growth and slowdown in mature industrial countries, and present concerns and future prospects (the influence of technology on employment, civilian "spillovers" from military R&D spending, and coping with technological change). (DR:5) 4-5 units, Spr (Rosenberg) optional section for extra unit

113A. Politics and Development in Latin America—(Enroll in Political Science 113A.) Survey of the major political systems in Latin America (normally Brazil, Mexico, Cuba, and Argentina), the patterns of economic and social development associated with them, and their historical and international contexts. (Counts for either Cluster A or C.) (DR:5) 5 units, Spr (Packenham)

114K. The Political Economy of Development—(Enroll in Political Science 114K.) Introduction to major theories of development, emphasizing political interplay between economic and political processes, and national and international factors from Latin America, and also Africa and Asia. Cases include Brazil, China, Cuba, El Salvador, India, Taiwan, Nigeria, and Venezuela. (DR:5) 5 units (Karl) given 1991-92

115. European Economic History—(Enroll in Economics 115.) General trends and detailed analysis of topics emphasizing organization and the growth of trade and industry in Western Europe from the 11th century on. Prerequisites: Economics 51 and 52. (Counts for either Cluster A or C.) 5 units, (Staff) not given 1990-91

116. The Economics of Development—(Enroll in Economics 118.) The economic problems and policy concerns of Third World countries. Topics: theories of economies' structural transformation during the process of economic development, trade and industrialization policies, inequality and poverty, agriculture and rural development, migration, population growth, education, nutrition, health, domestic and international sources of development finance. Focus is on principles, not case studies. Prerequisite: 51. 5 units, Win (Kochar)

116C. The Integration of Europe—(Enroll in Political Science 116C.) Analysis of efforts reducing national barriers to trade and investment, promoting social exchange and geographic mobility, creating common institutions and supra-national authorities in Europe since the 1950s. Emphasis on the European Coal and Steel Community, the European Economic Community, the European Free Trade Association, and to the recent commitment to "complete Europe's Internal Market" by 1992. Lectures/discussion sections,
computer-assisted instruction introduces students to the quantitative analysis of data on the unity and diversity of European countries. (Counts for either Cluster A or C.)

5 units, Aut (Schmitter)

121. Development and Population Interactions in the Third World—(Enroll in Economics 119, Food Research 121.) Historical and contemporary examination of the record of economic development and population growth suggests a diversity of experience. Country case studies illustrate the systematic components of the experience of the record of economic development and those of population growth with implications in terms of alternative structures of development, the timing of the demographic transition, income distribution, employment, and migration. Interactions and causal effects between economic development and population growth.

5 units, Win (Yotopoulos)

122. The Theory of Capitalist Development—(Enroll in Economics 122.) Theoretical and historical analysis of the growth and development process of capitalist economies. Focus: analysis of the mechanism, determinants, and consequences of the process; the causes of its unevenness on a world scale; and the question of historical stages in capitalist development. Topics: capital accumulation, income distribution, effective demand, employment and labor supply, technological progress and structural change, international trade and investment, underdevelopment, and the role of the state. Theoretical approaches: Classical, Marxian, Schumpeterian, Keynesian, and Neoclassical.

(DR:5)

5 units, Spr (Harris)

123. Economic Development in Latin America—(Enroll in Economics 123, Food Research 218; open to advanced undergraduate students, with the consent of instructor.) Historical approach to the political economy of development, focusing on economic growth and structural change of open economies. The evolution from raw material and primary product based expert economies to industrialization and the process of diversification, innovation, and their relationships to rent-seeking. Changing patterns of interdependence, debt and adjustment, price-policy and stabilization, and the political economy of accumulation, and labor market adjustment and migration. Seminar with major research paper.

5 units, Aut (Reynolds)

124. Seminar: Latin American Dependency—(Enroll in Political Science 124.) Basic concepts and theoretical frameworks, single country case studies, and research and political strategies regarding dependency and development in Latin America. (Counts for either Cluster A or C.)

(DR:5)

5 units, Win (Packenham)

125. The Rise of Industrial Asia—(Enroll in Political Science 125, History 130.) (Counts for either Cluster A or C.) Interdisciplinary seminar on the political, economic, security, social, and cultural aspects of industrial development and change in Asia as a region. Enrollment limited to 15. Prerequisite: consent of instructors.

5 units, Aut (Okimoto, Lau, Lho, Raphael, Lewis)


5 units, Spr (Karl)

134P. The Role of Technology in National Security—(Enroll in Political Science 134P.) Examines a number of critical decisions made by the U.S. government, including the decisions to develop the A-bomb and H-bomb, the crash development of the ICBM and SLBM after Sputnik, the decisions made in the wake of the energy crisis in the 70's, key decisions in our space program, and current issues such as support for high-density IV, the human genome project, and the SDI program. Also briefly examines how decisions to develop the A- and H-bombs were made in the Soviet Union and China, and compares the role of the U.S. and Soviet governments in their respective space programs. The focus is on the process by which deeply technical issues are synthesized into the decision process, and how they are explicated for the policy-maker with no background in technology; the role of technical agencies, governmental committees, and science advisory boards and the way these groups interact to bring a broad spectrum of informed advice to the senior policy-maker. Guest specialists form the business, technological, and governmental communities will provide key lectures. (Counts for either Cluster A or C.)

3 units, Aut (Perry)


5 units, Spr (Arthur)
140. Ethics of Development in a Global Environment (EDGE)—(Enroll in Engineering 297A, B, C, Political Science 140A, B, C.) A series of speakers on current development issues emphasizing problems of poorer nations. Autumn Quarter: basic world resources, energy, food, housing, population, and environment, and the political development and dependencies of developing regions. Winter Quarter: international institutions and their roles in international banking, international businesses, U.S. and foreign universities, East-West political policies, and organizations of developing countries. Spring Quarter: the roles of individuals in national and international institutions dealing with the problems of developing countries. Speakers present a range of political, professional, and national backgrounds and present candid and differing points of view. Gives students working in developing countries or in institutions dealing with developing countries a better knowledge of the challenges and issues. One unit credit for attendance of the speaker series; 3 units additional credit for optional workshops treating selected issues more in depth. (Sequential registration not required.)

1-4 units, Aut, Win, Spr (Fagen, Lusignan, Siegel)

146. Economic Policies of the European Community—(Enroll in Food Research 146, Economics 142.) Analysis of the current economic policies of the European Community and the planned completion of the internal market by 1992. Development of competition, transportation, and factor market policies; agricultural policy reform and changes in the food industry; external trade policy and relations with the U.S. and Japan; monetary and macroeconomic coordination and proposals for a common currency and central bank. Prerequisites: Economics 51, 52, or equivalent.

5 units, Spr (Josling)

149. Economic Development in Africa—(Enroll in Food Research 149, Economics 125.) Economic development issues in Africa, emphasizing the sub-Saharan region. Topics: socioeconomic maps of Africa; recent economic history, demography and migrations; development strategies; agricultural policies, external debt, famines and drought; environmental degradation.

5 units, Aut (Fafchamps)

165. International Economics—(Enroll in Economics 165.) Comparative advantage in production and trade among nations; trade policy; the international monetary mechanism; domestic monetary, fiscal, and exchange rate policies and their relationship to foreign trade. Prerequisites: Economics 1, 51, and 52.

5 units, Aut (R. STAIGER) Win (Huizinga)

166. International Trade Policy—(Enroll in Economics 166 or Food Research 166.) Effects of selected government policies affecting international trade. Trade policy and economic welfare, exchange rate policy, government responses to competition from imports, issues underlying international negotiation of reductions of barriers to trade and special trade arrangements for developing countries. Prerequisite: Economics 165.

5 units, Spr (Pearson)

167. European Economic Integration—(Enroll in Economics 167.) Theory of Customs Union and Free Trade Areas; trade creation and trade diversion; origin, development, and working of the European Common Market; the European common agricultural policy; Theory of Optimum Currency Areas and economic integration. A European parallel currency? Origin, development, and working of the European Monetary System (EMS) and relationships to other currency blocs. Prerequisite: Economics 165 or consent of instructor.

5 units, not given 1990-91

169. Development and Technology in the Third World—(Enroll in VTSS 169.) Seminar on the relationship between technology and industrial development from technical, social, and economic perspectives. Technology in developing countries and in newly industrializing countries (India, Brazil, Mexico, and Korea), including transfer of technology, "appropriate" technology, factors affecting choice of technology, technological capability, and the relationship between technology and culture. Limited enrollment.

4 units (Forbes) given 1991-92

191. Undergraduate Seminar in United States-Mexico Relations—(Enroll in Latin American Studies 191.) Seminar on the principal problem areas in the complex relationship between the U.S. and Mexico. Surveys U.S./Mexico economic and social relations, immigration, narcotics, trafficking, foreign trade and investment, and intergovernmental relations, e.g., differing perspectives on foreign policy issues. Enrollment limited to 15 with prior consent of instructor. Contact Center for Latin American Studies for pre-enrollment procedure.

5 units, Aut (Smith)

214. Economic Development I—Theoretical and empirical studies of resource allocation in developing countries. Topics: nutrition, health, and
fertility in poor households; joint production and consumption decisions in agricultural households; common property; involuntary unemployment and surplus labor in agriculture; rural land and credit institutions.

5 units, Aut (Dasgupta, J. Anderson)

215. Economic Development II—Dual economy models; industrialization and protectionism; rural-urban migration; urban labor markets; the banking system, interest rate determination, and the productivity of capital; price inflation, monetary control and the foreign exchanges; liberalization of domestic finance and foreign trade; stabilizing the macroeconomy.

5 units, Win (J. Anderson, McKinnon)


5 units, Aut (Okimoto)

215B. Seminar: Japanese Political Economy—(Enroll in Political Science 215B.) Research seminar aimed at acquiring the skills needed to complete a term paper on a subject related to the Japanese political economy. Prerequisite: 215A, or consent of instructor.

5 units, Win (Okimoto)

225. Political Economy of Socialist Reform—(Enroll in Political Science 225.) Analyzes the political economy of reform in selected socialist countries, including the U.S.S.R., China, and Eastern Europe. The political economy of the original Stalinist model, past efforts at economic reform in these countries, and the implications of recent political changes for the future of economic reform in the socialist world.

5 units, Spr (Halpern)

241. International Political Economy—(Enroll in Political Science 241.) Major theoretical approaches emphasizing structural-mercantilism, liberalism, and Marxism applied to a variety of historical and contemporary issues. Lectures and class presentations on readings.

5 units, Spr (Krasner)

248. Seminar on International Cooperation in Educational Development—(Enroll in Political Science 248.) Critical review of current policies, priorities, and practices in international cooperation in education, emphasizing the role of international organizations (World Bank, UNESCO, OECD), and of national development assistance agencies.

5 units; Aut (Weiler)

267. International Agricultural Policy—(Enroll in Food Research 267.) Comparative study of agricultural policies and their interaction in world markets. Emphasis on policies in industrial and middle-income countries. Determinants of policies and choice of policy instruments. Consequences of these policies for world markets; international regulation of agricultural trade; international negotiation on trade aspects of agricultural policies; trade aspects of food quality and environmental regulations. Prerequisite: Food Research 144 or consent of instructor.

5 units, Win (Josling)

280A. Undergraduate Colloquium: The Economic History of Latin America—(Enroll in History 280A.) The economic growth of Latin America in the 19th and 20th centuries. Various schools of thought on the nature of economic growth in Latin America and of the economic history of selected countries, primarily Mexico, Brazil, Peru, and Argentina. Twenty-page paper required. Consult with instructor prior to class sign-up.

5 units, Win (Haber)

INDEPENDENT STUDY

Students must obtain section numbers for these courses from the International Relations Office before enrolling.

197. Directed Study in International Relations. 3-5 units, any quarter (Staff)

198A,B,C. Honors Thesis—Open only to declared International Relations majors with approved honors thesis proposals. 3-5 units, any quarter (Staff)

OVERSEAS STUDIES

Descriptions of courses may be found in the "Overseas Studies" section of this bulletin.

BERLIN

Introduction to German History: Politics and Culture from the Middle Ages to the Unification of Germany, 900-1870—(Enroll in History 227.) Cluster A. (DR:5)

4 units, Aut (Neckenig)

The Federal Republic of Germany in East-West Relations—(Enroll in Political Science 144X.) Cluster A. (DR:5)

4 units, Aut (Jakobeit)

Industrialization/Technological Change in Germany and Britain, 1800-1914—(Enroll in History 133V.) Cluster C.

4 units, Aut (Kunz)

East-West Relations in Europe—(Enroll in Political Science 135X.) Cluster A. (DR:5)

5 units, Win (Jacobsen)
FLORENCE
European Integration and 1992—(Enroll in Political Science 218X.) Cluster A or Cluster C. 4-5 units, Win (D’Alimonte)
The Political Economy of Industrial Change: Italy and Europe—(Enroll in Economics 159X.) Cluster C. 4 units, Win (Bianchi, Bellini)
The United States and Western Europe After World War II—(Enroll in Political Science 121X, History 135V.) Cluster A. (DR:5) 4 units, Spr (Mammarella)
Contemporary West European Politics—(Enroll in Political Science 125X.) Cluster A. (DR:5) 4 units, Spr (D’Alimonte)
KRAKOW
Efficiency of the Capitalist and Socialist Economies and the Polish Crisis—(Enroll in Economics 123X.) Cluster C. 5 units, Spr (Wojtyna)
History of Eastern Europe—(Enroll in History 120V.) Cluster A. (DR:5) 4 units, Spr (Baran)
OXFORD
The British Empire and the Commonwealth—(Enroll in Political Science 132X, History 144V.) Cluster A. (DR:5) 4 units, Win (Rizzi)
European Economies in a Changing World—(Enroll in Economics 167X.) Cluster C. (DR:5) 5 units, Spr (Crafts)
SANTIAGO
The Reception of Social Science and Latin America’s Cultural Identity—(Enroll in Latin American Studies 123S, Sociology 172W.) Cluster B. 5 units, Spr (Fuenzalida)
TOURS
France and European Fascism from 1930 to 1945—(Enroll in History 130V.) Cluster A. 4 units, Aut (Labussiere)
Contemporary Problems of Economic Growth—(Enroll in Economics 128X.) Cluster C. (DR:5) 5 units, Aut (Leboucher)
French Foreign Policy—(Enroll in Political Science 120X.) Cluster A. (DR:5) 5 units, Aut, Spr (Billard)
1993: Towards the United States of Europe?—(Enroll in Political Science 219X.) Cluster A. 5 units, Win (Billard)

Economic Analysis of Europe and the Single European Act—(Enroll in Economics 168X.) Cluster C. 5 units, Win (Leboucher)
French Images of Asia—(Enroll in History 190V.) Cluster B. 5 units, Spr (Duus)

PROGRAM IN
JEWISH STUDIES

Director: Arnold Eisen
Faculty Advisory Committee: Joel Beinin, Howard Eilberg-Schwartz, John Felstiner, Edwin M. Good, Van Harvey, Seymour Martin Lipset, Mark Mancall, Dianne Middlebrook, Norman Naimark, Peter Stansky

The Program in Jewish Studies brings to focus the various courses given on campus relating to Jewish history, thought, literature, and culture from biblical times to the present.

The program committee, in consultation with the committee of the Individually Designed Major (undergraduate), has worked out a pattern for students interested in devising a Jewish Studies Program within the Individually Designed Major. Such students are required to participate in at least two Jewish Studies seminars. Faculty affiliated with the program are available to advise undergraduates who are interested. Contact the office of the Jewish Studies Program for information, (415-723-7589).

Graduate students enroll in the program through either the Department of Religious Studies or the Department of History and must meet the requirements of that department as well as those of the program. They participate in a central seminar in Jewish Studies offered yearly.

A series of guest lectures and conferences are an integral part of the program and its course of study.

HONORS PROGRAM

The Honors Program in Jewish Studies is in the final stages of preparation. The Committee on Undergraduate Studies will propose the program to the Senate of the Academic Council in Autumn Quarter 1990.

The new program will interest students in any discipline who wish to enrich their studies through the acquisition of knowledge of Jewish history, thought, literature, religion, and society. It may also interest students who wish to consider including some aspects of Jewish Studies in graduate work or in career planning. Students
in the Social Sciences and Humanities will be encouraged, by combining the program with their major, to explore the field of Jewish Studies from the perspective of their particular disciplines. Contact the Jewish Studies Program for information.

COURSES

1, 2, 3. Hebrew Beginning, Intermediate, Advanced.
   Aut, Win, Spr (Ben Meir)

   (DR:3)
   (Eisen)

10. Hebrew Bible—(Enroll in Religious Studies 121.)
    Aut (Good)

14. Zionism and the State of Israel—(Enroll in History 189.)
    (Mancall) given 1991-92

18. Genesis of Anti-Semitism—(Enroll in History 209.)
    Spr (Langmuir)

28. History of the Jews in Eastern Europe—
    (Enroll in History 188D.)
    (Mancall) given 1991-92

29. Jewish History from the Biblical Period to 1492—(Enroll in History 188A.) (DR:5)
    Aut (Mancall)

30. Jewish History from 1492 to the Present—
    (Enroll in History 188B.) (DR:5)
    Win (Mancall)

34. Palestine and the Arab-Israeli Conflict—
    (Enroll in History 288.)
    Aut (Beinin)

35. Beginning Yiddish—(Enroll in Linguistics 626C.)
    Aut (Berman)

36. Intermediate Yiddish—(Enroll in Linguistics 627A, B.)
    Win, Spr (Berman)

41. Jewish Emancipation and Anti-Semitism: Comparative Studies in 18th- to 20th-Century European History—
    (Enroll in History 235S.)
    Win (Rurup)

42. Anthropology of Ancient Judaism—(Enroll in Religious Studies 166.)
    Aut (Eilberg-Schwartz)

43. Women in Judaism—(Enroll in Religious Studies 128.)
    Win (Eilberg-Schwartz)

44. Jewish Studies Seminar—(Enroll in Religious Studies 321.)
    Aut (Eisen)

45. Russian and Soviet Jewish History—(Enroll in History 388A.)
    Spr (Zipperstein)

46. Graduate Colloquium: Problems in Jewish History—(Enroll in History 388A.)
    Aut (Mancall)

47. Religious Ritual—(Enroll in Religious Studies 165.)
    Spr (Eisen)

48. The Book of Job—(Enroll in Religious Studies 263.)
    Spr (Good)

NOT REGULARLY OFFERED

8. Encounters Between Modern Philosophy and Judaism.
13. Literature of the Holocaust.
15. Jewish Literature and Society.
22. Introduction to Jewish Law.
24. Introduction to Hebrew Literature.
26. Topics in Modern Hebrew Literature.
38. Contemporary Jewish Thinkers.
40. Religions of Late Antiquity.
**CENTER FOR LATIN AMERICAN STUDIES**

Chair of the Committee and Director of the Center: Terry Karl

Affiliated Faculty:

- Anthropology: Clifford Barnett, George Collier, Jane Collier, William Durham, James Fox, John W. Rick (on leave 1990-91), Renato Rosaldo
- Biology: Paul Ehrlich, Peter Vitousek
- Communication: Elie Abel, Steven ChafFee
- Economics: Julie Anderson, Donald Harris (on leave 1990-91), Ronald McKinnon
- Education: Martin Carnoy, Henry Levin, Hans Weiler
- English: Arturo Islas, Jr.
- Food Research Institute: Sandra Archibald, Reynaldo Martorell, Clark Reynolds
- History: Frederick Bowser, Albert Camarillo, Stephen Haber, John D. Wirth
- Linguistics: Gregory Guy, Shirley B. Heath, John Rickford (on leave 1990-91)
- School of Law: John Barton, William Gould, Thomas Heller, Bill Hing, Gerald Lopez
- School of Medicine: Paul Basch, Gary Schoolnik
- Political Science: Richard Fagen (on leave Autumn), Terry Karl, Stephen Krasner, Robert Packenham, Philippe Schmitter
- Sociology: Alex Inkeles, Seymour Martin Lipset
- Spanish and Portuguese: Fernando Alegria, Wilfrido Corral, Maria-Paz Haro, Adrienne Martin, Mary Pratt, Michael Predmore, Jorge Ruffinelli, Sylvia Wynter, Tomás Ybarra-Frausto (on leave 1990-91)
- Tinker Visiting Professor: Rodolfo Stavenhagen (Autumn, Winter)

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, 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. The Stanford-Berkeley Joint Center for Latin American Studies provides opportunities for Latin Americanist faculty and students on the two campuses to meet and work together.

The principal programs administered 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, contact Kathleen Morrison, Assistant Director, at the Center for Latin American Studies, Bolivar House, 582 Alvarado Row, Stanford University, Stanford, California 94305, or call (415) 723-4444.

**UNDERGRADUATE PROGRAMS**

**BACHELOR OF ARTS**

The purpose of the A.B. degree is to allow a small number of undergraduates to design individualized, interdisciplinary honors programs concentrating on Latin America.

Students must apply for admission to the major not later than the beginning of the second quarter of the junior year; exceptions are made only in unusual circumstances. To declare a major in Latin American Studies, a student must apply to the center’s Subcommittee on the Undergraduate Major. Students accepted share in the designation of a faculty advisor to supervise their work.

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 the student’s advisor and approved by a faculty advisory committee. This program ordinarily includes:
   a) At least two courses surveying Latin America comprehensively, whether historically, from the perspective of a discipline, or in an explicitly interdisciplinary frame. Appropriate courses are Anthropology 104; Economics 123; History 176 and 177; Latin American Studies 80; Political Science 113A. (Other courses for this requirement must be proposed for approval by the Subcommittee on the Undergraduate Major.)
   b) At least 25 units focused on a theoretical problem or disciplinary approach, usually within a single base discipline.
   c) Up to 15 units may be devoted to work on the senior research paper (see 3, below).
   d) The remaining units should be in 100-level courses or higher, focused directly on Latin America or closely related topics. First or second year language courses may not be counted toward the 55 units. Only 10 units of Satisfactory/No-Credit work may be counted towards the major.
2. Demonstration of language competency in either Spanish or Portuguese at least equivalent to one course in grammar and composition at the third-year level of university training, or any course taught in Spanish at the third-year level of university training. Alternatively, a certification from the Department of Spanish and Portuguese of oral language proficiency at the advanced level in the scale of the American Council for the Teaching of Foreign Languages. 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 15 units may be given for preparation of the senior paper.

Honors in Latin American Studies—Recommended for students who have completed a strong and well-designed program, have achieved a letter grade indicator of "B+" or better in coursework for the major, and have submitted a senior research paper judged to be of honors quality by the Subcommittee on the Undergraduate Major.

HONORS CERTIFICATION FOR MAJORS IN OTHER DEPARTMENTS OR PROGRAMS

As distinguished from honors for majors in Latin American Studies, Honors Certification in Latin American Studies is intended to complement study in any conventional major. The aim of certification is to enable the student to broaden study within a particular discipline through interdisciplinary coursework on Latin America while deepening disciplinary study through the undertaking of an honors project focusing on an aspect of Latin America.

The Honors Certification program is of particular interest to students in any discipline who plan for further study or for a career with an international or foreign-area focus. Students in the humanities, social sciences, or natural sciences may wish to enrich their studies by acquiring a first-hand understanding of a related aspect of Latin American life.

ADMISSION

Honors Certification is open to majors in any field. Those interested should apply no later than Autumn Quarter of the junior year. The first step is to consult with the Assistant Director of the Latin American Center, who assists in the preparation of an application which outlines plans for coursework and an honors project. The application is reviewed through the center's Subcommittee on the Undergraduate Major, which assists those accepted in establishing a faculty committee to supervise their work.

REQUIREMENTS

1. Coursework, in addition to an honors project, includes at least 25 units consisting of:
   a) At least one course surveying Latin America comprehensively, whether historically or from the perspective of a discipline, or in an explicitly interdisciplinary frame. Appropriate courses are Anthropology 104; Economics 123; Latin American Studies 80; History 176 and 177; Political Science 113A. (Other courses for this requirement must be proposed for approval by the Subcommittee on the Undergraduate Major.)
   b) At least 20 additional units in 100-level courses or higher, focusing directly on Latin America or closely related topics.

2. Demonstration of language proficiency in either Spanish or Portuguese at least equivalent to one course in grammar and composition at the third-year level of university training, or any course taught in Spanish at the third-year level of university training. Alternatively, a certification from the Department of Spanish and Portuguese of oral language proficiency at the advanced level in the scale of the American Council for the Teaching of Foreign Languages.

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 15 units may be given for preparation of the senior paper, but these units do not count toward requirement (1).

Honors Certification in Latin American Studies is recommended for students who have achieved a letter grade indicator of "B+" or better in their coursework for Latin American Studies and have submitted a senior research paper judged to be of honors quality by the Subcommittee on the Undergraduate Major.

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.

* First- or second-year language courses may not be counted toward these 25 units. Only 5 units of Satisfactory/No Credit work may be counted.
Latin American Studies (L.A.S.) 152, is required the Spring Quarter before departure, and an extensive written report is submitted the following Autumn Quarter for the independent research seminar, L.A.S. 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, 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 General Test of the Graduate Record Examination and have the results sent to the Office of Graduate Admission. Applicants whose native language is not English and who have not studied in an English-speaking institution for at least one and one-half years must take the Test of English as a Foreign Language (TOEFL). Deadline for submission of applications for admission and financial aid is January 1. 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. Nine courses with a minimum of 40 units. Only courses at the 100 level or above count for the 40 units. At least eight of the nine courses must be basically Latin American in content. Normally, all courses are taken for a letter grade and distributed as follows:
   a) Core Seminar (L.A.S. 250, 251, 252)—an interdisciplinary course required of all A.M. candidates in Latin American Studies. Fifteen units; 5 per quarter.
   b) Latin American Bibliography (L.A.S. 260) required of all A.M. candidates in Latin American Studies. Three units.
   c) Three or four courses that qualify as graduate level in a single base discipline or academic concentration.
   d) Two or three courses distributed among other disciplines. (Relevant courses may be found in the listings for the participating departments.)

2. Demonstration of language competency in either Spanish or Portuguese at least equivalent to one course in grammar and composition at the third-year level of university training, or any course taught in Spanish at the third-year level of university training. Alternatively, a certification from the Department of Spanish and Portuguese of oral language proficiency at the advanced level in the scale of the American Council for the Teaching of Foreign Languages. Portuguese 109, Portuguese for Students of Spanish, is strongly recommended for students who demonstrate competency in Spanish.

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 of 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-DEGREE PROGRAMS

LAS/Law—The Center for Latin American Studies (L.A.S.) 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 general requirements, see the "School of Education" section 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.
DOCTOR OF PHILOSOPHY

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 departments offering a Ph.D. with an emphasis on Latin America.

SUMMER FIELD RESEARCH

Stanford doctoral students having a Latin American area of concentration may apply to the Committee on Latin American Studies for summer grants for pre-dissertation research, ordinarily after the second year of graduate study.

COURSES

In addition to the courses listed here, the faculty affiliated with the center regularly offer over 60 courses related to Latin America in their base departments. Consult the quarterly Time Schedule for current course offerings or contact the Center for Latin American Studies.

80. Culture, Politics, and Society in Latin America—(Same as History 80.) Interdisciplinary survey of the interaction of Amerindian, African, and European cultures in the creation of New World societies from 1500 to the present. A basic introduction to the Latin American courses within several departments. (DR:5*)

5 units, Win (Haber) TTh 2:15-4:05

95. Contemporary Latin America—Introduction to the culture of everyday life in contemporary urban Latin America, emphasizing Santiago, Chile. Films, lectures, and discussions with Latin American professors, artists, and students. Preparatory for students bound for the Santiago Center through the Overseas Studies Program but not restricted to them only.

2 units, Win (Fuenzalida) Th 7-9 p.m.

128. Development and Human Rights in Latin America—Overview of the current social and economic situation of Latin America, emphasizing the issues of ethnic conflict and indigenous rights. Topics: urbanization, agrarian problems, the authoritarian state, indigenous movements, and the demise of traditional politics.

5 units, Aut (Stavenhagen) T 2:15-4:05

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—(Graduate students enroll in 269.) For students engaged in special interdisciplinary work that cannot be arranged by department.

1-5 units, Aut, Win, Spr (Staff) by arrangement

191. Undergraduate Seminar: Problems in United States-Mexico Relations—Overview of problem areas in the relationship between the U.S. and Mexico. A historical survey of U.S.-Mexico economic and social relations followed by trade problems, the foreign debt crisis, foreign investment, agriculture, energy policy, immigration policies, and labor markets. Prerequisite: consent of instructor by application at Bolivar House. Enrollment limited to 15.

5 units, Aut (Smith) W 7-9 p.m.

198. Senior Thesis—Restricted to undergraduate majors.

1-10 units, Aut, Win, Spr (Staff) by arrangement

250,251,252. Core Seminar in Latin American Studies—Introduction to methodologies and the status of research in the social sciences through examination of an interdisciplinary Latin American research topic. Restricted to A.M. degree students, or permission of instructor.

5 units, Aut (Bower) M 2:15-4:05

Win, Spr (Staff) Th 4:15-6:05

260. Latin American Bibliography—Introduction to research use of Stanford library collections on Latin American topics. Open to all graduate students.

3 units, Aut (Breedlove) Th 12-1:15

318. Ethnic Conflict and Minorities in the Contemporary World—Comparative international study of ethnic conflict emphasizing Latin America. The role of external interests, domestic agrarian structures, and the internationalization of such conflicts.

5 units, Win (Stavenhagen)
LINGUISTICS

Emeriti: (Professors) Clara N. Bush, Charles A. Ferguson, Joseph H. Greenberg, Dorothy A. Huntington
Chair: William R. Leben
Vice-Chair: Ivan A. Sag
Professors: Joan Bresnan, Eve V. Clark (on leave), Shirley Brice Heath, Martin Kay, Paul Kiparsky, William R. Leben, Stanley Peters, John Rickford (on leave), Ivan A. Sag, Elizabeth C. Traugott, Tom Wasow
Associate Professor: William Poser
Assistant Professors: Gregory Guy (on leave), Peter Sells
Affiliated Faculty: Herbert H. Clark (on leave), James A. Fox, Mary L. Pratt, Orrin W. Robison, III, Richard D. Schupbach
Senior Lecturers: Khalil Barhoum, Beverley McChesney
Lecturer: Philip Hubbard
Consulting Professors: Ronald M. Kaplan, Lauri Karttunen
Consulting Associate Professors: Jared Bernstein, Philip Cohen, Per-Kristian Halvorsen, Geoff Nunberg, Annie Zaenen
Visiting Emeritus Professor: Dwight Bolinger
Visiting Professor: Suzanne Romaine
Visiting Associate Professor: Mervyn Alleyne Visiting Assistant Professor: Donna Gerds
Acting Assistant Professor: Rene Kager
English for Foreign Students
Director: Beverley McChesney
Senior Lecturer: Beverley McChesney
Lecturer: Philip Hubbard
Special Language Program
Coordinator: Marya Teutsch-Dwyer
Lecturer in Arabic: Khalil Barhoum
Lecturer in Swahili: Ndinzi Masagara

LINGUISTICS

Linguistics concerns itself with the fundamental questions of what language is and how it is related to the other human faculties. In answering these questions, linguists consider language as a cultural, social, and psychological phenomenon and seek to determine what is unique in languages, what is universal, and how it changes. Linguistics is, therefore, one of the cognitive sciences; it provides a link between the humanities and the social sciences, as well as education, and hearing and speech sciences.

The department offers courses at undergraduate and graduate levels in the areas central to linguistic theory and analysis. Many of them deal with the analysis of structural patterns in the different components that make up language, including sounds (phonetics and phonology), meanings (semantics), words (morphology), and sentences (syntax). Other courses integrate the analysis of linguistic structure with phenomena that directly concern other disciplines. These include courses in language acquisition, sociolinguistics, computational linguistics, and the philosophy of language.

A variety of open forums are provided for the discussion of linguistic issues, including colloquia and regularly scheduled workshops in phonology, syntax, sociolinguistics, child language, and historical linguistics. Postdoctoral fellows in the Cognitive Science Group and the Center for the Study of Language and Information, whose members are linguists, philosophers, psychologists, and computer scientists, participate extensively in the activities of the department.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The undergraduate program 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 department courses on the nature of human language; in addition, the program draws on courses offered in other areas of the University.

The Linguistics major cuts across the humanities, social sciences, and physical sciences and provides a solid general education as a background for advanced studies in such departments as Anthropology, Communication, 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 48 units of coursework in linguistics and related fields and the study of a foreign language. No more than two courses, neither of which can be a core course, may be taken for a "+" grade.

1. Courses—A total of 48 units is required including 110, 120, 130 and 150, (100-level courses are waived if 200-level courses in the same area are taken), and a course in historical linguistics or history of a language. Other courses must form a coherent program within one of the following areas of specialization and must be approved by an Undergraduate Studies Advisor. Specific requirements vary with each area. Detailed information is available from the Department of Linguistics (Bldg. 100).

a) Linguistic Structure—This involves the investigation of the internal properties of the human linguistic system. Traditional core areas are phonology, morphology, syntax, and semantics, in which linguists attempt to develop and justify theories of
2. **Language**—Majors must have competence in a modern foreign language. This is usually demonstrated by completing a course at 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 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 related fields should seek departmental honors. An application to pursue honors work should be presented well before the end of the junior year; approval is given only to students who have maintained a letter grade indicator of "B +" or better in the courses required for the major.

Honors students take a total of 60 units. These must include 110, 120, 130, and 150, a course in historical linguistics or history of a language, an area of specialization as above, and an honors essay based on research conducted with a member of the Linguistics faculty (normally fulfilled by 98, Honors Research, 2 units, in Autumn Quarter, 4 units, in Winter Quarter). The essay must be submitted in final, acceptable form no later than six weeks before the date of intended graduation.

**GRADUATE PROGRAMS**

**MASTER OF ARTS**

The following requirements are in addition to the basic University requirements for the degree sought; see the "Degrees" section in this bulletin. Candidates should review departmental "Guidelines for Ph.D. Degrees" for further particulars concerning these requirements.

1. **Language**—Candidates must demonstrate the ability to read at least one foreign language in which a substantial linguistic literature is written, with sufficient facility to understand and to interpret linguistic research published in that language.

2. **Courses**—Candidates must complete a minimum 40 units of graduate work in linguistics (see graduate advisor for appropriate courses); a course in historical linguistics or the history of a language, and at least three courses in the student's area of specialization. Individual programs should be worked out in advance with the Linguistics Graduate Studies Advisor. A letter grade indicator of at least "B" must be maintained for all degree program coursework.

3. **Thesis**—A.M. candidates are expected to present either a formal A.M. thesis, fulfilling the University requirements specified in the "Degrees" section of this bulletin, or a research paper of A.M. scope (normally ful-
filled by up to 6 units of Linguistics 398, Directed Research).

**DOCTOR OF PHILOSOPHY**

The following requirements are in addition to the basic University requirements for the degree sought; see the “Degrees” section in this bulletin. Candidates should review departmental “Guidelines for Ph.D. Degrees” for further particulars concerning these requirements.

1. **Language**—Candidates must demonstrate the ability to read at least one foreign language in which a substantial linguistic literature is written, with sufficient facility to understand and to interpret linguistic research published in that language. (Particular areas of specialization may require additional research languages.) In addition, each candidate must demonstrate 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 graduate work beyond the A.B. or B.S. exclusive of dissertation units or, beyond the A.M., 40 units exclusive of dissertation units. A core course requirement guarantees that each student covers a sufficient set of sub-areas within the field. The student takes at least eight basic courses as listed (suffixes A and B indicate that the course is the first or second in a sequence): 205A,B; 206; 207A; 220A,B; 230A,B; 240; 241; 250; 251; 260; 265. In addition, all students must take 200, Foundations of Linguistics, in the second year. Candidates must achieve a letter grade indicator of “B” or better.

3. **Research**—The prospective Ph.D. candidate is expected to complete two substantial qualifying papers. The deadline for completion of the second qualifying paper is the end of the first quarter of the third year, but the department recommends that, if at all possible, the student complete the second qualifying paper by the end of the second year. Subject matter, although it may be related (e.g., same language), must be clearly distinct. The requirement is fulfilled by 395A,B, Research Workshop (2 units in Autumn Quarter, 2 units in Spring Quarter), and evaluation by a committee of at least three faculty members selected by the student and the faculty.

4. **Teaching**—At least two quarters serving as teaching assistant in a linguistics course.

5. **Colloquia**—Two oral presentations exclusive of the oral presentation of the dissertation proposal (see 6b below). This requirement is satisfied by class presentations, conference papers, or talks in a colloquium. Normally, both should be given during the first three years of study.

6. **Dissertation**—
   a) A written dissertation proposal.
   b) Oral presentation of the dissertation proposal in the Colloquium.
   c) Approval of dissertation topic and appointment of a dissertation project and related areas.
   d) Successful passing of a University oral examination on the dissertation project and related areas.
   e) Dissertation (up to 15 units of 399).

**Ph.D. MINOR**

1. **Courses**—The candidate must complete 30 units of coursework in linguistics at the 100 level or above, including 110, 120, and 130 (100-level courses are waived if 200-level courses in the same area are taken), and at least three courses related to the area of specialization. Courses submitted for the minor must be incremental units beyond those used to satisfy the major. Individual programs should be worked out in advance with the student’s Ph.D. minor advisor in linguistics.

2. **Research Project** (optional)—The candidate may elect to present a paper which integrates the subject matter of linguistics into the field of specialization of the candidate.

3. The linguistic advisor or designee serves 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.

**COGNITIVE SCIENCE**

Linguistics is participating with the Departments of Computer Science, Philosophy, and Psychology in an interdisciplinary program in Cognitive Science for doctoral students. The program is intended to provide an interdisciplinary education as well as a deeper concentration in linguistics. Students who complete the Linguistics and Cognitive Science requirements receive a special designation in Cognitive Science along with the Ph.D. in Linguistics. To receive this field designation, students must complete 30 units of approved courses, 18 of which must be taken in two disciplines outside of linguistics. The list of approved courses can be obtained from the Cognitive Science program located in the Psychology Department.

**FOREIGN LANGUAGES**

The Department of Linguistics administers a number of foreign language programs, including African languages, Mid-eastern lan-
guages, the Special Language Program, and the Program in English as a Foreign Language. Course offerings for each of these language programs follow the Linguistics courses listed below.

**COURSES LINGUISTICS**

Courses with two-digit numbers are primarily for undergraduates. Courses with 100-level numbers are for advanced undergraduates and A.M. and Ph.D. minor candidates in Linguistics. Those with numbers 200 and above are primarily for graduate students, but with the consent of instructor, some of them may be taken for credit by qualified undergraduates.

At all levels, the course numberings indicate a special area, as follows:

00-04 General
05-19 Phonetics, Phonology, and Morphology
20-39 Syntax, Semantics, and Pragmatics, Mathematical and Computational Linguistics
40-49 Language Acquisition and Psycholinguistics
50-59 Sociolinguistics
60-69 Language Change, Language, and Culture
70-84 Linguistic Analysis of a Language
85-94 Methods
95-99 Directed Work, Theses, Dissertations

1. Introduction to Linguistics—The nature of human language and the methods of modern linguistics. Topics: principles of the structure of human language, comparisons between human language and animal communication, how children acquire language, language change, universals, regional and social dialects, and the application of linguistic science to social, educational, and engineering problems. (DR:4)
   4 units, Win (Sells)

4. Language and Culture—(Same as Anthropology 4.) Language as a part of culture. Individual and community repertoires of languages, dialects, jargons, registers, and nonverbal communication, and their use. Structure of discourse, including conversation, narrative, and poetry. Language as a martial art: style, strategy, and politics in manipulating the rules of use. Linguistic relativity, encodability, and cultural origins of vocabulary and grammar. (DR:4)
   4-5 units (Fox) given 1991-92

5. Biology and Evolution of Language—(Same as Anthropology 5, Human Biology 113.) Language as an evolutionary adaptation of humans. Comparison of communicative behavior in humans and animals, and the inference of evolutionary stages. Structure, linguistic functions, and evolution of the vocal tract, ear, and brain, with associated disorders (stuttering, dyslexia, autism, schizophrenia) and therapies. Controversies over language centers in the brain and the inateness of language acquisition. Vision, color terminology, and biological explanation in linguistic theory. (DR:4)
   4 units, Spr (Fox) MWF 11
   plus section by arrangement

16. Writing and Literacy—(Same as Anthropology 18.) Introduction to the origins, evolution, and diffusion of writing, its relationship to speech, and its role in culture and civilization. Archaeological decipherment, major writing systems of the worlds, scribal practice, and current issues and problems in literacy.
   3-5 units (Staff) given 1991-92

   4 units, Spr (McNair-Knox)

60. Introduction to Language Change—(Same as Anthropology 178.) Variation and change as the natural state of language. Differentiation of dialects and languages over time. Determination of historical relationships among languages and reconstruction of ancestral stages. Types, structure, and functional and social explanations of change. Parallels with genetic and cultural evolutionary theory, and implications for the description and explanation of language in general. Language as a window on history: contact, migrations, the vocabulary of ancient institutions, and cultural origins of grammar. (DR:4)
   4 units, Aut (Fox) MW 1:15-3:05

62. The Japanese Language—(Same as Asian Languages 50.) Introductory overview of Japanese in terms of its linguistic characteristics, historical development, and cultural context.
   4 units, Aut (Tokunaga)

70. The Structure of English Words—Analysis of vocabulary to determine word meanings. Goals: to increase vocabulary, and, by enumerating the principles behind changes in pronunciation and meaning, take the mystery out of the processes that have made our vocabulary what it is today. (DR:4)
   4 units, Aut (Leben)

71B. Linguistics and Literature—(Same as English 101.) Introduction to literary analysis through applications of concepts from the science of language. Emphasis on discourse analysis and the phonological, syntactic, semantic, and pragmatic
structures of English. The use of regional and social dialects in literature. (DR:4)

5 units, given 1991-92


4 units, Aut (McNair-Knox)

75. Introduction to the Germanic Languages—(Same as German Studies 19A/119A.) Survey of the oldest attested stages of the Germanic language family: Gothic, Old Norse, Old Saxon, Old English, Old High German, Old Dutch, Old Frisian. External history and internal relationships. (DR:4)

3 units, given 1991-92

80. Linguistic Field Methods—(Same as Anthropology 71.) Practical training in collection and analysis of linguistic data from native speakers. Research goals, ethics, working in the community, technical equipment, and analytical strategies. Emphasis on use of computers in collection and analysis, and attention to preparation of materials useful to the subject community. Prerequisite: introductory course in linguistics.

5 units, Spr (Fox) MW 1:15-3:05

85. Introduction to Methods of Teaching English as a Foreign Language—Practical approach to problems of teaching English to speakers of other languages, including a survey of features of English phonology, morphology, and syntax which present particular difficulties—presentation of problems, construction of exercises, and lesson planning. Each student serves as tutor to an individual learning to speak English.

3 units, Win (McChesney)

86. Practicum in TEFL—Workshop for volunteer teachers currently active in area TEFL programs or planning to teach English abroad. Includes demonstration teaching, discussion of teaching problems, and evaluation of classes observed. Prerequisite: 85 or equivalent.

2-3 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.

4 units, given 1991-92

98A. B. Honors Research.

2 units, Aut (Staff)

4 units, Win (Staff)

99. Independent Study.

1 or more units, any quarter
(Staff) by arrangement

101/201. Writing Systems—Survey of different types of writing systems, emphasizing their linguistic properties, history, and mental processing. Topics: history of different writing systems, history of the discovery of ancient documents and their decipherment, psychology of reading, neurological deficits affecting reading and writing, and relative merits of different writing systems. Appropriate for undergraduate and graduate students, with little background in Linguistics; necessary background incorporated as needed.

4 units, Win (Poser)

102. History of the English Language—Evolution of English as a medium of literary expression.

4 units, Aut (Lerer) MTWTh 2:15

110. Introduction to Phonetics and Phonology—Focuses on training in phonological analysis including ability to look for relevant data, propose and substantiate solutions for problems in data, evaluate alternative solutions, and construct and evaluate phonological arguments based on the sound system of English. Also, essentials of information on articulatory phonetics and phonological theory for the practice of phonological investigation. (DR:4)

4 units, Spr (Kager)

115/215. Instrumental Phonetics—Introduction to techniques of instrumental research in phonetics, with emphasis on computer techniques for signal analysis and manipulation. Primarily a laboratory course, with some discussion of techniques and devices not available in our laboratory. Prerequisite: previous course in phonetics or consent of instructor. Some acquaintance with computers is desirable though no specific background is assumed.

4 units, Spr (Poser)

120. Introduction to Syntax—Analyses of various grammatical constructions, primarily English, and their consequences for a general theory of language. Practical experience in forming and testing linguistic hypotheses, reading, and constructing rules. Class meetings, and a weekly computer lab/discussion/writing section. (DR:4)

4 units, Aut (Sells)

121. Intermediate Syntax—(Same as Symbolic Systems 121.) Draws upon data from a variety of languages, and examines the morphological and syntactic properties of case marking, word order, verb agreement, passives, anti-passives, raising, reflexives, causatives, and relative
clauses. Language similarities and differences are given typological and theoretical treatment.

4 units, Spr (Gerdts)

130. Introduction to Semantics and Pragmatics—Linguistic meaning and its role in communication. Broad view of issues and problems that face linguistic, psychological, and philosophical efforts to analyze meaning in natural language. Topics: speech acts that can be performed with language; distinction between literal meaning of an utterance and what is communicated; the notion of propositional content; meaning of words, sentences, and discourses; study of presupposition, entailment, and conversational implicature; how to describe the meaning associated with the infinite number of sentences belonging to a language. Analyses of examples of language, from conversation and advertisements. Prerequisite: 120 or consent of instructor. (DR:4)

4 units, Win (Peters)

135. Basic Concepts of Mathematical Logic—(Same as Philosophy 159.) Concepts and techniques used in mathematical logic: sets, functions, structures, formalization, proof, mathematical induction, enumerability, and effectiveness. (DR:6)

3 units, Aut (Etchemendy)

136. First-Order Logic—(Enroll in Philosophy 160A, Symbolic Systems 160A.) Syntax and semantics of sentential and first-order logic. Introduction to basic concepts of model theory. Gödel’s Completeness Theorem and its consequences ( Löwenheim-Skolem Theorem and Compactness Theorem) and application. Prerequisites: Philosophy 57, and basic knowledge of set theory for students with no mathematics or computer background.

4 units, Win (Mason)

138/238. Lexicon and the Dictionary—Examination of similarities and differences of approaches to lexical description as they reflect different notions of "the dictionary." Topics: roots and practice of traditional lexicography, role of the lexicon in linguistic description, and explicit lexical information that is required for development of adequate natural-language systems such as used in machine translation.

4 units, Spr (Nunberg, Zaenen)


4 units, Aut (Kay)

145. Language and Thought—(Same as Psychology 146.) The psychology of language, including production and understanding of utterances, from speech sounds to speaker’s meaning, children’s acquisition of their first language, and psychological bases for language systems. Language functions in natural contexts and their relation to the processes by which language is produced, understood, and acquired. Prerequisite: 1 or Psychology 1. (DR:4)

4 units, Aut (Keysar)

147. Ethnography of Communication—(Same as Anthropology 167.) Language use in situations and organizations and by members of different cultures. Speech events and the role of conversation, narratives, and performance modes in different contexts. Focuses on ethnographic methods for the study of verbal and non-verbal communication.

4 units, given 1991-92

150. 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. Trains students in systematic observation of speech; some practice in participant-observation, interviewing, and recording of conversations. Prerequisite: 1 or its equivalent. (DR:5)

4 units, Win (Guy)

153. Inter- and Intra-Ethnic Variation in Urban Vernacular English—(Same as Urban Studies 165.) The literature on ethnic vernaculars in urban settings, concentrating on modern sociolinguistic studies of black and white vernaculars in New York City, Philadelphia, Detroit, Washington, D.C., Los Angeles, Atlanta, London. Recent research findings that urban black and white vernaculars are diverging is compared with new research in the local (E. Palo Alto) community. Students innovate local research on their own. Implications for linguistics, the social sciences, and urban policy. (DR:4 or DR:5)

4 units, Win (Baugh)

154. Language and Gender—(Same as Anthropology 171.) Synthesis of literature on the relations between gender and speech style, distinguishing linguistic, sociolinguistic and feminist issues. Examination of topics such as language, socialization, oral and written language, language and class membership.

4 units, Win (Heath, McElhinny)

157/257. The Study of Language Variation—Theoretical and methodological issues in the study
of language variation. Locating variation in the grammar; categorical vs. variable properties of language, incorporating dynamic dimensions in linguistic theory. Quantitative methods in linguistics, including probabilities and statistics. Variable rule analysis, implicational scaling, significance.

4 units, Win (Baugh)

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: borrowing and linguistic interference, language convergence and divergence, multilingualism, pidginization, decreolization, interlanguage and other continua, social and psychological dimensions of language contact. (DR:4)

4-5 units, Aut (Romaine)

162. Pidgins and Creoles—(Same as Anthropology 177.) Lecture on the formation of simplified contact languages and their subsequent elaboration. Emphasis on relationship between language structure and function, language universals, and the relevance of political power, ethnic identity, and social structure in the contact speech community. Other simplified languages and registers. Prerequisite: introductory course in linguistics or anthropology or consent of instructor. (DR:4)

4-5 units, Spr (Alleyne)

176. Introduction to German Dialects—(Same as German Studies 118/218.) The major dialects of German-speaking Europe through texts, tapes, lectures, and presentations by native speakers; also, an introduction to the dialect geography. (DR:4)

3 units, Spr (Robinson)

187/287. Teaching Japanese as a Second Language—(Same as Asian Languages 287.) Study of theoretical and practical problems involved in teaching Japanese as a second language. Prerequisite: Asian Languages 103 or consent of instructor.

4 units, Aut (Tokunaga)

189/289. Linguistics and the Teaching of English as a Foreign/Second Language—(Same as Education 282.) Foundation in methods and techniques for teaching second or foreign languages from the perspective of modern linguistics and language acquisition theory. By focusing on the teaching of English, the principles underlying the methods and techniques discussed are applicable to teaching any language.

4-5 units, Aut (Hubbard)

200. Foundations of Linguistic Theory—Theories that have shaped 20th-century linguistics; recurrent themes and descriptive practice.

4 units, Win (Kiparsky)

205A. Phonetics—Builds skill in the production and perception of speech sounds. Aims at developing an accurate kinesthetic appreciation of the speech mechanism. Skills are used in transcription and preliminary analysis of spoken language.

4 units, Aut (Bernstein)

205B. Phonetics—Introduction to the technical side of phonetics and phonology, including acoustics of speech production, acoustic correlates of speech sounds, aspects of speech perception, the phonetics phonology interface, and the status of phonetic explanation in phonology. Some laboratory exercises.

4 units, Win (Poser)

206. Phonology—Types of phenomena in phonological systems; the phonology of English, and other languages. Types of theoretical devices used for describing regularities involving distribution of phonemes, and phonological alterations.

4 units, Win (Leben)


4 units, Spr (Kiparsky)

207B. Morphosyntax—Role of morphology in grammar: how word structure serves syntax in the expression of meaning. Universal properties and typology of morphological categories; proposals towards their principled explanation in a restrictive theory of language.

4 units, not given 1990-91

208. Intermediate Phonology—Syllable structure and harmonic processes; their analysis in the framework of non-linear phonology. Prosodic lexical phonology.

4 units, Aut (Kager, Kiparsky)

209. Issues in Phonological Theory I—Constituency in the representation of stress. Seminar addresses the role of metrical constituency in the representation of stress, based on data from English, Yupik Eskimo, and Arabic dialects. Issues: stress weight relationship, integrity of
metrical structure, strict metrical binarity, and the form of distressing rules.

4 units, Win (Kager)

210. Issues in Phonological Theory II—Phonological and phonetic phenomena applying in domains larger than the word. The existing knowledge of phenomena, including sandhi rules, intonation, durational effects, and location and duration of pause. The role of instrumental data in this area; student projects involving instrumental work are encouraged. Theoretical topics emphasized: theory of prosodic hierarchy; relationship between the domains of phonological rule application and morphological, syntactic and discourse structure; and organization of the post-lexical phonology, emphasizing the relationship between phonological and phonetic rules.

4 units, Spr (Poser)

219. Topics in Phonology—Seminar addressing the close interaction between syllable structure and stress in Dutch, and its consequences for metrical and moraic theory.

4 units, Spr (Kager)

220A,B. Syntactic Theory—Intensive two-quarter introduction to syntactic argumentation through detailed analysis of data from English and other languages. The major phenomena central to issues in contemporary syntactic theory, constituent structure, lexical structure, grammatical functions, complementation, control, long distance dependencies, and binding. Discussion and evaluation of treatments of these in grammatical frameworks. Prerequisite: consent of instructor.

4 units, Aut, Win (Wasow, Sells)

221A,B. Phrase Structure and Categorial Approaches to Grammar—Surveys two related approaches to syntax and semantics of natural language: Phrase Structure Grammar and Categorial Grammar. Analyses of binding, unbounded (filler-gap) dependencies, agreement, word order variation, and complementation from the tradition of Generalized Phrase Structure Grammar are reviewed critically and compared with alternative approaches. Also, Montague-style categorial analyses, e.g., Bach, Steedman, and Dowty. A systematic presentation of theory of Head-Driven Phrase Structure Grammar. In special cases, 221A may be taken separately by arrangement with the instructor. Prerequisite: 220A,B or consent of instructor.

4 units, Win, Spr (Sag)


4 units, Aut (Bresnan)

224. Seminar in Syntactic Theory: Saramaccan.

4 units, Spr Alleyne

225. Relational Morphosyntax—Presents a relationally-based view of morphosyntax. A treatment of case phenomena including non-standard case, case spread, and case stacking. Parallelisms to a treatment of agreement are drawn and some general morphosyntactic principles proposed. Also, a relational account of complex verb morphology including reflexives, causatives, applicatives, and noun incorporation. Comparison to other theories.

4 units, Win (Gerds)

227. Computational Linguistics II—(Same as Computer Science 275, Symbolic Systems 150B) Computational methods in linguistics (phonology, morphology, syntax, semantics, etc.) and applications (translation, expert systems, question answering, etc.). Individually, or in small groups, students complete a programming project involving a substantial amount of linguistic theory. The programming language used is either Lisp or Prolog. Prerequisites: 120, Computer Science 21 or 22 depending on the programming language being used.

3-4 units, Spr (Kay)

228. Topics in Syntactic Theory: Evidence for Movement—Seminar focuses on phenomena attributed to Government-Binding Theory to NP-movement and head-movement, and alternative approaches to the relevant data.

4 units, Spr (Bresnan, Sells)

229A/B. Mathematical Linguistics—Mathematical results about syntactic and semantic systems emphasizing significance for linguistic theory and its empirical applications. Prerequisite: 135, or Philosophy 159, or consent of instructor.

3 units, Win, Spr (Peters, King)

230A. Semantics and Pragmatics—Introduction to study of meaning in natural language, focusing on the relation between circumstances of utterance, content expressed and information communicated. Topics: elementary set theory; propositional logic, predicate logic, and lambda calculus together with their relation to semantic analysis; model theoretic characterizations of meaning and semantic properties of English conjunctions and determiners. Grice’s theory of implicature, speech acts, Davidson’s theories of Rlogical forms, and Montague Grammar presented. Some familiarity with elementary logic and set theory useful.

4 units, Win (Sag)
320B. Semantics and Pragmatics—Topics: problems for possible world semantics; motivations for situation semantics; recent results in situation semantic analyses of natural language. Examination of results from other semantic frameworks; a consideration of possible advantages of re-analyses in situation theoretic terms.

4 units, Spr (Peters)

321. Semantics and the Logic of Natural Languages—(Same as Philosophy 265, Symbolic Systems 231.) Treats a substantial fragment of English: presentation and justification of a detailed syntactic analysis within situation semantics, presentation of detailed rules assigning meanings to the expressions in the fragment, development of the logic of the fragment under the given syntactic analysis, presenting rules of inference.

4 units, Aut (Peters)

327. Phenomenological Foundations of Cognition, Language, and Computation—(Same as Computer Science 378, VTSS 178.) Critical analysis of theoretical foundations of cognitive approach of language, thought, and computation. Readings contrast the rationalistic assumptions of current linguistics and artificial intelligence with alternatives drawn from phenomenology, theoretical biology, and socially oriented speech act theory. Emphasizes relevance of theoretical orientation to the design, implementation, and impact of computer systems, especially those dealing with language.

3 units, Aut (Winograd) MWF 10

240. Language Acquisition I—(Same as Psychology 240.) Survey of present knowledge of processes of language acquisition from a linguistic point of view. Recent and past literature.

4 units, given 1991-92

241. Language Acquisition II—(Same as Psychology 241.) Topic varies.

4 units, given 1991-92

246. Psycholinguistics—(Same as Psychology 246.) Prerequisite: graduate standing in Psychology or consent of instructor.

3 units, given 1991-92

248. Seminar on the Acquisition of Verb Argument Structure—Focuses on the theory in, and implications of, Pinker (1989). The role of verbs in acquisition of syntax are discussed in relation to linking rules, thematic roles, and verb subclasses. Relevant developmental and cross-linguistic evidence is emphasized.

4 units, Spr (Gropen)

250. Sociolinguistic Theory and Analysis—Kinds of problems with which sociolinguists deal and the theories, models, and methods of analysis which they have developed. Emphasis on 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, given 1991-92

252. The Analysis of Interactive Discourse—Roles and methods of interactive language use: “joint” production of turns, negotiation of reference, and range of types (e.g., conversation, sermons, stories). Connections to Gricean principles, speech act theory, and relations between pragmatic phenomena and interactive language.

4 units, Win (Heath)

255. Linguistic Anthropology—(Same as Anthropology 277.) Seminar on language in its cultural context. Topics are similar to those in Anthropology 4, plus roles of linguistic models in the social sciences and more thorough treatment of key terminological systems (e.g., kinship). Emphasis is on critical reading and discussion of landmark monographs and associated articles. Topics are motivated by the readings.

5 units, Win (Fox) TTh 1:15-3:05

256. Topics in Linguistic Anthropology—(Same as Anthropology 278.) Seminar on a key issue in the relationships between language and culture.

5 units (Fox) given 1991-92


4 units (Kiparsky) given 1991-92


4 units, Aut (Kiparsky)

267. Colloquium: Theories of Narrative and Genre—(Same as English 306H.) Inquiry into shift from structural analysis of plot to treatments of temporality and cause-and-effect in narrative discourse (non-literary and literary). Emphasis on linguistic/cognitive approaches and their influence on interdisciplinary studies of narratives. Reading of primarily American fiction and non-fiction (history, biography, autobiography) with attention to oral literature.

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

268. Topics in Language Change: Grammaticalization—Current issues in the history of English, emphasizing changes in case, "im-
personal constructions”, and word order.
3 units, Spr (Traugott) MW 3:15-4:45

269. Topics in Language Change: Tok Pisin.
3 units, Aut (Romaine)

271. Structure of Korean—(Same as Asian Studies 171/271.) Survey of grammatical structure of Korean, with emphasis on interactions of phonology, morphology and syntax. Topics: interaction of morphology with phonology within the lexicon, morphosyntax, and phrasal phonology.
4 units, Spr (Cho)

273. Seminar: Cultural and Linguistic Layers of Different Origins in Russian Poetic and Prose Texts—(Same as Slavic 198F/298F.)
4 units Spr (Ivanov)

276. History of the German Language—(Same as German 203.) Introduction to phonological and syntactic development of modern German from the Germanic parent language. Analysis of selected texts and the consultation of linguistic works on the subject.
3 units, Aut (Robinson)

4 units, Spr (Gerds, Sells)

279. Seminar: Clause Subordination in Early Old High German—(Same as German 222S.) Investigation of subordinate structures in Old High German, based on a study of the Old High German Isidor translation. Secondary sources consulted.
3-5 units, Spr (Robinson)

287. Field Methods—Analysis of structure of language using less familiar data gathered during interaction with a native speaker.
4 units (Staff)

291. The Structure of Modern Chinese—(Same as Asian Studies 291.) Overview of the grammatical properties of Chinese emphasizing syntax. Some linguistics and knowledge of Chinese assumed. Prerequisite: consent of instructor.
4 units, Spr (Zhu)

395A,B. Research Workshop—Student presentations of research toward qualifying papers. Designed for second-year students in the doctoral program.
2 units, Aut (Bresnan)
Spr (Kiparsky)

396. Directed Teaching.
1-5 units, any quarter (Staff) by arrangement

397. Directed Reading.
1-5 units, any quarter (Staff) by arrangement

1-6 units, any quarter (Staff) by arrangement

399. Dissertation Research.
1-15 units, any quarter (Staff) by arrangement

REGULARLY OFFERED
BUT NOT DURING 1990-91

45. Introduction to Language and Speech Disorders.

51. Language Minorities in Modern Nations.

72. Linguistic Approaches to Point of View in Fiction.

100. Typology and Universals of Language.

107. Introduction to Morphology.

115. Speech Perception.

116. Physiology of Speech.

156. Latin American Sociolinguistics and Dialectology.

160. Languages in Contact.


177. Structure of Japanese.


212. Metrics.

218. Topics in Phonetics.

219. Topics in Phonology, Morphology.


239. Topics in Computational Linguistics.

245. Language and Speech Disorders.

247. Psycholinguistic Theories of Parsing.

251. Sociolinguistics and Pidgin/Creole Studies.

253. Language Planning and Public Policy.

254. Literacy: Social and Historical Perspectives.

255. Linguistic Anthropology.

259. Topics in Multilingualism.

260. Language Change.

261. Phonological and Morphological Change.

262. Syntactic Change.

263. Semantic Change.

270. The Structure of Hausa.

275. Germanic Syntax.


286. Sociolinguistic Field Methods.

FOREIGN LANGUAGES

All beginning-level 3-unit courses are offered on a Satisfactory/No Credit basis only. "Beginning" and "Intermediate" each refer to an academic year's sequence of language study; the suffixes A, B, and C refer to 1st, 2nd, and 3rd quarter of language instruction that year. These and other languages are offered only on request. Requests must be made by the end of Autumn Quarter registration period at the Special Language Program, Bldg. 380 room 381. The course offerings for the entire year are decided immediately following Autumn Quarter registration, and additional new courses cannot usually be given. Intermediate-level courses are also available upon request, for 3 units, with a grading option. For further information, consult Coordinator, Special Language Program, Linguistics, Bldg. 380, room 381E.

AFRICAN LANGUAGES (600-619)

602A,B,C. Beginning Hausa—Successful completion of 602C may fulfill the foreign language requirement.
4 units, Aut, Win, Spr (Bature)

603A,B,C. Intermediate Hausa.
4 units, Aut, Win, Spr (Bature)

606A,B,C. Beginning Swahili—Successful completion of 606C may fulfill the foreign language requirement.
4 units, Aut, Win, Spr (Masagara)

4 units, Aut, Win, Spr (Staff)

608A,B,C. Advanced Swahili.
4 units, Aut, Win, Spr (Staff)

614A,B,C. Beginning Shona.
3 units, Aut, Win, Spr (Mano)

616A,B,C. Beginning Bambara.
3 units, Aut, Win, Spr (Staff)

618A,B,C. Beginning Zulu.
3 units, Aut, Win, Spr (Staff)

SPECIAL LANGUAGE PROGRAM (620-679)

The Special Language Program offers a number of foreign languages not otherwise taught at Stanford. Courses planned for 1990-91, given sufficient enrollment, are:

620A,B,C. Beginning Arabic—Successful completion of 620C may fulfill the foreign language requirement.
4 units, Aut, Win, Spr (Barhoum)

621A,B,C. Intermediate Arabic.
4 units, Aut, Win, Spr (Barhoum)

626A,B,C. Beginning Yiddish.
4-5 units, Aut, Win, Spr (Berman)

628A,B,C. Beginning Hebrew.
4-5 units, Aut, Win, Spr (Ben-Meir-Sikuler, Mina)

3 units, Aut, Win, Spr (Ben-Meir-Sikuler, Mina)

630A,B,C. Advanced Hebrew.
3 units, Aut, Win, Spr (Ben-Meir-Sikuler)

639A,B,C. Intermediate Navajo.
3 units, Aut, Win, Spr (Spencer)

640A. Beginning Dutch.
3 units, Aut, Win, Spr (Staff)

3 units, Aut, Win, Spr (Vicente)

650C. Beginning Vietnamese.
3 units, Aut (Staff)

651A,B. Intermediate Vietnamese.
3 units, Win, Spr (Staff)

652A,B,C. Beginning Hindi.
3 units, Aut, Win, Spr (Singh)

656A,B. Beginning Indonesian.
3 units, Win, Spr (Staff)

664C. Beginning Czech.
3 units, Aut (Henzl)

3 units, Win, Spr (Henzl)

670A,B,C. Modern Greek—Successful completion of 670C may fulfill the foreign language requirement.
4 units, Aut, Win, Spr (Prionas)

671A,B,C. Intermediate Greek.
4 units (Prionas)

676A,B,C. Beginning Thai.
3 units, Aut, Win, Spr (Court)

678A,B,C. Beginning Sign (ASL).
3 units, Aut, Win, Spr (Haas)

3 units, Aut, Win, Spr (Haas)

ENGLISH AS A FOREIGN LANGUAGE (683-699)

These courses represent the offerings in English as a Foreign Language in Autumn, Winter, and Spring Quarters. Enrollment in one or more courses may be required of, or recommended to, graduate students from foreign countries after they have taken the English screening examination.
During the Summer Session, courses in spoken and written English up to a maximum of 8 units are offered for undergraduates.

Six-week courses in spoken English and academic orientation for foreign graduate students are also offered during the summer. These programs are open to qualified graduate students who have been admitted to degree programs at other U.S. institutions, as well as those who have been admitted to Stanford for the following Autumn Quarter.

690. Spoken Usage—Structured practice in spoken English. Emphasis on current use in a variety of daily situations. Review and practice of grammatical patterns as needed.
3 units, Aut (Staff) by arrangement

691A. Discussion—Participation in seminar-style discussions as discussant and leader. 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—Preparation and delivery of numerous oral presentations, followed by short discussions. Emphasis on appropriate language and style in university settings. Video and other feedback from instructor.
3 units, Aut, Win, Spr (Staff) by arrangement

692. Speaking and Teaching in English—For non-native speakers who must teach in English. Focus is on developing clarity, intelligibility, and effectiveness through weekly presentations simulating actual teaching assistant responsibilities. Methods of feedback include videotaping and self and staff evaluations.
1 unit, Aut, Spr (McChesney, Hubbard) by arrangement

693. Aural Comprehension—Practice in listening to lectures, and discussion with evaluation of comprehension. Strategies for improving understanding and retention. Prerequisite: consent of instructor.
3 units, Aut (Staff) by arrangement

694. Interpreting English—For advanced graduate students. Analysis of complex spoken and written language in academic and professional contexts, including recognition of underlying meaning, nuance, and inference. Practice in expressing ideas appropriately within those contexts. Prerequisite: consent of instructor.
3 units, Win, Spr (Staff) by arrangement

695. Special Topics in English—Topics such as pronunciation and intonation, grammar, or intercultural communication determined each quarter according to enrollment.
3 units, Aut, Win, Spr (Staff) by arrangement

698A. Writing Academic English—Prepares graduate students for writing academic papers; emphasis on fluency, documentation, and appropriateness for specific tasks. May be repeated for credit. Prerequisite: consent of instructor.
3 units, Aut, Win, Spr (Staff) by arrangement

698B. Advanced Graduate Writing—For graduate students experienced in English writing and currently required to write for courses and research. Class meetings and frequent individual conferences. Prerequisite: consent of instructor.
3 units, Aut, Win, Spr (Staff) by arrangement

699. Tutorial in Academic Writing—For students actively engaged in writing dissertations, 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 is on student's work in progress. Emphasis on self-correction and achievement of independent control. Recommendation of major advisor and consent of instructor required.
1 unit, Aut, Win, Spr (Staff) by arrangement

At Stanford, courses in literature are taught in a number of departments and programs that 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 following list of courses has been prepared to assist students in selecting courses which feature foreign works in English translation. Consult departmental listings for further information.

**LITERATURE IN TRANSLATION**

**ASIAN LANGUAGES**

**CHINESE**

132. Chinese Fiction and Drama in Translation.
133. Modern Chinese Literature in Translation.
JAPANESE

CLASSICS
8. Political Philosophy in Classical Antiquity.
65. Greek Philosophy.
115. Greek Attitudes, Values, Beliefs.

FRENCH AND ITALIAN
FRENCH
105. The Writings of Albert Camus.
106. Literature and the Institution of Literary Study.
114. The Modern French Novel.
197. The Education of Women.
269E. Aesthetic Currents in the 20th-Century Theater.
279A. Expression and Interpretation Variations of a Theoretical Motive.
288A. Limits of Economic Rationality I: The Nature of the Social Bond.

ITALIAN
197/397. History of Language.
233/333. Dante's Divine Comedy.
272/372. Calvino in Translation.
286/386. Italian Dialectology.

GERMAN STUDIES
31A,32A,33A. German Culture and Civilization I, II, III.
168A/268A. Hesse, Kafka, Mann.
170A. Brecht and Modern German Drama.

HUMANITIES
SPECIAL PROGRAMS
301. The Greek Period.
302. The Roman Period.
303. The European Middle Ages.
304. From Renaissance and Reformation to the Enlightenment.
305. From Enlightenment to Modernism: the 18th and 19th Century.
306. The 20th Century.

SLAVIC LANGUAGES AND LITERATURES
135. The Other Europe.
146/246. Survey of Russian Literature in English Translation II: The Age of Realism.
151. Fyodor Dostoevsky.
153/253. Leo Tolstoy.

SPANISH AND PORTUGUESE
SPANISH
216. Don Quijote I.
217. Don Quijote II.
248. The Caribbean Americas: An Introduction to Their Literature, Thought, and Cultural Worlds.
MATHEMATICAL AND COMPUTATIONAL SCIENCE

Committee in Charge: Bradley Efron, Chairman (Statistics); Richard W. Cottle (Operations Research), Robert W. Floyd (Computer Science), John G. Herriot (Computer Science), H. Roy Jones (Computer Science), Joseph B. Keller (Mathematics), Robert Osserman (Mathematics), Stuart T. Reges (Computer Science), David O. Siegmund (Statistics), Mary V. Sunseri (Mathematics)

Ex-officio Members: Takeshi Amemiya (Economics), Thomas M. Cover (Electrical Engineering and Statistics), John T. Gill III (Electrical Engineering), J. Michael Harrison (Graduate School of Business), David R. Rogosa (Education)

This interdepartmental, interschool undergraduate program is designed as a major for students interested in the mathematical and computational 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 for 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 prepares students for graduate study or employment in the mathematical and computational 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.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The requirement for the bachelor's degree, beyond the University's basic requirements, is an approved course program of 76 to 80 units, distributed as follows:

<table>
<thead>
<tr>
<th>Course No. and Subject Mathematics (33-34 units)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Math. 41, 42, 43. Calculus and Analytic Geometry</td>
<td>15</td>
</tr>
<tr>
<td>or Math. 19, 20, 21, 43.</td>
<td></td>
</tr>
<tr>
<td>Math. 44. Calculus</td>
<td>3</td>
</tr>
<tr>
<td>Math. 103. Matrix Theory and Its Applications</td>
<td>3</td>
</tr>
<tr>
<td>or Math. 113. Linear Algebra and Matrix Theory</td>
<td></td>
</tr>
<tr>
<td>Math. 104. Continuation of 103</td>
<td>3</td>
</tr>
<tr>
<td>or Math. 114. Continuation of 113</td>
<td></td>
</tr>
<tr>
<td>Math. 109. Modern Algebra and its Applications</td>
<td>3</td>
</tr>
<tr>
<td>or Math. 120. Modern Algebra</td>
<td></td>
</tr>
<tr>
<td>Math. 130. Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>2. One of the following: Math. 115. Fundamental Concepts of Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Math. 160A. First Order Logic</td>
<td>4</td>
</tr>
<tr>
<td>Computer Science (C.S.) 137. Fundamentals of Numerical Computation</td>
<td>4</td>
</tr>
<tr>
<td>Computer Science (16-18 units)</td>
<td></td>
</tr>
<tr>
<td>1. C.S. 106X. Programming Methodology and Abstractions (C.S. 106A and B may be substituted)</td>
<td>5</td>
</tr>
<tr>
<td>2. C.S. 109A, B. Introduction to Computer Science</td>
<td>8</td>
</tr>
<tr>
<td>3. One of the following: C.S. 107. Programming Paradigms</td>
<td>5</td>
</tr>
<tr>
<td>C.S. 137. Fundamentals of Numerical Computation</td>
<td>4</td>
</tr>
<tr>
<td>C.S. 154. Introduction to Automata and Complexity Theory</td>
<td>4</td>
</tr>
<tr>
<td>or C.S. 254. Automata, Languages, and Computability</td>
<td>3</td>
</tr>
<tr>
<td>C.S. 200. Discrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Operations Research (8-9 units)</td>
<td></td>
</tr>
<tr>
<td>O.R. 152. Introduction to Operations Research</td>
<td>4</td>
</tr>
<tr>
<td>O.R. 153. Introduction to Operations Research</td>
<td>4</td>
</tr>
<tr>
<td>or O.R. 241 Linear Programming</td>
<td>3</td>
</tr>
<tr>
<td>or O.R. 340. Linear Programming</td>
<td>3</td>
</tr>
<tr>
<td>O.R. 243. Integer and Nonlinear Programming</td>
<td>3</td>
</tr>
<tr>
<td>Statistics (10 units)</td>
<td></td>
</tr>
<tr>
<td>2. Stat. 200. Introduction to Statistical Inference</td>
<td>3</td>
</tr>
<tr>
<td>3. Stat. 201A. Data Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>or Stat. 203. Analysis of Variance</td>
<td></td>
</tr>
<tr>
<td>Electives (9 units)</td>
<td></td>
</tr>
<tr>
<td>Three courses in mathematical and computational science, 100-level or above, and at least 3 units each.</td>
<td></td>
</tr>
<tr>
<td>At least one must be chosen from the following list:</td>
<td></td>
</tr>
<tr>
<td>Math. 106. Introduction to Theory of Functions of a Complex Variable</td>
<td>3</td>
</tr>
<tr>
<td>Math. 131. Partial Differential Equations I</td>
<td>3</td>
</tr>
<tr>
<td>Stat. 201B. Data Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>Stat. 217. Introduction to Stochastic Processes</td>
<td>5</td>
</tr>
<tr>
<td>Elect. Engr. 261. The Fourier Transform and Its Applications</td>
<td>3</td>
</tr>
</tbody>
</table>
For Computer Science (C.S.), suggested electives include those courses not taken under Part 3 of the above Computer Science list and the following:

C.S. 110. Introduction to Computer Systems and Assembly Language Programming
C.S. 112. Computer Organization (Enroll in Elect. Engr. 182)
C.S. 140. Concurrent Programming
C.S. 143. Compilers
C.S. 157. Logical Basis for Computer Programming
C.S. 161. Data Structures and Algorithms
C.S. 211. Logic Design (Enroll in Elect. Engr. 381)
C.S. 221. Introduction to Artificial Intelligence
C.S. 225. Declarative Programming
C.S. 237A. Numerical Analysis
C.S. 240A. Operating Systems
C.S. 243. Advanced Compiling Techniques

Elective:
Math. & Comp. Sci. 100. Mathematics of Sports

With the advisor’s approval, courses other than those offered by the sponsoring departments may be used to fulfill part of the elective requirement. There are courses in economics, electrical engineering, industrial engineering, etc., that might be relevant to a mathematical sciences major, depending on the particular interest of the student.

Majors must file with their advisors a plan for completing degree requirements at least three quarters before graduation. All courses used to fulfill major requirements must be taken for a letter grade with the exception of courses offered Satisfactory/No Credit only. A course used to fulfill the requirements of one section of the program may not be applied toward the fulfillment of the requirements of another section. The student must have a letter grade indicator (LGI) of “C” or better in all coursework used to fulfill the major requirement.

HONORS PROGRAM

The honors program is designed to encourage a more intensive study of mathematical sciences than the Bachelor of Science program. In addition to meeting all requirements for the B.S. in Mathematical and Computational Science, the student must:

1. Maintain, in mathematical sciences courses, an average LGI of at least 3.4.
2. Complete at least 15 units in mathematical sciences in addition to the requirements for the major listed above. These courses should form a sustained effort in one area and constitute a program approved by the committee in charge of the Mathematical and Computational Science Program.

3. Include in the above 15 units at least one of:
   (a) an approved higher-level graduate course,
   (b) participation in a small group seminar, or
   (c) at least 3 units of directed reading.

Prospective honors students should consult with their advisors by the last quarter of the junior year to prepare a program of study for approval by the committee in charge.

COURSES

100. Mathematics of Sports—(Same as Mathematics 100.) The use of mathematics, statistics, and probability in the analysis of athletic performance, sports records, strategy, etc. Topics: mathematical analysis of physical and biological aspects of human performance, effects of variations in technique and equipment, determination of optimal strategies, traditional sports statistics and development of new statistics, calculation of probabilities of various outcomes, etc. in different sports. Prerequisite: Math. 43. Corequisite: Statistics 116.

3 units, Win (Cover, Keller) TTh 2:45-4

MATHMATICS

Emeriti: (Professors) Harold M. Bacon, Kai Lai Chung, David Gilbarg, Georg Kreisel, Ralph Phillips, Hans Samelson, Menahem Schiffer, Mary Sunseri
Chairman: Solomon Feferman
Associate Professors: Daniel Bump, Brad Osgood, Brian White
Assistant Professors: F. Jay Bourland, Richard Canary, Amir Dembo, Piotr Grzegoreczyk, Zheng Chao Han, John Lowengrub, Karl Luttinger, Rafe Mazzeo, Tomasz Mrowka, Zeev Rudnick, Richard Sommer, Michael Ward
Courtesying Professor: Renata Kallosh
Visiting Professors: Dimitry B. Fuchs, Atle Selberg
Acting Assistant Professor: Alexandre Freire

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 B.S. in Mathematical
and Computational Science. The department also participates in the M.S. and Ph.D. degree programs in Scientific Computing and Computational Mathematics.

**ADVANCED PLACEMENT FOR FRESHMAN**

Students of unusual ability in mathematics often take 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. A decision as to placement and credit is made by the department after consideration of the student’s performance on the Advanced Placement Examination in Mathematics (forms AB or BC) of the College Entrance Examination Board. This examination is the only one used for granting credit. 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, 43, 44; or 41, 42, 43, 44). These courses should be started during the first year.

2. Nine 3-unit courses, numbered 100 or above or 44H, 45H (excluding 103, 104, and 109) distributed as follows: three in algebra or number theory, four in analysis, and two in geometry, topology, or foundations, at least one of which must be in geometry or topology. These are typically chosen among: algebra—113, 114, 120, 152, 154, 155, 157; analysis—44H, 45H, 106, 115, 130, 131, 132, 134A,B, 171, 173, and 175; geometry—any of the courses numbered in the 140s; foundations—160A,B, 161, 162. Note that courses 103, 104 and 109 do not satisfy algebra requirements. Graduate courses in the same subject may be substituted for the preceding courses; for example, 206A for 106.

3. Five additional courses, each of at least 3 units, chosen from courses numbered 100 or above.

Mathematics majors must have a letter grade indicator of at least “C” 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 Satisfactory/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, 114, and 115 or 171 as early as possible. Students intending to go on to graduate work in mathematics are also urged to study at least one foreign language chosen from French, German, and Russian.

4. One of the following options. The choice of (a) or (b) is recommended.

a) Physics 51, 53, 55, 57 (total, 15 units) or 61, 62, 63 (total 12 units).

b) Any four quarters of physics lecture courses 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 departmental Committee on Undergraduate Affairs.

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 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.

**HONORS PROGRAM**

The Department of Mathematics program leading to the degree of Bachelor of Science in Mathematics with Honors is intended for students having strong theoretical interests and abilities in mathematics. The goal is to give students a strong background in the three basic areas of pure mathematics: analysis, algebra, and geometry. Through the honors thesis program, a student is introduced to current mathematical research. The program provides an excellent background with which to enter a Ph.D. program in Mathematics.

The basic requirement for entry is the completion of Math. 45H or, equivalently, Math. 44, 113, and 130. Beyond this level, fourteen 3-unit math courses are required, as well as successful completion of a senior thesis. Of the 14 courses, these are required: 106, 114, 120, 134A,B, 171, and 173. In addition a student must take two geometry/topology courses numbered in the
140s, one algebra course numbered in the 150s, and one course in probability or set theory (123 or 160A or 162). In addition, at least three other courses numbered above 110 must be taken. Students are urged to include graduate-level courses numbered above 200, particularly 205A.

In addition to course requirements, an honors student must write a senior thesis worth 6 units of credit, which generally takes two quarters to complete. Typically, at the end of the junior year the student chooses a thesis advisor from the Mathematics faculty, and the advisor and the student together map out a concentrated reading program. In the senior year, the thesis is written under direction of the advisor, on a problem or set of problems in the chosen area of study. The thesis may consist of original material or be a synthesis of work in the current research literature.

Beyond these requirements, the honors major has the same physics/applied math requirements as the regular major (see paragraph 4 above). Below is a typical mathematics curriculum of an honors Math. major:

<table>
<thead>
<tr>
<th>Autumn</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman year:</td>
<td>43H</td>
<td>44H</td>
</tr>
<tr>
<td>Sophomore year:</td>
<td>120</td>
<td>134A</td>
</tr>
<tr>
<td>Junior year:</td>
<td>171</td>
<td>173</td>
</tr>
<tr>
<td>Senior year:</td>
<td>143</td>
<td>4 electives</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Students with questions about the honors program should see Professors R. Cohen, B. Osgood, or H. Royden.

BACHELOR OF SCIENCE IN MATHEMATICAL AND COMPUTATIONAL SCIENCE

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 and Computational Science. See the "Department of Mathematical and Computational Science" section in this bulletin.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The University's basic requirements for the master's degree are discussed in the "Degrees" section 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. It must include 18 units in courses numbered 200 or above. The candidate must have an average letter grade indicator (LGI) of "B" over all coursework taken in Mathematics, and an LGI of "B" in the 200-level courses considered separately.

For the degree of Master of Science in Computer Science, see the "Computer Science" section in this bulletin.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, see the "School of Education" section of this bulletin or address inquiry to 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 Master of Arts in Teaching (Mathematics). It is intended for candidates who have a teaching credential or relevant teaching experience and wish to strengthen their academic preparation. Detailed requirements are outlined under the "School of Education, Master of Arts in Teaching" section in this bulletin.

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 following are additional departmental requirements:

To be admitted to candidacy the 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 substantial breadth in mathematics outside the student's field of application of mathematics. The student must receive a letter grade indicator of "B" or better in courses used to satisfy the Ph.D. requirement. 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.

Experience in teaching is emphasized in the Ph.D. program. Each student is required to complete nine quarters of such experience. The nature of the teaching assignment for each of those quarters is determined by the department in consultation with the student. Typical assignments include teaching or assisting in teach-
ing an undergraduate course or lecturing in an advanced seminar.

For the degree of Doctor of Philosophy in Computer Science, see the "Computer Science" section in this bulletin.

For further information concerning degree programs, fellowships, and assistantships, inquire of the academic secretary of the department.

Ph.D. MINOR

The student should complete both of the following:

1. Mathematics 106, 131, 132
2. Mathematics 113, 114, 120, or 152

These courses may have been completed during undergraduate study, and their equivalents from other universities are acceptable.

In addition, the student should complete 18 units of 200-level courses in Mathematics. These must be taken at Stanford and approved by the Math. Department's Ph.D. minor advisor.

COURSES

INTRODUCTORY AND UNDERGRADUATE

The department offers two sequences of introductory courses in 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 in the third quarter (43).

2. Calculus and Analytic Geometry (19, 20, 21) covers the material of 41 and 42 in three quarters instead of two.

Precalculus 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 (103 or 113). There are no formal prerequisites for this course, but appropriate mathematical maturity is expected.

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

19. Calculus and Analytic Geometry—Complete introduction to concept, techniques, and applications of differentiation and a brief introduction to concept, techniques, and applications of integration. The sequence (19, 20, 21) is taught in individual sections and covers the same subjects as the sequence (41, 42) described below.

Prerequisites: See 41. (DR:6)

3 units, Aut (Staff) MWF 8, 9, 10, 11, and 1:15 TTh 1:15-2:30
Win (Staff) MWF 9, 10, 11
Sum (Staff) MTWTh 10


3 units, Win (Staff) MWF 8, 9, 10, 11, and 1:15 TTh 1:15-2:30
Spr (Staff) MWF 9, 10, and 11


4 units, Aut (Staff) MWF 8, 9, 10, 11, and 1:15 TTh 1:15-2:30

41,42,43—(Autumn, Winter, Spring Quarters respectively) Consists of three large lecture classes per week together with two classes in small sections.

41. Calculus and Analytic Geometry—Introduction to differential and integral calculus. Topics: limits, derivatives of polynomials, algebraic 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 (Osgood) MTWThF 11, 1:15

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 (Bourland, Han, Staff) MTWThF 10, 11, and 1:15
Win (R. Cohen) MTWThF 11 and 1:15

43. Calculus and Analytic Geometry—Continuation of 42. Vector functions, functions of several variables, partial derivatives, gradient. Lagrange multipliers, double and triple integrals. Prerequisite: 42 or consent of department. (DR:6)

5 units, Aut (Schoen, Rudnick, Canary, Hironoha) MTWThF 10, 11, 1:15, and 2:15
Win (Luttinger, Han, Finn) MTWThF 10, 11, and 1:15
Spr (Brumfiel) MTWThF 11 and 1:15

* A third coherent sequence designed by the student, subject to the approval of the graduate committee may be considered as a substitute for one or two.
53H, 44H, 45H. Honors Calculus—Three-quarter sequence, beginning in the Autumn, covers 43, 44, 113, and 130, with additional advanced calculus and ordinary and partial differential equations. Provides a unified treatment of multivariable calculus, linear algebra, and differential equations, with a different order of topics and emphasis from standard courses. Students should know one-variable calculus and have an interest in a theoretical approach to the subject. For prospective math majors in the honors program or other areas of science or engineering who have a strong mathematics background. Prerequisite: score of 5 on BC Advanced Placement Exam or consent of the instructor. Recommended: complete at least the first two quarters. (DR:6)

5 units, Aut (Sarnak) MTWTh 2:15-3:15
Win (Osgood) MTWTh 2:15-3:15
Spr (Kerckhoff) MTWTh 2:15-3:15

44. Calculus—Continuation of 43. Topics: infinite sequences and series, line and surface integrals. The basic theorems of vector analysis (Green's, Stokes, and Divergence). Prerequisite: 43 or equivalent.

3 units, Aut (Staff) MWF 10, TTh 11-12:15
Win (Sommer, Huisken, Lowengrub) MWF 10 and 1:15, TTh 11-12:15
Spr (Finn, Canary) MWF 1:15, TTh 11-12:15

51, 52, 53. The Nature of Technology, Mathematics, and Science—(Enroll in VTSS 51, 52, 53.) Integrated three-quarter sequence enhancing one's ability to think quantitatively and to understand the character and interrelationships of technology, mathematics, and science. Treats quantitative questions that confront people intending to comprehend and influence contemporary society. Basic concepts: conservation laws, energy, entropy, equilibrium, feedback, probability, reliability, symmetry, uncertainty. Topics: sources of problems, nature of invention and discovery, experiment vs. theory, societal concerns. Whole sequence must be taken; no partial credit given. (DR:6, 7, and 8 when entire sequence taken.)

not given 1990-91

UNDERGRADUATE AND GRADUATE

Unless explicitly stated, there are no prerequisites for the courses listed below. Where a prerequisite is stated it may be waived by the instructor.

100. Mathematics of Sports—(Same as Mathematical and Computational Science 100.) The use of mathematics, sports records, strategy, etc. Topics: mathematical analysis of the physical and biological aspects of human performance, the effects of variations in technique and equipment, the determination of optimal strategies, traditional sports statistics, and the development of new statistics, calculation of probabilities of various outcomes, etc. in different sports. Prerequisite: 43. Corequisite: Statistics 116.

3 units, Win (Keller, Cover) TTh 2:45-4

103. Matrix Theory and its Applications—Linear algebra and matrices, emphasizing computational and algorithmic aspects and the scientific problems in which matrix theory is applied. Solution of linear equations. Linear spaces and matrices. Orthogonal projection and least squares. Introduction to eigenvalues and eigenvectors. (DR:6)

3 units, Aut (Zingano, Peres, Sommer) MWF 9, 1:15, TTh 11-12:15
Win (Grzegorczyk, Mrowka, Ward) MWF 10, 1:15, TTh 11-12:15
Spr (Louengrub, Freire) MWF 10, TTh 11-12:15
Sum (Staff) MTWTh 11


3 units, Win (Freire) MWF 9
Spr (Grzegorczyk) MWF 10
Sum (Staff) MTWTh 9

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 (Liu) TTh 1:15-2:30
Spr (Grzegorczyk) MWF 1:15
Sum (Staff) MTWTh 9

109. Modern Algebra and its Applications—Same as 120, but emphasis on applications of modern algebra including symmetry groups, crystallographic groups, and error-correcting codes. Prerequisite: 103, 113, or equivalent.

3 units, Aut (Mrowka) TTh 9:30-10:50
Sum (Staff) MTWTh 2:15

113. Linear Algebra and Matrix Theory—Algebraic properties of matrices and their interpretation in geometric terms. Relationship between the algebraic and geometric points of view and matters fundamental to the study and solution of linear equations. Topics: linear equations, vector spaces, linear dependence, bases and coordinate systems; linear transformations...
and matrices; similarity; eigenvectors and eigenvalues; diagonal and Jordan forms. (DR:6) 3 units, Aut (Eliashberg) MWF 9
Win (Mazzeo) MWF 10

114. Linear Algebra and Matrix Theory—(Continuation of 113.) A deeper study of 113 topics plus additional topics from 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 (Eliashberg) MWF 9
Spr (Mazzeo) MWF 10

115. Fundamental Concepts of Analysis—Development of real analysis in Euclidean space: sequences and series, limits, continuous functions, derivatives. Basic point set topology. Honors math majors and students who intend to do graduate work in mathematics take 171. Prerequisite: 44. 3 units, Aut (Grzegorczyk) MWF 1:15
Win (Canary) MWF 1:15
Sum (Staff) MTWTh 11

120. Modern Algebra—Basic structures in algebra: groups, rings, fields, homomorphisms, permutations, graphs, quotient groups, ideals. Prerequisite: 103 or 113. 3 units, Aut (Bump) MWF 2:15

123. Theory of Probability—Introduction to the theory of probability and its applications. Basic concepts of probability, random variables, and their distribution functions are treated in the modern manner. Also, detailed classical limit theorems for sequences of independent random variables. Prerequisite: 44. 3 units, Aut (Grzegorczyk) MWF 1:15
Win (Canary) MWF 1:15
Sum (Staff) MTWTh 11

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 (Long, Ward) MWF 9,
TTh 1:15-2:30
Win (Macken, Mrowka) MWF 1:15,
TTh 1:15-2:30
Spr (Freire, Rudnick, Dembo) MWF 10, 1:15, TTh 1:15-2:30
Sum (Staff) MTWTh 1:15

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 (Levine, Brendel) MWF 11,
TTh 1:15-2:30
Spr (Ward) MWF 1:15

132. Partial Differential Equations II—Initial and initial-boundary value problems in infinite domains. Fourier transforms. Boundary value problems for Laplace equation. Bessel functions and Legendre polynomials. 3 units, Spr (Levine) MWF 10

134A,B. Honors Analysis—Coherent, mathematically sophisticated presentation of basic areas in classical real analysis. Primarily for students planning graduate work in mathematics of physics who would normally enroll in an honors sequence. Required of honors math majors, but of use and interest to other majors at ease with rigorous proofs and qualitative discussion. Emphasis on ordinary and partial differential equations. Prerequisites: 45H, or 113 and 130, and 171, or consent of instructor. 3 units, Win, Spr (Simons) TTh 11-12:15

135. Perturbation Methods in Mathematics and Physics—Introduction of the analysis intent on securing quantitative results for problems which lack exact solutions, but 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. not given 1990-91

141. Higher Geometries—Study of various geometries, including projective, affine, and non-Euclidean geometry. Prerequisite: 113. 3 units

143. Differential Geometry—Geometry of curves and surfaces in 3-space and higher dimensional manifolds. Parallel transport, curvature and
3 units, Aut (Luttinger) MWF 3:15

144. Topics in Geometry.

not given 1990-91

145. Algebraic Geometry—Affine and projective spaces, plane curves, Bezout’s theorem, singularities and genus of a plane curve, applications of commutative algebra to geometry. Prerequisite: 157.

3 units, Win (Bump) MWF 1:15

147. Differential Topology—Smooth manifolds, transversality, Sard’s theorem, embeddings, degree of a map, Borsuk-Ulam theorem, Hopf degree theorem, Jordan Curve Theorem. Prerequisites: 115 or 171, 173.

not given 1990-91


3 units, Aut (Fuchs) TTh 1:15-2:30

149. Topics in Topology.

not given 1990-91

150. Introduction to Combinatorial Theory—(Enroll in Computer Science 264.)

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, Win (Katznelson) TTh 9-10:15

154. Group Theory—Discrete groups, groups, homomorphisms, permutations, representations, classification of finite abelian groups, Krull-Schmidt theorem, Sylow theorems. Solvable groups, central series, and Nilpotent groups. Prerequisite: 120 or consent of instructor.

3 units, Win (Rudnick) MWF 3:15

155. Geometrical Groups—The rotation and unitary groups emphasizing two, three, and four dimensions. Quaternions. The Lorentz group and SL(2,C). Prerequisites: II3, 120, or consent of instructor.

3 units, Spr (Osserman) TTh 1:15-2:30


not given 1990-91

160A. First-Order Logic—(Enroll in Philosophy 160A, Symbolic Systems 160A.) Syntax and semantics of sentential and first-order logic. Introduction to basic concepts of model theory. Gödel’s Completeness Theorem and its consequences: the Löwenheim-Skolem Theorem and the Compactness Theorem. Prerequisite: 159 or consent of instructor.

4 units, Win (Mason) MWF 9

160B. Computability and Logic—(Enroll in Philosophy 160B, Symbolic Systems 160B.) A precise definition of “effective procedure” through Turing machines, register machines, and recursive functions. Church’s Thesis explained. These develop Gödel’s work on the undecidability of arithmetic, culminating in his Incompleteness Theorem. Also, other undecidable problems. Prerequisite: 160A.

4 units, Spr (Von Bentham) MWF 9


not given 1990-91

162. Set Theory—Non-axiomatic, informal approach. Operations on sets and Boolean Algebra. Relations, orderings, equivalence relations, and functions. Set-theoretical characterization of the basic number systems. Equinumerosity of sets, the axiom of choice and cardinal numbers. Well-ordering relations and ordinal numbers. Transfinite arithmetic. Prerequisite: 44.

3 units, Spr (Sommer) MWF 2:15

171. Fundamental Concepts of Analysis—Similar to 115 but altered contents and more theoretical orientation. Properties of Riemann integrals, continuous functions and convergence in metric spaces; compact metric spaces, basic point set topology. Recommended for math majors and required of honors math majors. Prerequisite: 44H or equivalent.

3 units, Aut (Simon) TTh 11-12:15


3 units, Win (Rogden) MWF 10

175. Elementary Functional Analysis—(Formerly 117.) Linear operators on Hilbert space. Spectral theory of compact operators; applications to integral equations. Elements of Banach space theory. Prerequisite: 171.

3 units, Spr (Mrowka) TTh 9:30-10:45
181. Topics in the History of Mathematics from Antiquity to the 17th Century—(Enroll in History 138D, History of Science 140, Philosophy 140.)  
3 units, Win (Knorr)

182A, B. Topics in the History of Mathematics.  
182A. From the 17th to the 19th century. Rapid development of powerful new concepts and methods in analysis and their direct connection with the physical sciences, i.e., mechanics. Illustrations from works of famous mathematicians from Descartes to Abel.  
3 units, not given 1990-91  
182B. The 19th to the early 20th century. Extension and expansion of analysis and its applications. Rigorization and generality; rise of algebra and abstract mathematics. Illustrations from work of famous mathematicians from Fourier to Lebesgue.  
3 units, not given 1990-91

185. Teaching Practicum—Students assist in an undergraduate course, lead problems sessions, and tutor. Some reading in topics in mathematics education is required.  
not given 1990-91

186. Undergraduate Colloquium—Readings/discussions of topics in mathematics, its history and philosophy. Emphasis on influence of models on science and western civilization. Topics determined by interests and backgrounds of class members. Term paper required.  
not given 1990-91

197. Senior Honors Thesis.  
1-6 units, Aut, Win, Spr (Staff)  
by arrangement

199. Independent Work—Undergraduates pursue a reading program. Topics limited to those not in regular department course offerings. Credit can fulfill the elective requirement for math majors. Approval of Undergraduate Affairs Committee must be received to use credit for department's area requirement. Consult academic secretary for help in finding an advisor.  
(Staff) by arrangement

PRIMARILY FOR GRADUATE STUDENTS

200. Graduate Problem Seminar.  
3 units, Aut, Win, Spr (Katznelson)  
TTh 9-10:15

205A. 3 units, Aut (Katznelson)  
TTh 1:15-2:30  
Spr (White) MWF 10  
205B. 3 units, Win, (Katznelson)  
TTh 1:15-2:30  
205C. 3 units, Spr (Liu) 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: 171.  
206A. 3 units, Aut (P. Cohen) MWF 11  
206B. 3 units, Win (P. Cohen) MWF 11  
206C. 3 units, Spr (Royden) 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 (Bump) MWF 11  
210B. 3 units, Win (Bump) MWF 11  
210C. 3 units, Spr (Sarnak) MWF 11

217A. 3 units, Win (Freire) TTh 11-12:15  
217B. 3 units, Spr (Osserman) TTh 11-12:15

220A, B, C. Methods of Mathematical Physics—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 (Keller) TTh 9:30-10:45  
220B. 3 units, Win (Ward) TTh 9:30-10:45  
220C. 3 units, Spr (Lowengrub) TTh 9:30-10:45

221A. Calculus of Variations—Euler-Lagrange equations, sufficient conditions; applications to eigenvalue and scattering problems; direct methods, Dirichlet's principle.  
3 units, Win (Finn)

222. Topics in the Calculus of Variations—Global direct methods for multidimensional problems emphasizing geometrical questions, capillarity theory, stability of fluid configurations. Topics chosen according to interests of participants. Prerequisite: foundations of analysis or equiv-
alent. Recommended: some background in measure theory and classical calculus of variations.

not given 1990-91


not given 1990-91

234. Integral Equations—Singular types and methods for their solution; alternative integral equation reformulation of boundary value problems, dual equations, and affiliated variational principles.

3 units, Aut (Levine) MWF 1:15


3 units, Win (Levine) MWF 1:15

236. Mathematical Models in Population Biology—(Same as 126.)

not given 1990-91


not given 1990-91

242. Difference Equations—Theoretical account of linear functional equations which have a difference or recursive character; applications to special (Gamma) functions and to physically mo-
activated problems. Comparisons with analogous aspects of differential equations.

not given 1990-91

244A. Riemann Surfaces—Compact Riemann surfaces: topological classifications, Hurwitz’ formula. Riemann-Roch formula, uniformization theorem. Abel’s theorem, Jacobian varieties. Also, some elements of harmonic analysis are developed with applications. Methods generally applicable to algebraic curves are highlighted.

3 units, Win (Royden)


not given 1990-91

248A,B. Analytic Number Theory—The theory of modular forms.

not given 1990-91


3 units, Aut (Karlin) MWF 8:30-9:45

254A,B. Ordinary Differential Equations—Qualitative theory of ordinary differential equations, analytic and geometric methods. Topics from the stability and perturbation theory of dynamical systems; Hamiltonian systems; applications to the theory of oscillations and celestial mechanics.

not given 1990-91

256A,B,C. Partial Differential Equations—Local solvability; regularity of weak solutions; Sobolev space methods and the $L^2$ theory of elliptic equations; potential theoretic methods and Schauder theory; nonlinear elliptic equations; apriori estimates and nonlinear functional analysis; the minimal surface equation and its properties; elliptic systems; variational problems. Topics from the theory of hyperbolic and parabolic equations.

3 units, Aut, Win, Spr (Simon, Mazzeo) TTh 2:35-3:50

257. Symplectic Geometry—Linear symplectic geometry and linear Hamiltonian systems. Symplectic manifolds and their Lagrangian submanifolds—local properties. Symplectic geometry and mechanics. Contact geometry and contact manifolds. Relations between symplectic and contact manifolds. Hamiltonian systems with symmetries. Momentum map and its properties.

3 units, Aut (Eliashberg) MWF 1:15


3 units, Win (Eliashberg) MWF 1:15


not given 1990-91


3 units, Aut (Fuchs) MWF 2:15

264. Infinite Dimensional Lie Groups.

3 units, Win (Fuchs)

267. Harmonic Analysis—Topics from the “$L^2$ theory” of harmonic analysis—the singular integral theory of Calderon and Zygmund and its extensions, interpolation of operators, multiplier transformations, and smoothness properties of functions: sets of uniqueness for trigonometric series, spectral syntheses, thin sets, spectral theory of convolution operators, and applications. Prerequisite: knowledge of the elements of Fourier analysis.

3 units, Win, Spr (P. Cohen)

270. Perturbation and Asymptotic Methods with Applications—Exposition of perturbation and asymptotic methods. Topics: regular perturbation theory, singular perturbation theory, initial
and boundary layers, the method of multiple scales, ray theory, two-time methods. Applications: problems from fluid and solid mechanics, wave propagation, etc. Prerequisite: some familiarity with ordinary and partial differential equations.

3 units, Spr (Keller) TTh 9:35-10:50

272. Topics in Partial Differential Equations.
3 units, Aut (Liu)

274. Wave Propagation—(Same as Mechanical Engineering 236B.) Concepts presented: waves, wavefronts, rays, phase functions, amplitude functions, ray equations, eikonal equations, transport equations, reflection coefficients, transmission coefficients, edge diffraction coefficients, asymptotic expansions. Applications are made to electromagnetic, acoustic, elastic, and other types of waves.

not given 1990-91


3 units, Aut (Simo) TTh 8-9:15

277A,B. Mathematical Theory of Relativity—Ricci calculus; variational principles and covariance properties; differential geometry of spacetime; Cauchy's problem for the differential equations of gravitation and electromagnetism; relativistic hydrodynamics; unified field theories.

not given 1990-91

281A,B,C. Introduction to Algebraic and Differential Topology—Fundamental group, covering spaces, embeddings and immersions of manifolds, transversality, homotopy theory, homology and cohomology of complexes, differential forms, fiber and vector bundles and their characteristic classes.

3 units, Aut, Win, Spr (Milgram) MWF 1:15

283. Morse Theory.
3 units, Aut (R. Cohen) TTh 2:35-3:50

284A,B. Topics in Geometric Topology—Topics in classical knot theory and the theory of three manifolds: Alexander and Conway polynomials, surgery theory, Kirby's theorem, Jones' polynomial, Casson's invariant, and generalizations. Also, representation spaces of 3-manifold groups, hyperbolic geometry, recent invariants of Witten, Turaev, and others.

3 units, Win, Spr (Kerckhoff) MW 11:12-15

285A,B. Geometric Measure Theory—Hausdorff measures and dimensions; area and coarea formulas for Lipschitz maps; integral currents and flat chains; minimal surfaces and their singular sets.

3 units, Aut, Win (White) TTh 11-12:15

286A,B. Topics in Differential Geometry.
3 units, Aut, Win (Schoen) MW 3-4:15

287A,B. Topics in Algebra and Number Theory—Introduction to algebraic geometry.

not given 1990-91


not given 1990-91

289A. Topics in Analysis—Basic introduction to Ergodic Theory.

not given 1990-91

290A. Model Theory—Language and models of the first order predicate calculus. Validity and definability. Complete and decidable theories. Saturated models, ultraproducts, categoricity in power. Infinitary languages. Applications to algebra. Prerequisites: 160A,B and 162, or equivalent.

not given 1990-91


3 units, Win, Spr (Feferman, Mason)

292A,B. Set Theory—(Same as Philosophy 392A,B.) First quarter: the basics of Zermelo Fraenkel set theory. Topics: cardinal and ordinal numbers, the cumulative hierarchy and Axiom of Choice, and the universe of constructible sets. Second quarter: models of set theory, including admissible sets, and models constructed by forcing. Prerequisites: 160A,B and 162, or equivalent.

not given 1990-91
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 and 162, or equivalent.

3 units, Win, Spr (Mintz, Sommer)  
MW 3:15-4:30

294. Topics in Logic—Varies each 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, Spr (Van Bethsam)

295. Topics in the Philosophy of Mathematics—Surveys various views on the philosophy of mathematics. Topics: The Three Foundational Crises; the Greek view and Platonism; the view of Frege and Russell, Hilbert, and Brouwer; Bishop's Constructive Analysis; pragmatism. Also, an articulation of a Formalist View of Mathematics. Prerequisite: 205 or consent of instructor.

not given 1990-91

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 a 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

by arrangement

389. Seminar in Mathematical Biology.  
by arrangement

by arrangement

MEDIEVAL STUDIES

Committee in Charge: George H. Brown (Chair), Hester Gelber, Gavin Langmuir, William Mahrt, Nancy Stork, Mary Wack  
Affiliated Faculty: Theodore M. Andersson (German Studies), George H. Brown (English), Phillipe Buc (History) Brigitte Cazelles (French and Italian), John Freccero (French and Italian), Hester Gelber (Religious Studies), Gavin I. Langmuir (History), Seth Lerner (English), Suzanne Lewis (Art), William Mahrt (Music), Jeffrey Schnapp (French and Italian), Nancy Stork (English), W. Wesley Trimpi (English), Mary Wack (English)

The Medieval Studies Program is administered through Humanities Special Programs. Although there is no formal undergraduate degree program, students may propose individually designed majors in Medieval Studies. Such 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 "Program for Individually Designed Majors" section in this bulletin. 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 Undergraduate Advising Center. The major is normally declared by the beginning of the student's third year.

The major combines interdisciplinary breadth with a disciplinary focus. The interdisciplinary emphasis is provided by 165, Introduction to Medieval Culture, by upper-level interdisciplinary colloquia, and by the requirement that students take courses in three different areas. Depth is ensured by the requirement that students take at least four courses in one area. A faculty advisor helps each student choose courses that integrate the requirements of breadth and
To that end the following guidelines are provided. The student should take a minimum of 10 courses dealing directly with the Middle Ages and distributed as follows:

1. The introductory course, Medieval Studies 165, "Introduction to Medieval Culture."
2. Two upper-level interdisciplinary courses in medieval subjects.
3. Four courses in one of the following categories:
   a. Literature: English, French, German and Scandinavian, Italian, Latin, Slavic, Spanish.
   b. History
   c. Art History, Drama, Music
   d. Philosophy, Religious Studies, Humanities. (Certain Humanities courses may fulfill requirements within other categories.)
4. Two courses in a second category chosen from the above list.
5. One course in a third category chosen from the above list.

In addition to the 10 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**

165. Introduction to Medieval Culture—(Same as English 165A, History 105A.) Introduction to the development of medieval culture through religious, philosophical, literary, artistic, social, and political sources with emphasis on interrelationships among them. Lectures by faculty from various departments. (DR:2)
5 units, Spr (Brown, Staff)

**RELATED AREAS**

Courses suitable for self-designed majors in Medieval Studies are listed below. More detailed course descriptions are found under the various departmental headings with (DR) notations. See quarterly Time Schedule for changes in listings.

**ART**

103. Late Roman and Byzantine Empire, 312-1452.
107. Age of Cathedrals in Western Europe, 1150-1500—(DR:2)
206A. Seminar: Medieval Manuscript Illumination.

**CLASSICS**

103. History of the Roman Empire—(DR:5)

**ENGLISH**

65D/165D. Medieval Epic and Romance.
102. The History of the English Language—(DR:4)
171A. Chaucer's *Canterbury Tales*.
171B. Chaucer's *Troilus and the Dream Poems*.
181A. Seminar: Medieval Women's Writing.
205. Old English.
211. Readings in Middle English.
312. Seminar: Medieval Drama.
370. Seminar: Old English.
371. Seminar: Chaucer.

**FRENCH**

130. French Literature I: Middle Ages and Renaissance—(DR:2)
210. Old French.
315. Romance of the Rose.

**GERMAN STUDIES**

208A. Introduction to Middle High German.
208B. Advanced Middle High German.

**HISTORY**

115. Introductory Seminar: Modernism and Medievalism.
15S. Introductory Seminar: The Medieval Church and Violence.
27S. Introductory Seminar: The Fall of the Roman Empire.
108. The Christianization of Western Europe, 500-1350.
188A. Jewish History from the Biblical Period to 1492—(DR:5)
307. Graduate Core Colloquium in Medieval History.
308. Graduate Colloquium: The Religious Crisis of the 11th and 12th Centuries.

**ITALIAN**

227. Italian Literature I: The Middle Ages and the Renaissance—(DR:2)
233. Dante's *Divine Comedy*—(DR:2)
245. Petrarch.

**MUSIC**

100. Music History: Medieval and Renaissance.
PHILOSOPHY
120. Aquinas.
138B. Introduction to Cosmology: Middle Ages to Newton—(DR:3)

RELIGIOUS STUDIES
267. Anselm.

SPANISH AND PORTUGUESE
150. Spanish Literature I—(DR:2)

MICROBIOLOGY AND IMMUNOLOGY
The Department of Microbiology and Immunology offers programs leading to the B.S. and Ph.D. The undergraduate major program is unusual in its flexibility and small size (typically 30 majors are enrolled) as well as its status as the only undergraduate major offered in the School of Medicine. It has a strong bias toward research opportunities, and outstanding effort may be recognized by granting of departmental honors upon graduation. Details of course listings and other requirements can be found under the listing for this department in the “School of Medicine” section of this bulletin.

MODERN THOUGHT AND LITERATURE
Committee in Charge: Henry Breitrose (Communication), Sandra Drake (English), Regenia Gagnier (English), Jay Fliegelman (English), Herbert Lindenberger (English), Mary Louise Pratt (Spanish and Portuguese), Renato Rosaldo (Anthropology), Peter Stansky (History)
Chair: Mary Louise Pratt (Spanish and Portuguese)
Faculty: Joel Beinin (History), John Bender (English), Henry Breitrose (Communication), Terry Castle (English), Wanda Corn (Art), Sandra Drake (English), Charles Drekmeier (Political Science), Jay Fliegelman (English), Eckhart Förster (Philosophy), Estelle Freedman (History), Regenia Gagnier (English), Peter Galison (Philosophy), Barbara Gelpi (English), René Girard (French), David Haliburon (English), Van Harvey (Religious Studies), Shirley Heath (English and Linguistics), Arturo Islas (English), Herbert Lindenberger (English and Comparative Literature), Diane Middlebrook (English), Thomas C. Moser (English), Kurt Mueller-Vollmer (German Studies), Marjorie Perloff (English), Mary Louise Pratt (Spanish and Portuguese), Paul A. Robinson (History), Renato Rosaldo (Anthropology), Lucio Ruotolo (English), Jeffrey Schnapp (French and Italian), James Sheehan (History), Peter Stansky (History), Hans Weller (German Studies), Robert Weissberg (Law), Sylvia Wynter (African American Studies), Sylvia Yanigasako (Anthropology)

The Program in Modern Thought and Literature admits students for the Ph.D. and sponsors an undergraduate major through the Humanities Honors Program.

UNDERGRADUATE PROGRAM HONORS PROGRAM
This undergraduate program is designed for students with a strong commitment to the interdisciplinary study of modern literature (since the 17th century), intellectual history, and critical theory. Students planning to concentrate in Modern Thought and Literature must apply for admission to the Humanities Honors Program and for graduation with Honors in Humanities. Modern Thought and Literature as a major is an option within the Humanities Honors Program. Students in the program do not need to complete an additional major in another department, but, in order to satisfy the fourth requirement below, they normally will have the equivalent of a major in a single national literature. It is in the student’s interest to complete the requirements of a departmental major in order to be able to graduate, should the honors essay not be completed in acceptable form. Program requirements include:

1. Completion of the Cultures, Ideas, and Values requirement (15 units, freshman year) with a letter grade indicator (LGI) of at least “B” and an “A-” or better in at least one quarter of the sequence.
2. Humanities 90 (5 units).
3. Two seminars drawn from the series Humanities 191–197, of which one must be Humanities 197.
4. Six courses in a national literature, read in the original language, and covering a wide range of periods and genres.
5. Three courses, to be chosen in consultation with the advisor, covering major movements in intellectual history since the Enlightenment. The scope of these courses must be comparable to that of German Studies 241, 242, 243, or History 136, 136A, 136B.
6. One course in the history of modern science or technology.
7. One course in modern art or music.
8. One course addressing modernization from a historical or social scientific perspective.
9. Completion of at least two years of college-level study of a modern foreign language or demonstration of equivalent proficiency.
10. Honors essay on a literary topic treated in an interdisciplinary manner (2 units, Spring Quarter, junior year; 5 units, Autumn Quarter; 5 units, Winter Quarter, senior year). An LGI of at least "B" is required on the essay for graduation with Honors in Humanities.

GRADUATE PROGRAMS

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 literature departments or in interdisciplinary programs. It assumes serious interest in one or more areas of modern thought: anthropology, history, linguistics, philosophy, political and social thought, psychology, religious studies. Students are expected to acquire an extensive knowledge of a single literature, normally English and American (with more emphasis on one of the two), from 1750 to the present. "Extensive knowledge" is understood to mean a knowledge of major authors and movements as full and as balanced, within the modern period, as that expected of Ph.D. candidates in English. Advisory reading lists have been compiled to suggest the range of competence expected.

Coursework in the program is divided about evenly between advanced courses in literature and advanced courses in interdisciplinary and related fields such as those listed above.

MASTER OF ARTS

Only candidates for the Ph. D. are 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 the equivalent, in graduate study beyond the A.B. He or she is expected to complete 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 plans his or her program with a specific advisor. The exact distribution of time, between the literature of specialization and the interdisciplinary work in modern thought and literature, depends 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.

Requirements for the Ph.D. in Modern Thought and Literature are:
1. An introductory seminar, Modern Thought and Literature 361 (5 units).
2. Forty-five units of advanced work in the modern literature of one language, normally English. Another national literature taught at Stanford may be substituted. 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. Procedures for Candidacy:
   a) Qualifying Paper—By the end of Spring Quarter of the first year, the student organizes a colloquium developed from work done in a seminar or submits a 25-30 page essay based on a term paper written during the first year. The colloquium to be attended by two members of the Committee-in-Charge, including the chair, must be scheduled at least three weeks before the end of Spring Quarter. The paper, to be read by at least two members of the Committee-in-Charge, including the chair, must be submitted by the same date.
   b) Qualifying Examination—At the beginning of the second year, students must demonstrate knowledge of major writers and movements in their chosen literature
from 1750 to the present. Normally students spend much of their first summer preparing for this demonstration. Students may choose between two ways of demonstrating this knowledge: a one-hour examination conducted by two faculty members plus the chair, covering materials not already studied in courses; or a collection of brief critical commentaries on materials not covered in courses, to be read by two faculty members plus the chair. The examination and/or commentaries are based on reading lists drawn up by the student in consultation with the advisor and approved by the Committee-in-Charge. Normally a student's list is based on the advisory lists provided by the program, which can be revised to include works drawn from the student's special field of interest.

5. Teaching is an essential part of the program. Candidates must do four quarters of supervised half-time teaching. 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 high-enrollment course.

As preparation for teaching, students must take English 396, a 2-unit course on the obligations and opportunities of graduate study, and 397A, a 5-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 scholarly use of the language: that is, to read prose of ordinary difficulty.

Students may not take the University oral examination until completion of 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 coursework and prior to the University oral examination, the student prepares a detailed statement of advanced work done outside the area of specialization. This normally includes 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, normally is taken in the third year of graduate study.

10. Dissertation—The fourth year is devoted to the dissertation, which should 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.

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 Humanities program, see "Humanities Special Programs" in this bulletin.

COURSES

Courses crosslisted below are relevant to the interdisciplinary component of the program. For literature courses, students should consult the listings of the Departments of English, German Studies, Spanish and Portuguese, French and Italian, Asian Languages, and Slavic Languages. For other offerings, including courses at the undergraduate level, students should consult listings in the Departments of Anthropology, Art, Communication, Drama, Feminist Studies, History, Linguistics, Philosophy, Political Science, and Religious Studies. Consent of instructor is often required.

51D. Introduction to Political Philosophy—(Enroll in Political Science 51D, Philosophy 30.)
5 units, Aut (Hampshire)

101. Science, Technology, and Contemporary Society—(Enroll in VTSS 101.)
4-5 units, Aut (McGinn)

121W. Politics, Literature, and Film in Germany—(Enroll in Political Science 121W.)
5 units, Spr (Weiler)

141. History of Film—(Enroll in Communication 141/241.)
4 units, Win (Breitrose)

145. Scientific Revolution—(Enroll in History of Science 145/245, History 139, Philosophy 145, VTSS 125.)
3-5 units, Aut (Gallison)
150. Poetry and Poetics—(Enroll in English 150.)
   5 units, Aut (Lindenberger)
   Win (Middlebrook)
   Spr (Felstiner)

152. The Darwinian Revolution—(Enroll in History of Science 152, History 133, VTSS 130, Human Biology 152.)
   4 units, Aut (Lenoir)

153. Utopian Political Thought—(Enroll in Political Science 153.)
   5 units, Aut (Hansot)

154. Creation: Procreation—(Enroll in Anthropology 154.)
   5 units, Aut (Delaney)

156. Problems in Political Theory: Punishment—
    (Enroll in Political Science 156.)
   5 units, Win (Tunick)

160A. Dance, History, and Philosophy—(Enroll in Dance 160A, Drama 127A.)
    3-5 units, Win (Ross)

160B. Dance and Live Art in the 20th Century—
    (Enroll in Dance 160B, Drama 127B.)
    3 units, Spr (Ross)

163. Seminar: Contemporary Issues in Feminist Thought—
    (Enroll in Political Science 163, Feminist Studies 102A/202A.)
   5 units, Win (Van Natta)

164. Seminar: Authority and Freedom in Weber, Durkheim, and Freud—
    (Enroll in Political Science 164.)
   5 units, Spr (Drekmeier)

165. Dance Heritage: History and Styles—
    (Enroll in Dance 165.)
   3 units, Aut, Win (Ross, Frank)

166E. Making Sense of the Other—
    (Enroll in Comparative Literature 166E.)
   5 units, Win (Palumbo-Liu)

170. Undergraduate Colloquium: Mexican Immigration and the Corrido—
    (Enroll in Spanish 170.)
   3-5 units, Win (Herrera-Sobek)

180A. Creating a Popular Culture: Three Historical Cases—
    (Enroll in English 180A.)
   5 units, Aut (Light)

180B. Seminar: Political Science Fiction—
    (Same as English 180B.) Considers why popular political novels frequently have been science fiction, and why popular science fiction novels have frequently been political. The status of modern technology. Works by Bellamy, Frank, Bradbury, Asimov, Vonnegut, Disch, Russ, Piercy, Butler, Shirley, and Atwood.
   5 units, Spr (Medovoi)

200. Core Seminar: The American Character—
    (Enroll in American Studies 200, History 261S.)
   5 units, Aut (Gilliam)

201. Core Seminar: Ideas in America from the Revolution to 1900—
    (Enroll in American Studies 212, History 271A.)
   5 units, Aut (Frederickson)

210. Theories of Literature and Society in Latin America—
    (Enroll in Spanish 210.)
   5 units, Spr (Ruffinelli)

212. Psychiatry and Literature—
    (Same as Psychiatry 212, Comparative Literature 212.) Seminar uses psychology as a tool in literary criticism and literature as a tool in developmental theory. Authors: Erikson, Barrie, Spark, Mann, Joyce, Shakespeare, Tolstoy
   2-3 units, Win (Van Natta) 7-9 p.m.

217. Technology and Cultural Theory—
    (Enroll in VTSS 217.) The place of technology in the shaping of modern culture; theoretical perspectives on technology developed by the Frankfurt School (Horkheimer and Adorno, Marcuse, Benjamin), existentialism and phenomenology (Husserl and Heidegger), theorists of modernism and post-modernism (Lyotard, Castoriadis, Habermas); current debates over technology within the arts and architecture.
   4 units, Spr (Katz)

221. Core Seminar: Technology in American Culture—
    (Enroll in American Studies 221, History 252, VTSS 157.)
   5 units, Aut (Corn)

233. Subordination: Traditions of Thought and Experience—
    (Enroll in Anthropology 233, Law 423.)
   3-5 units, Aut (Rosaldo, Gordon)

240. Marxisms, Feminisms, Post-Modernisms—
    (Enroll in Anthropology 240.)
   5 units, Spr (Gupta, Yanagisako)

241. Deutsche Geistesgeschichte I—
    (Enroll in German Studies 241.)
   3-5 units, Aut (Schlossbauer)

242. Deutsche Geistesgeschichte II—
    (Enroll in German 242.)
   3-5 units, Win (Rohrwasser)

243. Deutsche Geistesgeschichte III—
    (Enroll in German 243.)
   3-5 units, Spr (Mueller-Vollmer)

244. Montesquieu and Rousseau—
    (Enroll in French 244.)
   2-3 units, Win (Dupuy)
245A. Survey of Russian Literature in English Translation I: The Age of Experiment—(Enroll in Slavic Languages 145/245.)
4 units, Aut (Wachtel)

245B. Survey of Russian Literature in English Translation II: The Age of Realism—(Enroll in Slavic Languages 146/246.)
4 units, Win (Hunt)

245C. Survey of Russian Literature in English Translation after 1917: Invention of Tradition—(Enroll in Slavic Languages 147/247.)
4 units, Spr (Brown)

248. The Caribbean Americas: An Introduction to their Literature, Thought, and Cultural Worlds—(Enroll in Spanish 248.)
3-5 units, Aut (Wynter)

252. Major Dramatic Texts III: Early Realistic to the Present—(Enroll in Drama 252.)
4 units, Spr (Lyons)

254. Essentials of Political Theory—(Enroll in Political Science 254.)
5 units, Aut (Drekmeier)

259A. Limits of Economic Rationality I: The Nature of the Social Bond—(Enroll in Political Science 259A.)
2-3 units, Spr (Dupuy)

262. Topics in Political Economy—(Enroll in Anthropology 262.)
5 units, Win (C Gupta)

263. Seminar: Thought and Action—(Enroll in Political Science 262.)
5 units, Win (Drekmeier)

265. Introduction to Literary Theory—(Enroll in English 265.)
5 units, Win (Perloff)

265A. Seminar: Marx and Marxists—(Enroll in Political Science 265.)
5 units, Spr (Tunick)

268. Society, Education, and Dance—(Enroll in Dance 268.)
3-5 units, Aut (Cashion, Ross)

277. French Critical Theory: Complexity and Self-Reference in the Humanities and Social Sciences—(Enroll in French 277.)
2-3 units, Win (Dupuy)

282. Relativism and the Diversity of Religions—(Enroll in Religious Studies 282.)
5 units, Spr (Harvey)

288A. Limits of Economic Rationality I: The Nature of the Social Bond—(Enroll in French 288A.)
2-3 units, Spr (Dupuy)

289. Brazilian Cinema—(Enroll in Portuguese 290.)
5 units, Aut (Lopes)

290. History of Anthropological Theory—(Enroll in Anthropology 290.)
5 units, Aut (Wolf)

291. History of Anthropology: The 20th Century—(Enroll in Anthropology 291.)
5 units, Win (J. Collier)

293. Race Discourse and the Origins of the Americas: A New World View of 1492—(Enroll in Spanish 291.)
3-5 units, Spr (Wynter)

294. Luso-Brazilian Women in a Postmodern Context—(Enroll in Portuguese 294.)
3-5 units, Spr (Lopes)

301. Seminar: Foucault and Contemporary Critique—(Enroll in Comparative Literature 301, English 383.)
5 units, Spr (Parker)

302. Colloquium: Feminism, Formalism, and New Historicism: Rereading the Renaissance—(Enroll in Comparative Literature 302, English 302.)
5 units, Spr (Parker)

302A. Graduate Colloquium: Introduction to Problems of Historical Interpretation and Explanation—(Enroll in History 302A.)
5 units, Spr (Emmons)

303A. Colloquium: Thinking in 18th-Century Literature—(Enroll in Comparative Literature 303A, English 303A.)
5 units, Win (Bender)

305. Colloquium: Literature and Institutions—(Enroll in English 305.)
5 units, Aut (Lindenberger)

306H. Colloquium: Theories of Narrative—(Enroll in English 306H.)
5 units, Spr (Heath)

307C. Colloquium: Methods and Materials for the Study of Modern Literature—(Enroll in English 307C.)
5 units, Spr (McPherson)

315. Fiction (Re)ality: The Theory of Fiction and/as the Phantomatics of the Real—(Enroll in Comparative Literature 315.)
2 units, Win (Pfeiffer)

320. Seminar on Giambattista Vico: Poetry, History, and Science—(Enroll in Italian 420.)
4 units, Spr (White)

323. Seminar: Theories of Development—(Enroll in Political Science 323.)
5 units, Aut (Packenham)
345. Graduate Seminar: Research in Modern Britain—(Enroll in History 445.)
5 units, Win (Stansky)

348C. Colloquium: Problems in the Economic History of West Africa—(Enroll in History 348C.)
5 units, Aut (Roberts)

349H. Rousseau, Herder, and Humboldt on Language and Culture—(Enroll in German 349H.)
3-5 units, Spr (Mueller-Vollmer)

349S. Colloquium: Semiotics—(Enroll in German 349S.)
5 units, Aut (Rakove)

351D. Graduate Core Colloquium in American History: Part III—(Enroll in History 351D.)
5 units, Aut (Kennedy)

361. The Modern Tradition: Criticism and Colonialism—(Same as Spanish 309.) Examines critical approaches to literature and the study of literature and culture in relation to colonialism, neocolonialism, and the postcolonial world. Topics: representations and hegemony, dynamics of transculturation, cultural dimensions of decolonization and resistance, psychoanalysis and colonial subjects, ideologies of masculinity and the feminine, the colonial discourse movement, nationalism and the first world/third world distinction, popular culture and syncretism. Readings from European, North American, Latin American, African, and Caribbean scholars. (In English.)
3-5 units, Aut (Pratt) T 2:15-5:05

363B. Seminar: Biography and Psycho-analysis—(Enroll in English 363B.)
5 units, Win (Ginsberg, Middlebrook)

364. Seminar: British Political Economy—(Enroll in English 364.)
5 units, Spr (Gagnier)

369. Expression and Interpretation Variations of a Theoretical Motive—(Enroll in English 369, Comparative Literature 369.)
5 units, Aut (Gumbrecht)

384. Methods of Research in Latin American Literature, Popular Culture, and Chicano Studies—(Enroll in Spanish and Portuguese 384.)
3-5 units, Aut (Herrera-Sobek)

392. Graduate Seminar: Culture and Ideology in 19th-Century America—(Enroll in History 454.)
5 units, Spr (Frederickson)

395. Ad Hoc Graduate Seminars—Graduate students (at least three or more) who wish 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. Letter grade or Satisfactory/No Credit basis.
any quarter, by arrangement

396. Introduction to Graduate Study—(Enroll in English 396.)
2 units, Aut (Fifer, Halliburton)

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) 12-1

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 a member of the committee or another faculty member. Thesis work not to be registered under this course.
any quarter, by arrangement

MUSIC

Emeriti: (Professors) William L. Crosten, Wolfgang E. Kuhn, Herbert B. Nanney, Leonard G. Ratner, Sandor Salgo, Harold C. Schmidt, Earl Schubert (by courtesy, School of Medicine); (Professors, Performance) Marie Gibson, Andor Toth; (Lecturers) Adolph Baller, Frances Blaisdell, Earle Blew, Edward C. Colby

Chairman: Karol Berger

Professors: Karol Berger, John Chowning, Albert Cohen (on leave Spring), George Houle, William H. Ramsey, Leland C. Smith

Associate Professors: Laurence Dreyfus, William P. Mahrt

Assistant Professors: Thomas Grey, Kimberly Marshall, Jody Rockmaker

Professor (Research): Max V. Matthews

Associate Professors (Research): Christopher Chafe, Bernard Mont-Reynaud, Julius O. Smith

Professor (Performance): Arthur P. Barnes (Director of Bands)

Associate Professor (Performance): George Barth

Senior Lecturers: Judith Bettina (Voice), Margaret Fabrizio (Early Keyboard), Susan Freier* (Violin), Stephen Harrison* (Violoncello), Cennady Kleyman (Violin, Viola), Naomi Sparrow (Piano), Gregory A. Wait (Voice), Bernard Zaslav* (Viola)

Lecturers: Robert Bates (Associate University Organist), William Bell (Jazz), Joan Brainard
The Music Department's aims are to promote the 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.

The department is housed in Braun Music Center, Dinkelspiel Auditorium, and The Knoll, including two theaters for concert and operatic productions, two rehearsal halls, and a small chamber hall. 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 music library contains a comprehensive collection of complete editions, scores, books, and records. Supplementing this is the Stanford Memorial Library of Music, an invaluable collection of musical manuscripts and first editions.

The department has a large time-sharing digital computer on which work is being done in sound synthesis, acoustical analysis, composition, digital recording, and music manuscript. 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**

The undergraduate major in music is built around a series of foundation courses in theory, musicianship, and music history, in addition to performance and proficiency requirements outlined below. Prospective majors are urged to consult one of the major advisors in the department as early as possible in order to plan a program which allows sufficient time for major coursework, practice, and University requirements outside the major. Early planning is especially important for students contemplating overseas study during their undergraduate years, and for those with particular musical talents and interests.

1. Students are required to include the following foundation courses in their programs:
   a) 21, 22, 23 (Elements of Music).
   b) 100, 101, 102, 103, 104 (Music History).
   c) 121, 122A,B, or C (Advanced Harmonic Materials)

2. Additionally, music majors must fulfill the following two performance requirements:
   a) Individual studies in performance: six quarters.
   b) Ensemble: six quarters of work in one or more of the department's organizations or chambers groups. 161C (Sports Activity Band) and 167 (University Singers) do not satisfy this requirement.

3. Majors are required to demonstrate a minimum proficiency in piano by sight-reading works at the level of Clementi sonatinas and by playing two prepared pieces comparable in difficulty to Bartok's Mikrokosmos, Book IV. This requirement should be fulfilled as early as possible and not later than the beginning of the junior year.

4. Students must demonstrate an ability to hear music accurately and to perform it at sight. These skills will be tested 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.

**RECOMMENDED SCHEDULE FOR THE MUSIC MAJOR**

The following sample schedule shows how a student may include substantial work on a major in music while also fulfilling the University Distribution Requirements during the freshman and sophomore years. The schedule also includes foreign language study, which is strongly recommended for all music majors and especially for those expecting to continue into graduate work in any area of music.
## FIRST YEAR

<table>
<thead>
<tr>
<th>Courses</th>
<th>A</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman English</td>
<td>3</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>Music 21-23*</td>
<td>4</td>
<td>4</td>
<td>4</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>Cultures, Ideas, and Values</td>
<td>3-5</td>
<td>3-5</td>
<td>3-5</td>
</tr>
<tr>
<td>Choice of Foreign Language, Distribution Requirement, Seminar</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>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music 100-102 and 121</td>
<td>4</td>
<td>8</td>
<td>4</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>Distribution Requirement</td>
<td>3-5</td>
<td>3-5</td>
<td>3-5</td>
</tr>
<tr>
<td>Elective (or Music 23 if 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>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music 103-4 and two from 122A, B, or C</td>
<td>4-8</td>
<td>4-8</td>
<td>(4)</td>
</tr>
<tr>
<td>Elective (or Music 23 if previously)</td>
<td>(4)</td>
<td>(4)</td>
<td></td>
</tr>
</tbody>
</table>

* The 21-23 sequences may begin in the Winter rather than Autumn Quarter. If so, 23 must be taken in Autumn Quarter of the second year.

## CONCENTRATIONS

Students wishing to pursue graduate study should complete a more intensive course of study than is provided by the basic major requirements. They should begin the basic courses as early as possible, identify a concentration, and complete the work for the concentration in the course of the senior year. Areas of concentrations are performance, composition, or history. The specific coursework in each area, detailed in a brochure available from the department, includes advanced work, some work in a foreign language, an additional year of ensembles, and a senior project. Approval of the advisor and an appropriate faculty member in the area is required for declaration of a concentration.

## HONORS PROGRAM

The department offers a special program for undergraduate majors leading to Honors in Music. Eligibility consists of a marked ability in composition, performance, or music history, as shown by letter grade indicator 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 during one or two quarters of the senior year. Application for the program must be made well before the end of the Spring Quarter of the junior year.

## GRADUATE PROGRAMS

The following statements apply to all the graduate degrees described below, unless otherwise indicated.

**Admission**—Applicants should arrange to take the Graduate Record Examination, including the advanced music sections, and a departmental entrance test in theory and musicianship. In addition, an applicant will be asked to submit evidence of accomplishment: a composition, research paper, or performance in the proposed field of concentration.

**Departmental Examinations**—(1) A placement examination tests the student in theory (counterpoint, harmony, and analysis) and history of Western music, and (2) a proficiency examination in sight-singing and piano sight-reading is given at the beginning of study in the department.

None of Stanford's required undergraduate courses may be credited toward an advanced degree. Only work that receives a letter grade indicator of "A", "B" or "satisfactory" in music courses taken as a graduate student is recognized as fulfilling the advanced degree requirements. Students may need to devote more than the minimum time in residence if preparation for graduate study is inadequate.

## MASTER OF ARTS

**Residence**—A minimum of three quarters of full-time study in residence is required.

**Foreign Language Requirement**—Reading knowledge of German, French, or Italian must be demonstrated at the beginning of graduate study.

**Study Program**—Students may concentrate in composition, history, or performance (including conducting). To be recommended for the A.M. degree, a candidate must complete a program of 36 units of graduate coursework. Depending on the concentration, the A.M. project will be an investigative essay, a composition, or a demonstration of performance supported by a written commentary on the performance practice involved.

**Required are:**

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>200. Music Bibliography</td>
<td>4</td>
</tr>
<tr>
<td>Three quarters of work in the student's area of concentration</td>
<td>9</td>
</tr>
<tr>
<td>Three quarters of ensemble performance</td>
<td>3</td>
</tr>
<tr>
<td>299. Master of Arts Project</td>
<td>4</td>
</tr>
<tr>
<td>223. Composition</td>
<td>4</td>
</tr>
<tr>
<td>or 240. Music History: Philosophy and Methods</td>
<td>4</td>
</tr>
<tr>
<td>or 257. Introduction to Performance Practice</td>
<td>4</td>
</tr>
</tbody>
</table>
DOCTORAL PROGRAMS

Residence—The candidate must complete a minimum of three years of full-time work, some of which is planned individually, for each concentration. Doctoral candidates working in absentia on Ph.D. dissertations or D.M.A. final projects that require consultation with faculty members must continue enrollment in the University under Terminal Graduate Registration (TGR).

Foreign Language Requirement—At the beginning of graduate study, all D.M.A. students, and Ph.D. students in the program Computer-Based Theory and Acoustics are required to demonstrate a reading knowledge of German, French, or Italian, and the ability to translate from one of these languages into idiomatic English. Ph.D. candidates in musicology are required to demonstrate proficiency in German and may substitute Latin as a second language. All doctoral candidates except those in composition and computer theory are required to demonstrate a similar competence in a second language, chosen from the three above, before the beginning of the second year of doctoral study.

Qualifying Examination—An examination for admission to candidacy is given in the sixth quarter of full-time residence. Written sections of the test examine knowledge of history and repertory, and an oral examination tests ability to respond verbally to a wide range of questions in the field.

Teaching—All students in the Ph.D. or D.M.A. degree programs, regardless of sources of financial support, are required to do three quarters of supervised teaching at half time and one at quarter time.

Basic Requirements—Doctoral programs in the Music Department do not require the A.M. degree as a prerequisite, but students entering with only a bachelor's degree are required to take the following courses:

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>200. Music Bibliography</td>
<td>4</td>
</tr>
<tr>
<td>240. Music History: Philosophy and Methods</td>
<td>4</td>
</tr>
<tr>
<td>301A,B,C. Music Analysis: Modal, Tonal and Post-Tonal</td>
<td>12</td>
</tr>
</tbody>
</table>

DOCTOR OF MUSICAL ARTS

The Doctor of Musical Arts (D.M.A.) degree may be pursued in two concentrations: composition or performance practice (including conducting). Each concentration is given breadth through collateral studies in other branches of music and in relevant studies outside music as seems desirable. A minimum of 72 units of credit is required for the degree.

Examinations—A written examination in the candidate's special area of concentration is given no later than the third quarter after passing the qualifying examination. A public lecture-demonstration is given during the last quarter of residence. It should be about one hour in length, treating some aspect of the final project or composition.

Performance Practice—Candidates make extensive study of historical styles of performance, technique, and repertory. In addition to formal coursework and such independent study as may be done, the program in performance practice includes a number of performances supported by research papers. This requirement totals 16 units of academic credit and may be satisfied by one of the following course arrangements, to be selected in consultation with an academic advisor:

Four term projects, each of 4 units, investigating and performing compositions in different styles of music, or music from different historical eras.

Three term projects, each for 4 units, and a full recital for 4 units.

Two projects of greater scope, each for 6 units, and one term project for 4 units.

Two projects of greater scope, each for 6 units, and a full recital for 4 units.

The final project in performance practice is chosen from among different possibilities open to the candidate, including (1) preparing a performing score of a work, with commentary; (2) writing an extended critical or historical essay on a problem of performance practice; and (3) translating and commenting on a notable treatise on performance practice.

Composition—Candidates are expected to produce a number of works demonstrating their ability to compose in a variety of forms and for the common media: vocal, instrumental, and electronic music. If possible, the works submitted are presented in public performance prepared by the composer.

The final project in composition is an extended work for instruments, voices, electronic media, or a combination of these.

REQUIRED COURSES

Performance Practice:

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>267. Introduction to Performance Practices</td>
<td>4</td>
</tr>
</tbody>
</table>

Two courses in the 269 series:

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>269A. Performance Practice of Medieval Music</td>
<td>4</td>
</tr>
<tr>
<td>269B. Performance Practice of Renaissance Music</td>
<td>4</td>
</tr>
<tr>
<td>269C. Performance Practice of Baroque Music</td>
<td>4</td>
</tr>
</tbody>
</table>
Performance Practice of Classic Music
Performance Practice of 19th-Century Music
Performance Practice of 20th-Century Music
D.M.A. Performing Projects
D.M.A. Conducting Projects
D.M.A. Final Project

Additional courses are required for performance practice candidates chosen in consultation with the advisor from the following:

Performance Technique:
- Instrumental and Voice lessons
- Ensemble performance
- Repertory and literature classes

History of Music Theory
Solfege and Score Reading
Orchestral and Choral Conducting
Thorough-bass Realization
History of Notation

Composition:
D.M.A. Projects in Composition
D.M.A. Final Project

General University regulations for the Ph.D. are discussed in the "Degrees" section of this bulletin. The Ph.D. in Music can be pursued in two concentrations: Musicology or Computer-Based Music Theory and Acoustics.

Examinations—(1) An examination testing knowledge of music and research in the area of special concentration is given no later than the third quarter after passing the qualifying examination. This includes an oral defense of the dissertation proposal. The examining committee comprises prospective readers of the dissertation. (2) The University oral examination, taken once the dissertation is substantially underway, is an oral presentation and defense of dissertation research methods and results.

REQUIRED COURSES

**Course No. and Subject** | **Units**
--- | ---
221. History of Music Theory | 8
312. Aesthetics and Criticism of Music | 8
341. Ph. D. Dissertation | 12

**MUSICOLOGY**
267 or one course in the 269 series | 4
300. History of Notation | 12
301. Research Seminars in Musicology | 16

**COMPUTER-BASED MUSIC THEORY AND ACOUSTICS**
220A, B, C. Signal Processing | 12
320A, B, C. Signal Processing | 9
420A, B, C. Research Seminar or equivalent work in another Stanford department (e.g., Psychology, Computer Science, or Electrical Engineering), to be decided in consultation with the advisor | 9

**JOINT PH.D IN MUSIC AND HUMANITIES**
The department participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Music and Humanities. For a description of the program see the "Humanities Special Program" section in this bulletin.

**COURSES**

**GENERAL**
1. Introduction to Music—Techniques of active and skillful listening to music, from awareness of the elements of music through musical forms, styles, and aesthetics. (DR:2)
   - 3 units, Aut (Marshall)

2A. The Symphony—Survey of symphonic literature from 1750 to the present, emphasizing developing skills in critical listening. Ability to read music not required. (DR:2)
   - 3 units, Spr (Grey)

2B. The Concerto.
   - 3 units (Barnes)

2C. Opera.
   - 3 units (Mahrt)

2D. Medieval Music.
   - 3 units (Mahrt)

   - 3 units (Grey)

4A. The Music of J. S. Bach—Develops awareness and skill in listening to the music of Bach: structure, style, instruments, and aesthetics. Music for the church and chamber: dance music, concerti, cantatas, sonatas, preludes and fugues, and Passions. (DR:2)
   - 3 units, Spr (Houle)

4B. The Music of Mozart.
   - 3 units (Staff)

4C. The Music of Beethoven—The composer's music and personality through selected masterworks. Ability to read music is not required. (DR:2)
   - 3 units (Barth)

4D. The Operas of Mozart—(DR:2)
   - 3 units (Berger)

4E. The Music of Debussy and Ravel.
   - 3 units (Staff)

4F. The Music of Wagner—(DR:2)
   - 3 units, Win (Dreyfus)
5A. Music in America—Development of popular folk and art music in America from the Pilgrims to the present. (DR:2)
3 units, Aut (Cohen)

5C. Music and Culture at the Court of Louis XIV.
3 units (Marshall)

5D. French Musical Culture from Leonin to Boulez.
3 units (Marshall)

6D. Technology and Musical Aesthetics—(Enroll in VTSS 165.) (DR:2)
4 units, Spr (Staff)

18. Jazz History.
3 units, Win (Sales)

19. Introduction to Music Theory—Fundamentals of music notation, basic sight reading, sight singing, ear training, keyboard harmony; also melodic, rhythmic, and harmonic dictation. Skill oriented, using piano and voice as basic tools to develop listening and reading skills. For non-music majors and music majors unable to pass proficiency test for entry to 21.
3 units, Aut (Staff)

20A. Jazz Theory.
3 units, Aut (Nadel)

20B. Advanced Jazz Theory.
3 units, Spr (Nadel)

100. Music History: Medieval and Renaissance—Prerequisites: 21, 22.
4 units, Aut (Houle)

101. Music History: Baroque—Survey of Western music in the 17th and early 18th centuries, including music of Monteverdi, Schutz, Lully, Buxtehude, Couperin, J. S. Bach, Rameau, and their contemporaries. Prerequisites: 21, 22, 100
4 units, Win (Cohen)

102. Music History: Classical—Prerequisite: 21
4 units, Spr (Grey)

103. Music History: Romantic—Prerequisite: 102
4 units, Aut (Dreyfus)

104. Music History and Theory: Modern—Prerequisite: 103.
4 units, Spr (Danuser)

121. Analysis of Tonal Music—Complete movements or entire shorter works of the 18th and 19th centuries, analyzed in a variety of theoretical approaches. Prerequisite: 23.
4 units, Win (Ratner)

122A. 18th-Century Counterpoint—Analysis and composition of two- and three-part inventions and three- and four-voice fugues. Use of keyboard, ear training, and sight singing underlies all written work. Prerequisite: 23.
4 units, Win (Rockmaker)

122B. Harmonic Materials of the 19th Century—Analysis of 19th-century music, with compositional exercises based upon 19th-century models.
4 units, Aut (Rockmaker)

122C. Introduction to 20th-century Composition—Projects in free composition based, at first, on 20th-century models analyzed in class. Final projects are performed in an informal setting. Prerequisite: 23 or permission of instructor.
3 units, Spr (Rockmaker)

COMPOSITION AND THEORY

120. Introduction to Music Synthesis and Programming Using MIDI Based Systems—Composition projects demonstrate participant’s own software for voicing and controlling MIDI synthesis. Extensive individual lab time required during week days. Prerequisite: consent of instructor. (DR:8)
4 units, Win (Chafe)
123. Composition—Individual projects in creative work. May be repeated for credit. Prerequisite: consent of instructor.
3 units, Aut, Win, Spr (Smith)

127. Orchestration—Prerequisite: 23.
3 units (Barnes)

220A. Fundamentals of Computer-Generated Sound—Introduction to computer-sound generation, composition, acoustics, and computer programming. Prerequisite: experience in musical composition or consent of instructor.
4 units, Aut (Chowning)

220B. Compositional Algorithms, Psychoacoustics, and Spatial Processing—Use of high-level programming language as a compositional aid in creating musical structures. Studies in the physical correlates to auditory perception, and review of psychoacoustic literature. Simulation of a reverberant space and control of the position of sound within the space. Prerequisite: 220A.
4 units, Win (Chowning)

220C. Research—Research projects in composition, psychoacoustics, or signal processing. Prerequisite: 220B.
4 units, Aut, Win, Spr (Smith)

220D. Music Typography on the Computer.
4 units, Aut (Smith)

223. Seminar in Composition—May be repeated for credit.
4 units, Aut, Win, Spr (Smith)

224, 225. Solfège and Score Reading.
224. 4 units, Win (Barnes)
225. 4 units (Barnes)

HISTORY AND LITERATURE

Unless otherwise stated, 103 is prerequisite for these courses.

50. Readings in Music and Music History—(Enroll in German Studies 52E.) For students with a knowledge of German (one year or equivalent) who want to acquire German reading proficiency in music.
3-4 units (Staff)

140. Studies in Medieval and Renaissance Music—Prerequisite: 100.
140E. The Music of Guillaume Dufay.
4 units (Mahrt)

4 units (Staff)

4 units (Houle)

142A. String Quartets of Beethoven.
4 units, Spr (Ratner)

142F. The Operas of Mozart.
4 units (Ratner)

142G. The Music of Mozart.
4 units (Barnes)

142H. The Chamber Music of Haydn and Mozart.
4 units (Ratner)

142I. Dramatic Order in the Music of Mozart.
4 units, Spr (Houle)

143A. The Operas of Verdi—The development of Verdi’s style through detailed examination of selected operas. Prerequisite: 23.
4 units (Staff)

143B. The Music of Brahms.
4 units (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 (Berger)

145. Criticism and Analysis of 18th- and 19th-Century Opera.
4 units, Win (Grey)

150A. History of Musical Instruments.
4 units (Myers)

150C. History of Musical Aesthetics—Aesthetic theories from antiquity (Plato, Aristotle, Plotinus) through Augustine, Aquinas, Boethius, Renaissance humanists, Descartes, and the Enlightenment to Romanticism. Music style and criticism in response or relation to aesthetic theory.
4 units (Houle)

151. Psychophysics and Cognitive Psychology for Musicians—(Same as Psychology 265.) Basic concepts and experiments relevant to use of sound, especially synthesized, in music. Starts with elementary concepts. No previous background assumed. Listening to sound examples important. Emphasis on salience and importance of various auditory phenomena in music. Prerequisite: some basic knowledge of music.
3 units, Win (Mathews, Pierce, Schubert, Shepard)
153. Organ Literature and Performance Practice—To be taken concurrently with 172B/272B. A specific period of repertoire is treated each quarter. Students present one paper on organ performance practice pertaining to that period.
1 unit, Aut, Win, Spr (Marshall)

154. Introduction to Computer Music—Survey of recent works and computer-based techniques.
4 units, Spr (Chafe, Staff)

155. Keyboard Literature and Performance Practice—To be taken concurrently with 172A/272A. A six-quarter sequence covering keyboard literature for the pianist (J. S. Bach to the present.) Required for majors with a concentration in piano performance and graduate students in piano performance practice.
1 unit, Aut, Win, Spr (Earth)

198. Seniors Honors Project.
4 units, Aut, Win, Spr (Staff)

199. Independent Study—For advanced undergraduates and graduate students who wish to do work outside the regular curriculum. Before registering, student must present a specific project and enlist a faculty sponsor.
1-4 units, Aut, Win, Spr (Staff)

251. Choral Repertory (1500-1750).
4 units (Ramsay)

252. Choral Repertory (1750- Present).
4 units (Ramsay)

PERFORMANCE GROUP INSTRUCTION

Special fee of $75 per quarter (subject to revision) for 12A,B,C, 65A,B, 72, 72, 74, 75, 76, 77.

12A,B,C. Introductory Piano—(A = level 1; B = level 2; C = level 3) Preference to music majors. Special fee for non-majors: $75.
1 unit, Aut, Win, Spr (Brainard, Goldsworthy)

65A. Voice Class I—Large group beginning voice for the non-major. Special fee: $75.
1 units, Aut, Win, Spr (Giovanetti)

65B. Voice Class II—Large group instruction for non-majors with previous vocal training. Special fee: $75.
1 unit, Aut, Win, Spr (Giovanetti)

65C. Voice Class—For music majors, and non-majors who are members of departmental performing organizations.
1 unit, Aut, Win, Spr (Wait)

72,73,74,75,76,77. Small Group Instruction.
1 unit, Aut, Win, Spr (Staff)

72A. Piano Class—For intermediate students.
(Ng-Quinn, Goldsworthy)

72B. Organ Class—For beginning organ students who have keyboard skills.
(Marshall)

73. Voice Class.
(Wait)

74A. Stringed Instruments Classes.
(Harrison, Kleyman)

74D. Harp Class.
(Chauvel)

75A. Wind Instruments Classes.
(Hawley, Staff)

75B. Renaissance Wind Instruments Class.
(Myers)

76. Brass Instruments Classes.
(Staff)

77. Percussion Class.
(Cirone)

INDIVIDUAL INSTRUCTION

172, 173, 174, 175, 176, 177, 272, 273, 274, 275, 276, 277. Individual Vocal and Instrumental Instruction—Special fee of $150 per quarter for majors and $300 for non-majors (subject to revision). Prospective students must demonstrate, by audition with the appropriate teacher, a minimum proficiency on instrument. Minimum repertory lists for each instrument are available at department office.
3 units, Aut, Win, Spr

172A/272A. Piano.
(Baller, Barth, Gandolfi, Ng-Quinn, Sparrow, Goldsworthy)

172B/272B. Organ.
(Marshall)

172C/272C. Harpsichord.
(Fabrizio)

172E/272E. Early Piano.
(Barth, Fabrizio)

(Bettina, Wait)

174/274. Stringed Instruments.
174A/274A. Violin.
(Freier, Kleyman, Leybin)

174B/274B. Viola.
(Kleyman, Zaslav)

174C/274C. Violoncello.
(Harrison)

174D/274D. Contrabass.
(Tramontozzi)

174E/274E. Viola da Gamba.
(Dornenburg)

174F/274F. Classical Guitar.
(Ferguson)

174G/274G. Harp.
(Chauvel)

174H/274H. Baroque Violin.
(Martin)
174/274. Early Plucked Strings. (Staff)
175/275. Woodwind Instruments.
175A/275A. Flute.
   (Blaisdell, Haucley, Maestre)
175B/275B. Oboe.
   (Matheson)
175C/275C. Clarinet.
   (Dufford)
175D/275D. Bassoon.
   (Olivier)
175E/275E. Renaissance Wind Instruments.
   (Myers)
175F/275F. Saxophone.
   (Stein)
175G/275G. Baroque Flute.
   (Claire)
176A/276A. French Horn.
   (Klingelhoffer)
176B/276B. Trumpet.
   (Burkhart)
176C/276C. Trombone.
   (Williams)
176D/276D. Tuba.
   (Cooley)
177/277. Percussion.
   (Cirone)

PERFORMANCE PRACTICES
130. Orchestral Conducting—Prerequisite: 127.
   3 units, alternate years, given 1991-92
131. Choral Conducting.
   3 units (Ramsey)
   131A. 3 units, Win (Ramsey)
   131B. 3 units, Spr (Ramsey)
180. Diction for Singers.
   180A. Italian.
      1 unit (Staff)
   180D. English.
      1 unit (Staff)
181. Performance of Vocal Literature.
   1 unit, Aut, Win, Spr (Bettina)
183. Performance of String Literature.
   183A. 1 unit, Win (Zaslav)
   183B. 1 unit, Spr (Zaslav)
230. Advanced Orchestral Conducting.
   4 units, Win, Spr (Jaffe)
231. Advanced Choral Conducting.
   4 units, Aut (Ramsey)
   4 units, Aut (Houle)

268. Thorough-Bass Realization.
   1 unit, Aut, Win, Spr (Fabrizio)
269. Studies in Performance Practices—Performance techniques, theoretical principles, aesthetics, and musical resources of various historical periods. Lectures, seminar reports, individual research, and performance. Prerequisite: 267.
   269A. Medieval.
      4-6 units (Mahrt)
   269B. Renaissance.
      4-6 units, Win (Houle)
   269C. Baroque.
      4-6 units, Spr (Dreyfus)
   269D. Classic.
      4-6 units (Barth)
   269E. Romantic.
      4-6 units, Spr (Barth)
   269F. Modern.
      4-6 units (Barth)

ENSEMBLE
These courses may be repeated for credit but are subject to the 12-unit activity class limitation policy. An audition is required for admission to any University musical organization. Membership is open to all students including those who do not register for credit. Audition schedules are announced before each registration period.
   1 unit, Aut, Win, Spr (Cirone)
158. Contemporary Performance Ensemble.
   1 unit, Aut, Win, Spr (Rockmaker)
   T 4:15-6:05
159. Early Music Ensembles.
   159A. Early Music Singers.
      1 unit, Aut, Win, Spr (Mahrt)
   159B. Renaissance Wind Band.
      1 unit, Aut, Win, Spr (Myers)
   159C. Baroque Orchestra—A chamber orchestra performing on instruments closely approximating those of the 17th and 18th centuries and employing articulations and bowings from historical sources.
      1 unit, Aut, Win, Spr (Dornenburg, Myers)
160. University Orchestra.
   1 unit, Aut, Win, Spr (Dornenburg, Myers) MTh 7:15 p.m.
161. University Bands.
   161B. Jazz Band.
      1 unit, Aut, Win, Spr (Bell)
      by arrangement
   161C. Sports Activity Bands.
      1 unit, Aut (Barnes) MWF 4:15-5:30
      Win (Barnes)
      Spr (Staff) by arrangement
162. University Symphonic Chorus.
1 unit, Aut, Win, Spr (Ramsey) 2 units, any quarter (Ramsey, Wait) T 4:15-5:30, Th 7-9:30 p.m. and Su 10-12

165. Stanford Chamber Chorale—Small vocal ensemble specializing in performance music of all periods for the chamber chorus.
1 unit, Aut, Win,Spr (Ramsey) TThF 12-1:50

166. Chamber Orchestra—Open to advanced players who have had orchestral experience.
1 unit, Aut, Win, Spr (Jaffe) TThF 12-1:50

1 unit, Aut, Win, Spr (Ramsey) T 7:15-8:45 p.m. and Th 4:15-5:45

168A. University Symphonic Band.
1 unit, Aut, Win, Spr (Barnes) MWF 12

170. Piano Accompanying.
1-2 units, Aut, Win, Spr (Bailer, Barth, Sparrow)

170A. Piano Accompanying.
1-2 units, Aut, Win, Spr (Baller, Barth, Sparrow)

170B. The Literature and Practice of Accompanying.
1 unit, Aut, Win, Spr (Baller, Barth, Sparrow)

171. Chamber Music—Open to any student with sufficient technical ability to play in small combinations for strings, winds, and keyboard instruments.
1 unit, Aut, Win, Spr (Harrison, Staff)

191. Concert Production and Self-Promotion for the Musician—Basic principles of public relations, concert production, and professional presentation.
1 unit, Win (McGee, Staff)

271. Performance Special—For students who take part in performances organized in 269 while not enrolled in that class.
1 unit, Aut, Win, Spr (Staff)

GRADUATE RESEARCH AND SPECIAL STUDIES

200. Music Bibliography—Use of bibliographical materials in music research; introduction to methods of research.
4 units, Aut (Nagy)

221. History of Music Theory—Principal theories, theorists, and treatises of Western music, from ancient times to the present.
alternate years, given 1991-92
221A. Ancient Through Renaissance.
4 units (Cohen)
221B. Baroque Through Modern.
4 units (Cohen)

240. Music History: Philosophy and Methods—Introduction to study of music history through intensive reading and discussion of representative primary and secondary works, and selected sources.
4 units, Win (Grey)

241. Seminar in Analysis for Performance.
4 units (Houle, Mahrt)

299. Master of Arts Project.
4 units, any quarter (Staff)

300. History of Notation.
300A. 4 units, Aut (Mahrt)
300B. 4 units, Win (Mahrt)
300C. 4 units, Spr (Mahrt)

301A. Modal Analysis.
4 units, Aut (Mahrt)
301B. Tonal Analysis.
4 units, Spr (Smith)
301C. Post-Tonal Analysis.
4 units, Win (Rockmaker)

302. Research in Musicology.
Aut, Win, Spr (Staff) by arrangement

310. Research Seminar in Musicology.
4 units, Aut (Cohen)
310A. Win (Dreyfus)
Spr (Danuser)

312. Aesthetics and Criticism of Music—Intensive reading of selected major primary texts.
312A. 4 units, Win (Berger)
312B. 4 units, Spr (Berger)

319. Research Seminar on Computational Models of Sound Perception.
1-3 units (Mont-Reynaud)

320A. The Discrete Fourier Transform (DFT)—Fundamentals of spectrum analysis for discrete-time signals. Topics: sampled signals, complex variables, geometric projection, orthogonality, the DFT, and Fourier theorems relating to time-shift, convolution, correlation, aliasing, signal power, symmetries, and band limited interpolation. Prerequisites: high-school algebra and trigonometry.
3 units, Aut (J. Smith)
320B. Applications of the Fast Fourier Transport (FFT)—Spectrum analysis and digital filtering using FFT. Topics: convolution, z transforms, transfer function analysis, frequency response, FFT windowing, and use
of FFT to implement nonrecursive filters by means of overlap-add or filter-bank summation techniques. Prerequisite: 320A or equivalent.

3 units, Win (J. Smith)

320C. Recursive Digital Filtering—Analysis, design, and implementation of recursive digital filters. Concepts: difference equations, impulse response, transfer function, frequency response, poles and zeroes, stability, phase and group delay, partial fraction expansion, Schur algorithm, physical simulation, and structural/numerical issues. Optional laboratory consists of projects using existing signal-processing facilities at CCRMA, and/or signal-processing projects related to the student's research program (final report required). Prerequisite: 320B or equivalent.

3 units, Spr (J. Smith)

plus lab by arrangement

321. Readings in Music Theory.

3 units, any quarter (Staff)

by arrangement

322. 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, Jaffe)


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 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


alternate years, given 1991-92

420A. Acoustical Signal Processing—Classical acoustics translated into a digital signal-processing framework. Topics: mass-spring oscillation, the mass-spring chain, the wave equation for the ideal flexible string and acoustic tubes, traveling waves, wave impedance, scattering theory, signal energy and momentum, digital filter counterparts, all-pass techniques, and efficient physical modeling using delay lines, scattering junctions, and low-order digital filters. Prerequisites: 320C or equivalent, and calculus.

2 units (J. Smith)

420B. Nonlinear Modeling—Computational models for woodwinds and strings. Physically meaningful synthesis algorithms are built by coupling a "negative-resistance device" (woodwind reed or bow-string interaction) to a linear filter (which models a woodwind bore or vibrating string). Models are designed to capture only the "audible physics" of a musical instrument with a computationally simple algorithm.

2 units (J. Smith)

OVERSEAS STUDIES PROGRAM

Stanford Center for Technology and Innovation—Kyoto
Director: Robert Orr

Stanford Program in Berlin
Director: Karen Kramer
Assistant Director: Hannelore Noack

Stanford Program in Florence
Director: Giuseppe Mammarella
Assistant Director: Carla Lekai
Language Program Coordinator: Joan M. McConnell
Faculty: Nicola Bellini, Patrizio Bianchi, Roberto D'Alimonte, William S. Di Piero, Guido Fink, John Freccero, Patrizia Guarnieri, Clark Reynolds, Giovanni Scichilone, Maria Todorow, Carlo Triglia

Stanford Program in Krakow
Faculty Director: Norman Naimark
Faculty: Kazimierz Baran, Wladyslaw Miodunka, Halina Nicz, Emil Orzechowski, Jacek Szmata, Jacek Wasilewski, Andrzej Wojtyna

Stanford Program in Oxford
Director: Geoffrey Tyack
Associate Director: Pamela Murray
Faculty: Elie Abel, Nicholas Crafts, Michael Gearin-Tosh, Ruth Mateer, J. B. McLaughlin, Gerald Meier, John Meyer, David Miles, Syed Rizvi, Trevor Rowley, Sarah Street

Stanford Program in Paris
Resident Director: Estelle Halevi
Professor: (Stanford) René Girard
Overseas Studies believes academic study abroad should be a normal part of every student's educational options. Offered are study centers in Berlin, Florence, Kraków, Oxford, and Tours, with a variety of courses from art to zoology. Last year new programs opened in Kyoto, Japan, and in Santiago, Chile. Courses meeting Distribution Requirements in Areas 2 and 5 are usually offered every quarter at all centers. In some quarters, science, engineering, and technology courses are available in Berlin, Kyoto, and Oxford, and internship programs are offered in Berlin and Kyoto. The Berlin, Florence, Kyoto, Santiago, and Tours programs require two quarters of the appropriate language instruction; instruction is largely in English. The Oxford and Kraków programs have no foreign language prerequisites. Students may enroll for one, two, or three quarters. All courses are taught by local and Stanford faculty.

Special programs are offered at Paris and Salamanca for students fluent in French or Spanish; students attend some classes in the local universities. Other opportunities through consortium programs exist in Rome and Kyoto. Students stay registered at Stanford and pay the usual tuition, and room and board fees. Regular financial aid rules apply, and aid is often increased to cover the cost of transportation and other expenses of living abroad. Students have a variety of housing options, depending upon the center; some students live in the Stanford Center, others with families, and others with local students in apartments or in local university dormitories. Courses offered abroad carry regular University credit; some also receive credit toward departmental majors. The information below, while accurate at the time of printing, is subject to change.

Overseas Studies has a full-time staff to assist students in planning all aspects of a program abroad. The office is on the first floor of Sweet Hall. Telephone: (415) 723-3558.

**COURSES**

**BERLIN**

   4 units, Spr (Cartwright)

4. West German Literature between the Reality of Ruins and the Student Movement, 1945-68—The relationship between the suppression of Germany's fascist past and the various schools of post-war German literature. (DR:2)
   4 units, Win (Schutte)

5. Political Culture in East Germany: Traditions and Transition.
   units to be announced, Win (Lemke)

6. The New Germany in Europe—The rapid pace of the German unification process is capturing attention and is prompting anxiety in Europe. Emphasis is on the history, origin, and development of Germany after 1945, including the events after November 1989 and the central internal and external aspects of the political system in a newly emerging unified state. Interdisciplinary approach. Historical, political, economic, constitutional, cultural, and international relations issues are discussed.
   units to be announced, Win (Jakobeit)

8. Germany in European Politics, East and West.
   units to be announced, Spr (Mangasarian)

11. Comparative Studies of Culture: West Germany and the U.S.A.—The American and W German societies have capitalist economies at almost the same level of technological development, democratic states, and extended public welfare institutions. Both represent variations of the common Western theme of modern individualism. Comparisons of formal education, religious organizations, soap operas, work, sports, etc. demonstrate the social composition of the "U.S. citizen" and "the German citizen."
   4 units, Aut (Gebhardt)

**101A. German Theater: East and West—(Same as Drama 101A.)** Weekly theater trips, a tour of back-stage facilities, attendance at a rehearsal, and discussions with actors, directors, or other theater professionals. Syllabus is based on the productions attended in any given quarter. The texts of the plays (50% in English translation) are supplemented by theoretical writings of the
117V. Industrial Revolution and Its Impact on Art, Architecture, and Theory—(Same as Art 173Y, VTSS 117V.) The interlinking of architecture and painting with technological and scientific development. In a period of industrial revolution, the dominance of positivist thinking and empirical methods promotes in the cultural and artistic realm a response of euphoric acceptance or emphatic rejection. Art work as a social, cultural, and spiritual “symbol” is a response to scientific and technological development, yet claims timeless validity. Topics: frictions between Idealism and Realism, photography and painting, Historicism and Functionalism, Expressionism and Dada, Futurism and New Sobriety, Functionalism and Nazi Classicism. The technological and scientific development motivates aesthetic redefinition. 

4 units, Aut (Kramer)  

120X. New Ways of Seeing—(Same as Art 120X.) Art objects in the Berlin cityscape, museums, and galleries as historical symbols. 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. 

4 units, Win (Neckenig)  

123X. German Art in the Weimar Republic and the Nazi Reich—(Same as Art 123X.) Analysis of the active role German art, 1919-1933, played in the general development of European art. The artistic preconditions, the different schools of art between 1919 and 1933, and the change from the progressive movement of Weimar to the return to national cultural roots and the break with the international scene in the Nazi period. 

4 units, Spr (Neckenig)  

133V. Industrialization and Technological Change in Germany and Britain: 1800-1914—(Same as History 133V; also listed as International Relations Cluster C.) Whether and to what degree technological innovation contributed to the economic development of both countries, and how far the transfer of technological knowhow from the originator (Britain) contributed to the success of the emulator (Germany). 

4 units, Win (Kunz)  

133X. The Frankfurt School: From Marxism to Postmodernism—(Same as Philosophy 133X, Political Science 164X.) The history of the Frankfurt School from its origins in the 1920s to its current controversies, from its early concerns with Marxism, social psychology, and aesthetics to its attempt to develop a comprehensive “communication ethics” and to repoliticize the debate around “postmodernism.” 

4 units, Win (Kunz)  

135X. East-West Relations in Europe—(Same as Political Science 135X; also listed as International Relations Cluster A.) The historical developments and major issue areas of East-West relations and the differences between the two systems. Economic, cultural, and political issues. 

5 units, Win (Engels)  

144X. The Federal Republic in East-West Relations—(Same as Political Science 144X; also listed as International Relations Cluster A.) Major themes: who makes German foreign policy, the principal objectives of German foreign policy, and the major problems managing the German foreign policy vis-a-vis the Superpowers. 

4 units, Win (Jakobeit)  

158G. Contemporary Theater in Berlin East and West—(Same as Drama 158G, German Studies 152T) The history of the German theater and drama since the Enlightenment, the organization and finances of the German theater in the 20th century, the current situation of rapid and basic changes in Berlin, and the correlation of text and stage, literature and theatrical realization, author and director, and production and audience. 

4 units, Win (Engels)  

170. Environmental Science and Technology—(Same as Civil Engineering 170, VTSS 182.) For science and nonscience majors. Causes, effects, and methods of controlling environmental degradation. Global warming, stratospheric ozone depletion, urban and indoor air quality, and hazardous waste management. 

3 units, Aut (Roberts)  

179B. Split Images: German Film Culture, East and West—(Same as German Studies 179B.) The emergence in the postwar period of two new German film and television cultures. Strategies for cross-cultural reception. Students attend the Berlin Film Festival. 

4 units, Win (Kramer)  

227V. Introduction to German History: Politics and Culture from the Middle Ages to the Unification of Germany, 900-1870—(Same as History 227V; also listed as International Relations Cluster A.) Berlin and Prussia in an “exemplarisch” selective way. The transformation of social forms and their cultural expressions in the context of political development. History as an interdisciplinary project, drawing on artistic,
literary, and theoretical documents and artifacts. (DR:5)
4 units, Aut (Neckenig)
230B. Berlin: Its History, Politics, and Culture—
(Same as History 230B.) The early history of the city, Imperial Berlin, the Revolution of 1918, and the divided city after 1945. (DR:5)
4 units, Spr (Neckenig)

GERMAN LANGUAGE PROGRAM

70. Intensive German—Grammar, composition, and conversation. 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—For students who wish to improve their knowledge of the German language and begin reading texts in history, literature, politics, and economics.
4 units, Aut, Win, Spr (Staff)
88. Intermediate Conversation.
2 units, Aut, Win, Spr (Staff)
90. Advanced German—For advanced students who wish to expand their knowledge of the German language and become more familiar with the finer points of German grammar and style.
4 units, Aut, Win, Spr (Staff)
93. Contemporary Berlin: Public Media—Conversation course using radio, television, advertisements, etc. as a basis for the discussion of current events. Vocabulary is expanded in the fields of politics, economics, sports, and the arts.
2 units, Aut, Win, Spr (Staff)

FLORENCE

1. History of the European Community.
units to be announced, Aut (Mammarella)
2. Modern Italian Poetry—Survey of Italian poetry in the 20th century and the different movements that have shaped it. Guido Gozzano, Giuseppe Ungaretti, Eugenio Montale, and others. Texts are bilingual.
4-5 units, Win (Di Piero)
4. Modern Fiction in Italy and America—Examination of the correspondences between Italian and American novelists of this century who have shared stylistic or thematic concerns. Self-consciousness, black humor, narrative structure, and irony. Authors: Italo Svevo, Carlo Levi, Saul Bellow, Hemingway, Vittorini, and others.
4-5 units, Win (Di Piero)
5. Cinema and Literature After World War II.
3-4 units, Spr (Fink)
6. The Political Economy of Interdependence—Introduction to the problem of uneven economic and social development during the process of regional and national integration. Cases from the Italian experience in the postwar period, Field trips.
5 units, Spr (Reynolds)
11. Roman and Etruscan Art—Introduction to native cultures of ancient Italy: art and artistic trends against the background of contemporary history and economy. Interpreted through abundant archaeological evidence near Florence, Etruscan culture and history are seen in relation to Italic neighbors during the early Iron Age. Topics: Etruscan heritage in Rome; rise of the Roman Republic; development into an empire; Roman art from its origin to the times of the late Empire.
3 units, Aut (Scichilone)
12. Politics and Management of Cultural Heritage in the Modern World—How Florence copes with pressures to preserve the past while responding to the needs of residents and the ways in which the preservation of the past are politicized and managed. Case studies such as the expatriation of the Parthenon marbles to England.
3 units, Win (Scichilone)
106V. Italy: From an Agrarian to a Post-Industrial Society—(Same as History 106V, Political Science 158X.) Italian history from the Risorgimento to the present. Italian society, crises, evolution, values, and relation to the political institutions existing in the different periods. Ideologies and political doctrines, and historical events which contributed to the formation of modern Italy’s predominant subcultures, Catholic and Socialist. (DR:5)
4 units, Win (Mammarella)
111A. Tuscan Art from Giotto to Leonardo—
(Same as Art 111A.) Chronological analysis of the stylistic development of Tuscan art from the 13th to 15th centuries, including study of Giotto, Donatello, Botticelli, and Leonardo. (DR:2)
4 units, Aut, Spr (Todorow)
111B. The High Renaissance and Mannerism in Florence, Rome, and Venice—(Same as Art 111B.) The stylistic trends, iconography, and social history of Italian art, concentrating on Michelangelo and Raphael, but including Bronzino, Vasari, Titian, Tintoretto, and Caravaggio. Emphasis on classical influences on the artists studied. (DR:2)
4 units, Win (Todorow)
121X. U.S. and Western Europe after WWII—
(Same as Political Science 121X, History 135V; also listed as International Relations Cluster A.) Economic, political, military, and cultural relations between the U.S. and NATO countries.
especially U.S. policy toward Europe as it relates to East-West issues and European unification. (DR:5)
4 units, Spr (Mammarella)

125X. Contemporary West European Politics—
(125X; also listed as International Relations Cluster A.) Introduction to Western European politics. Thematic approach with a country-based analysis. Material grouped by topic to allow for comparison. Particular aspects related to single political systems. The political, socio-economic, and cultural conditions explaining the rise of democratic regimes in W. Europe and their different pattern of development, constitutional models, parties and party systems, electoral trends and electoral systems, and the development of the "welfare" state. The European Economic Community and its future. (DR:5)
4 units, Spr (D'Alimonte)

126X. Italian Political System, Part I—
(Same as Political Science 126X.) Part I: in-depth analysis (in English) of Italian political institutions, actors, and processes. Political parties, the connection between the stability of the political system and its performance. Prospects for change with reference to the evolution of the Italian Communist Party. Part II in the following quarter, in Italian, at the University of Florence. (DR:5)
4 units, Aut (D'Alimonte)

159X. The Political Economy of Industrial Change: Italy and Europe in a Global System—
(Same as Economics 159X; also listed as International Relations Cluster C.) Analysis of structural change and new tendencies of industrial systems. Federal and local role of authorities in promoting the restructuring of industrial organizations. The differences in industrial organization and public policy between the U.S. and Europe. Emphasis on the Italian experience, mainly in small firm organization and policy. 5 units, Spr (Bianchi, Bellini)

1901. Seeing and Measuring Human Differences: Historical Perspective in Human Science (1800-1940)—
(Same as History of Science 1901, Psychology 112X.) Historical perspective on human biology including physiogomy and phrenology. Origins of racial and sexual stereotypes, and the historical treatment of madness and criminality. (DR:4)
4 units, Aut (Bianchi, Bellini)

218X. European Integration and 1992—
(218X; also listed as International Relations Clusters A and C.) The historical development of the European Communities from the Schuman plan to the Single European Act and the "1992 project." Topics: institutions and policy-making, policies and budgets, the completion of the internal market, and the path toward the economic and monetary union. Use of integration to analytically answer questions of the dynamics and possible alternative outcomes of the integration process. (DR:5)
4-5 units, Win (D'Alimonte)

295F. The Country and the City in the Modern Italian Novel from Manzoni to Italo Calvino—
(Same as Italian 295F.) The struggle in Italian cultural imagination between pastoral evasion and civic commitment during the formative years of contemporary Italian reality. Emergence of national identity, beginning of the industrial revolution and WWI, rise of Fascism and its aftermath, and the post-war struggle for the Italian Republic. Recommended: reading knowledge of Italian.
4 units, Win (Freccero)

ITALIAN LANGUAGE PROGRAM

3F. First-Year Italian, Third Quarter—
(Enroll in Italian 3F.)
5 units, Aut, Win, Spr (Staff)

51F. Second-Year Italian, First Quarter—
(Enroll in Italian 51F.)
5 units, Aut, Win, Spr (Staff)

52F. Second-Year Italian, Second Quarter—
(Enroll in Italian 52F.)
5 units, Aut, Win, Spr (Staff)

198F. Italian Language Specials—
(Enroll in Italian 198F.)
3 units, Aut, Win, Spr (McConnell)

KRAKÓW

4. East Meets West: Polish Film from the Polish Perspective—Stanford and Polish students meet in forum for discussion of issues of mutual concern.
2 units, Spr (Niec)

117V. The History of Polish-Soviet Relations: The Issue of the Blank Spots—
(Same as History 117V.) Since 1945, Polish historians have been unable to investigate important areas of the history of Polish-Soviet relations. These blank spots have dominated Polish national consciousness for the past 45 years despite official efforts to eliminate them. What had been blank spots have become national obsessions. Myths about
the past overlap with revelations about Soviet crimes against the Poles.

5 units, Spr (Naimark)

**120V. History of Eastern Europe**—(Same as History 120V; also listed as International Relations Cluster A.) Comparative history of Eastern Europe from the Middle Ages to the end of WWII. The rise of a new serfdom east of the Elbe in the 15th and 16th centuries, the relatively liberal patterns of the Polish-Lithuanian Commonwealth with its habeas corpus for gentry, etc. Enlightenment, liberalism, and nationalism in Poland during the 19th century, the interwar period in the 20th century, and the drift of Eastern European states from parliamentary democracies to authoritarian governments. Detailed diplomatic history of 1939-1945 emphasizing the Tehran 1943 and Yalta 1945 conferences. (DR:5)

4 units, Spr (Baran)

**123X. Efficiency of Capitalist and Socialist Economies and the Polish Crisis**—(Same as Economics 123X; also listed as International Relations Cluster C.) Explores the relative efficiency of the capitalist and socialist economies in coping with new challenges. The Polish economic crisis as an extreme example of interaction between domestic and external factors, and the main causes and effect of the crisis at macro- and micro-levels.

5 units, Spr (Wojtyna)

**134W. Polish Society in Transition**—(Same as Sociology 134W.) The various social forces in Poland (military, church, labor unions, peasants, the party, etc.) and the place of each in the current upheaval.

4 units, Spr (Wojtyna)

**156X. The Transition of Communism in Eastern Europe**—(Same as Political Science 156X.) The processes that are changing the Eastern Bloc, differentiating between the historical circumstances of Czechoslovakia, Hungary, German Democratic Republic, Bulgaria, and Romania. Political science/international relations focus.

4 units, Spr (Wasilewski)

---

**JAPANESE LANGUAGE PROGRAM**

5. Japanese Language—Taught at levels appropriate to work students have already completed. Placement tests in Kyoto assist in placing each student. Emphasis on spoken Japanese, and on study which is useful for the internships.

5 units, Spr (Staff)

---

**OXFORD**

6. Seminar: Changes in British Organizational Structure—Literature on distinctively British organizational forms (policy, economy, and other sectors) is read, and case histories prepared describing changes in patterns of authority, specialization, and ideologies and forms of organizational integration.

4-5 units, Spr (Meyer)

7. Sociology of Education: The British Educational System—Theories of educational effects, studies of school effects on achievement and attainment, the distinctive British system of educational organization, and ideas about the
long-term structural origins and effects of the system.

4-5 units, Spr (Meyer)

8. International Economic Development—Constraints that limit a poor country's economic development, and various policy measures to relax these constraints. Models of dualism and the macro- and micro-economics of development. Emphasis on the theory of policy, as it applies to the countries of Asia, Africa, and Latin America.

5 units, Aut (Meier)

9. Developments in Modern British Theater.

4 units, Win (Gearin-Tosh)

81. Values, Ethics, and Law—(Same as Philosophy 81.) Analysis of values and standards of conduct in the light of traditional ethics; the widening dimensions of human self-interpretation in light of modern scientific, political, and legal developments; the problems of planning for the future. Conceptual and historical approach. (DR:3)

4 units, Win (McLaughlin)

120Y. Art and Society in Britain: 1730-1914—(Same as Art 120Y.) Themes: social change in 19th-century art; effects of social and economic change on art, architecture, and design. How historical factors influence the type of art and architecture produced in a period of confused taste, experimentation, and uneven achievement. Field trips to buildings and paintings discussed. (DR:2)

3 units, Aut (Tyack)

124. Eyewitness Narrative as Literature—(Same as Communication 124.) Covers documents based on eyewitness accounts of historical events, ranging from Plato on the death of Socrates to the London Blitz of 1940 and the downfall of President Marcos in the Philippines, 1986. Students analyze and criticize the assigned readings written by historians, professional journalists, and amateurs who witnessed important events.

4 units, Win (Abel)

126. Global Communication: Prospects and Problems—(Same as Communication 126.) Changes in communication with the advent of satellites, computers, remote sending, and other new technologies. Ways in which countries organize and control their communication systems and the political and economic differences. Links between mass communication and national development.

4 units, Win (Abel)

127. Cinema and Society in Britain in the 1960s—(Same as Communication 127.) Analysis of a different film each week. The "classic" new wave period (1958-63) and films that came afterwards. Themes: affluence, images of men, images of women, sex and marriage, class, homosexuality, work and leisure.

3 units, Spr (Street)

143V. Urban History in Britain from 1500 to the 20th Century—(Same as History 143V, Urban Studies 146U.) Development of Britain's towns and cities: physical growth, economics, changes in urban life through the centuries, housing, sanitation and community life; why towns grew at different times and how they adapted to Britain's changing character and international role; how visual evidence can contribute. Use of primary archival material. Field trips in Oxford and London. (DR:5)

3 units, Win (Tyack)

144V. The British Empire and the Commonwealth—(Same as History 144V, Political Science 132X; also listed as International Relations Cluster A.) British imperialism in the 20th century and its legacy today. Topics: the Commonwealth as an element in international affairs, immigration from the Commonwealth, trade with and aid to the Third World. (DR:5)

4 units, Win (Rizvi)

167X. European Economies in a Changing World—(Same as Economics 167X; also listed as International Relations Cluster C.) The applied economics of Britain and how policy has been and may be affected by relationships with Europe. Topics: impact of EEC on production in Europe; evaluation of common agricultural policy; investigation of implications of European monetary union; Britain's major postwar economic problems; demand management, balance of payments, industrial concentration, and economic inequality. Recommended: Economics 1 or equivalent. (DR:5)

5 units, Spr (Crafts)

176X. History of British Architecture—(Same as Art 176X.) Chronology of the development of English architecture from the early Middle Ages to the 20th century. Analysis is stylistic and functional, and buildings are related to their historical background. Topics: the variety of materials used; the influence of foreign ideas on English architecture; the rise of the professional architect during the 17th century; and the emergence of new types of building with changing historical circumstances during the 18th and 19th centuries. Study of grand buildings like the Oxford Colleges, and ordinary homes of the people. (DR:2)

4-5 units, Spr (Tyack)

178Z. Charles Dickens: Bleak House and After—(Same as English 178Z.) Dickens' later novels:
Bleak House, Little Dorrit, and Great Expectations, and his frank acknowledgements of pain, old age, and personal suffering. Themes: private and public life, injustice and bureaucratic cold heartedness, and self-knowledge. (DR:2)

4 units, Aut (Mateer)

240V. History and Archeology of the British Landscape—(Same as History 240V.) Relationship between man and his habitat in Britain from the Iron Age to 1500. The geography of the British Isles and the nature of archeological evidence. Links between archeology and history. Changes in religion and ritual, in man's attitude toward death, and in the nature of social and political organization through the archeological record. Field trips.

4 units, Aut (Miles, Rowley)

254Z. Drama in Britain Today—(Same as English 254Z, Drama 158D.) The classics of world drama and some contemporary plays. The meanings of the works and the theatrical techniques used to complete them on stage. Weekly visits to the theater.

4 units, Spr (Mateer)

272A,B. Introduction to Post-War European Thought—(Same as French 272A, B.) Hegelian tradition through the study of exerpts from Kojeve's Introduction a la lecture de Hegel and the writings of the Frankfurt school: Adorno, Marcuse, etc. Two waves of Heideggerian influence distinguished: the existentialist school of the '40s and '50s (Jean-Paul Sartre, Albert Camus, etc.). Structuralism regarded as a reaction against and a continuation of existentialism: Claude Levi-Strauss and structural linguistics, Roland Barthes and structural criticism, Althusser and structural Marxism, Jacques Lacan and structural psychoanalysis.

4 units, Win (Halevi)

2. Latin American Literature and Social Development—Major themes from: Garcia Marquez, Cortazar, Roa Bastos. The social commitment of Latin American writers, writers in exile, revolution in Latin American literature, oral narratives, and history as metaphor.

4-5 units, Spr (Alegria)
106H. Man-Environment Interactions: Case Studies from Central Chile—(Same as Human Biology 106H.) Pollution, over-exploitation of resources, and deterioration of the landscape, are closely linked to social problems, related to the absence of an environmental policy and pertinent legislation. Case studies of central Chile illustrate the issues related to the terrestrial landscapes (Mediterranean-type climate), the coastal zone, and the urban area of the capital, Santiago.

5 units, Spr (Hajek)

107H. Population and Development Issues in Latin America—(Same as Human Biology 107H, Anthropology 133Z.) Population issues in Latin America during its development in the 20th century. The impact of economic development and industrialization on population and on the challenges that present and future population characteristics and trends impose on society. Issues: population growth and distribution; urbanization; social inequality and poverty, and survival or coping strategies of the urban poor. Social, economic, and population policies; and institutional arrangements at work in the Latin American societies.

5 units, Spr (Raczynski)

114X. Political Systems and Transition to Democracy: the Cases of Argentina, Brazil, Chile and Uruguay—(Same as Political Science 114X.) Analyzes the political systems of Argentina, Brazil, Chile, and Uruguay, and the transitions to democracy since the 1970s. Approaches to the study of politics in Latin America; the historical aspects of political development of the region; types of political systems; changes in political systems, and the transitions to democracy. Systematic analyzes of the transition to democracy in each of the countries included. Problems of stabilization of democracies.

5 units, Spr (Racynski)


5 units, Spr (Hachette)

172W. The Reception of Social Science and Latin America's Cultural Identity—(Same as Sociology 172W, Latin American Studies 132S; also listed as International Relations Cluster B.) Modern social science by Latin Americans and their representations to understand and justify Latin America's actual role in the modern world, or to criticize it and advocate a different one during 1870-1920 and 1950-1980. Concepts for analysis and a historical background, the images or representations created by Latin American authors under the influence of positivism (contrasted with their spiritualist and nationalist critics) 1950 to 1960. The ongoing search for a Latin American cultural identity in the context of a critical reception of modern social science.

5 units, Spr (Fuenzalida)
Rabelais and the French poet Ronsard who encompass the salient ambitions and highlight the successes and failures of 16th-century French writing.

3 units, Aut (Hester)

111X. Contemporary French Politics: A Comparative Approach—(Same as Political Science 111X.) Two major aspects of the French political system, political institutions under the Fifth Republic, and agents of political action (political parties and pressure groups). Comparisons with the American political system. (DR:5)

5 units, Spr (Gorgues)

115X. History of Art: The Renaissance in Italy and France—Periods, monuments, and masterpieces of French art. Architecture and interior decoration of castles, churches, and cities on French painting and sculpture, and the chief artistic techniques used over the centuries. Field trips to cities and museums. (DR:2)

4 units, Spr (DuFresne)

119X. Introduction to French Art and Architecture: Romanesque to Renaissance—(Same as Art 119X, Urban Studies 179U.) French art from the 11th to the 16th centuries. Historical and analytical treatment of major works and artists through lectures and slides complemented with field trips to museums, castles, churches, and archaeological sites. Periods are Pre-Romanesque, Romanesque, Gothic, and Late Gothic. (DR:2)

4 units, Aut (DuFresne)

120X. French Foreign Policy—(Same as Political Science 120X; also listed as International Relations Cluster A.) The main themes of French foreign policy since WWII: the French rejection of bipolar hegemony, the quest for an autonomous European community, and the preservation of special relationships with the Third World. (DR:5)

5 units, Spr (Billard)

121X. Painting and Society in France—(Same as Art 121X.) The artist's position in relation to French society and the French state since the 17th century. Emphasis on the history of painting. (DR:2)

4 units, Win (DuFresne)

128. Second Language Acquisition and Learner Strategies: Theory and Practice—(Same as French 128) Acquaints students of French with language learning theory so they may evaluate knowledgeably their personal experience and to facilitate their progress in acquiring a second language abroad. Students estimate better their own language learning aptitude profile and motivation and discard the preconceived ideas from linguistic folklore that hinder second language acquisition by adults.

3 units, Aut (Hester)

128X. Contemporary Problems of Economic Growth—(Same as Economics 128X; also listed as International Relations Cluster C.) The concept of economic growth, its definition and measurement, short and long range consequences, relationship to inflation, and its specific expression in the French economy. (DR:5)

5 units, Aut (Leboucher)

130V. Survey of French History: 1715 to the Present—(Same as History 130V.) Chronological and thematic survey of French history since Louis XIV. Political, social, and economic developments, emphasizing the emergence of republicanism in France, and its subsequent evolution. (DR:5)

5 units, Win (Green)

131V. France and European Fascism from the Thirties to 1945—(Same as History 131V; also listed as International Relations Cluster A.) Survey of the phenomenon of Fascism as it developed in Europe and in France between the 1930's and 1945, first in Italy under Mussolini, then in Germany and Spain. Examination of the French reaction to that "ideology". Historical approach. The socio-economic factors and the political values involved in the tensions of present day France and Europe.

4 units, Aut (Labussiere)

132. French Literature III: 19th and 20th Centuries—(Same as French 132.) Readings/discussions of prose, poems, and plays written in 19th- and 20th-century France. Their social and intellectual context, raising questions about the changing concept of poetry since the Romantics, the concerns of the novel from order and mimetic description to disorder, and the function of humor in plays by Beckett and Ionesco as compared to the Romantic irony of the earlier playwrights. (DR:2)

4 units, Win (Newman-Gordon)

135Z. Introduction to Intercultural Economic Relations: A Socio-Anthropological Approach—(Same as Anthropology 135Z.) Intercultural marketing and management as they apply to innovation in the Third World. Objectives: to heighten awareness of the significance of the cultural dimensions of marketing, management, and innovations in the Third World; and to show the limits of the cultural approach to an understanding of behavior of consumers, Third World farmers, and employees of multinational corporations.

4 units, Win (Desjeux)
154T. Molière and the Traditions of Comedy—(Same as French 154T.) Significant works of French comic theater, chiefly Molière. Plays reflect social tensions within the successive cultures that produced them and embody permanent aesthetic and anthropological values. Examples from Aristophanes and Shakespeare highlight specificity of French comedies and their adherence to the comic tradition of Western civilization. Syllabus is based on theatrical offerings in Tours and Paris. (DR:2)
4 units, Win (Doubinsky)

168X. Economic Analysis of Europe and the Single European Act—(Same as Economics 168X; also listed as International Relations Cluster C.) The functioning of French and European society in the socio-economic field. The objective for 1993, when the European Community becomes fully integrated, stressing the issues concerned: fiscal and monetary policies, economic policies, the social charter, norms, and the free movement of persons, goods, and capital. (DR:5)
5 units, Win (Leboucher)

181T. Modern French Poetry: From Baudelaire to Surrealism—(Same as French 181T.) Poets that have been major voices in the French poetry of the last 100 years and have left a profound imprint on the poetry and aesthetics of Western culture. All used the medium of poetry to pursue a spiritual adventure, to seek the absolute, or by divergent roads (Romanticism, Symbolism, Surrealism) to explore the mystery of the human condition. The linguistic, imaginative, and musical texture of the poems. Selected poems from Mallarme, Verlaine, Rimbaud, Valery, and Eluard. Taught in French. Credit for French major granted only if all student's work done in French. (DR:2)
4 units, Win (Loyen)

190V. French Images of Asia—(Same as History 190V; also listed as International Relations Cluster B.) The images the French constructed of China and Japan played a significant role in the cultural history of France, despite its limited involvement in the early phases of European expansion. Asia provided political philosophers, social critics, and novelists, a fulcrum to leverage a new understanding of their own society. French artists discovered new ways of looking at and recreating the world in painting, architecture, and design.
5 units, Spr (Duus)

191T. The Short Story in France—(Same as French 191T.) French stories spanning the 19th and 20th centuries, as revealing as any genre of the sensitivity and preoccupations of their time. Read as specimens of narrative art with reference to the literary movements to which they are related, and as examples of the individuality of each writer. (DR:2)
3-5 units, Win (Newman-Gordon)

219X. 1993: Towards the United States of Europe?—(Same as Political Science 219X; also listed as International Relations Cluster A.) The Single European Act invites a retrospective consideration of past progress and results, together with a careful scrutiny of the outstanding issues to be solved in the years to the deadline. 1993 may be won if one assesses the success of the "Common House" with respect to economic integration, and why 1993 looms as a challenge when analyzing the issue of political and military unity, without which the United States of Europe cannot fully exist. (DR:5)
5 units, Win (Billard)

FRENCH LANGUAGE PROGRAM

Intensive French—Grammar, conversation, and composition, emphasizing rapid acquisition of verbal skills necessary to use the French language in daily life.

70. Elementary Intensive French.
6 units, Aut, Win, Spr (Staff)

6 units, Aut, Win, Spr (Staff)

90. Advanced Intensive French.
6 units, Aut, Win, Spr (Staff)

123. French Language Continuation—Advanced language class dealing with more sophisticated grammatical analysis, composition and explication of texts.
4 units, Win, Spr (Staff)

PHILOSOPHY

Chair: John Perry
Director of Graduate Study: Eckart Förster
Director of Undergraduate Study: Julius Moravcsik

Professors: Michael Bratman (on leave), Nancy Cartwright (on leave, Autumn), Partha Dasgupta, Fred Dretske, Solomon Feferman, Dagfinn Føllesdal, Peter Galison, Wilbur Knorr, Julius Moravcsik, John Perry, Patrick Suppes (on leave, Spring), Thomas Wasow

Associate Professors: John Dupré (on leave, Spring), John Etchemendy, Eckart Förster
Assistant Professors: Rachel Cohen, Marleen Rozemond, Debra Satz (on leave)
The Joint Major in Philosophy and Religious Studies combines courses from both departments into a coherent theoretical pattern.

The Tanner Memorial Library of Philosophy contains an excellent working library and ideal conditions for study.

Graduate students and undergraduate majors in philosophy have formed associations for discussion of philosophical issues and reading of papers by students, faculty, and visitors. These associations elect student representatives to department meetings.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

There are two ways of majoring in philosophy, the “General Program” and the “Special Program in the History and Philosophy of Science.” A student completing either of these receives an A.B. degree in Philosophy. 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 is assigned an advisor to work out a coherent plan. The department strongly urges 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 10 units.
   b) The core: 24 additional units as follows:
      1) Logic: 57, or 159, or 160A.
      2) Philosophy of Science: any course in history of science or philosophy of science offered by the Philosophy Department
      3) Moral and Political Philosophy: one from 170-173
      4) Metaphysics and Epistemology: one from 180-188
      5) History: two history courses numbered 100 or above.
   c) One undergraduate philosophy seminar from the 194 series.
   d) Electives: 18 additional units, all numbered 10 or above, at least 13 of which must be numbered above 99 for a total of 55 units.

2. Units for Tutorial or Directed Reading (Philosophy 196, 197) may not be counted in the 55-unit requirement. No more than 10 units completed with grades of “Satisfactory” may be counted in the 55-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 HISTORY AND PHILOSOPHY OF SCIENCE

Undergraduates may major in History and philosophy of Science under the Philosophy Department. Each participating student is assigned an advisor who approves the course of study. 61 units are required for the sub-major, to be taken according to requirements 1-5 below. Substitutions for the listed courses are allowed only by written permission of the undergraduate advisor for History and Philosophy of Science. Students are encouraged to consider doing honors work with an emphasis on the history and philosophy of science. Interested students should see the description of the honors thesis in Philosophy and consult their advisors for further information.

1. General requirements:
   a) Three science courses in a coherent field (e.g., physics, chemistry, biology) (12 units)
   b) One history course, e.g., modern European history, modern American history (3 units)

2. The following core courses must be completed with a letter grade indicator (LGI) of "B-" or better by the end of the junior year.
   a) Philosophy 57 or 159
   b) Philosophy 80
   c) Philosophy 60

3. Two history of philosophy courses.
4. Three history of science courses.
5. Three philosophy of science courses. Choices of courses must be approved in writing by the program advisor.
6. At least six courses in the major must be completed at Stanford with an LGI of "B" (not including "B-") or better. Units for Tutorial or Directed Reading (196, 197) may not be counted in the requirement. No more than 10 units completed with grades of "satisfactory" may be counted in the requirement.
7. 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 is strictly limited.

HONORS PROGRAM

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 Winter Quarter of the junior year. Admission is selective on the basis of letter grade indicator (LGI), demonstrated ability in philosophy, and progress towards satisfying the requirements of the major.

Applicants should submit an intended plan of study for the remainder of the junior year and the senior year. It should include an undergraduate philosophy seminar in Spring Quarter of the junior year or Autumn Quarter of the senior year, also at least 5 units of Senior Tutorial (196) during Autumn and/or Winter Quarters of the senior year. In the quarter preceding the 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 write an essay on some philosophical problem. This essay is usually about 7,500 words for those taking one quarter of the tutorial, and about 12,500 for those taking two quarters of the tutorial. Of course, length may vary considerably depending on the problem and the approach. The tutorial essay may use work in previous seminars and courses as a starting point.

A completed draft of the essay is due to the advisor at the end of the Winter Quarter. If rewriting is necessary, the student may enroll in 2 units of the Spring Quarter senior tutorial. Two copies of the essay must be given to the honors committee by the end of the fourth full week of the Spring Quarter. Another copy must be given to Tanner Library.

The honors committee reviews applications, assigns tutors and second readers, and makes the final determination as to whether students receive honors.

The honors tutorials represent units in addition to the 55-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 coursework with approximately one third each in the philosophy core, the religious studies core, and either the general major or the special concentration.

No courses in either the philosophy or religious studies core can be taken Satisfactory/No Credit. At least three courses in each must be completed with a letter grade indicator of "B" (not including "B-") or better.

In general, transfer units cannot be used to satisfy the core requirements. Transfer units must be discussed with the director of under-
graduate studies in the appropriate department at the time of declaring the major.

CORE REQUIREMENTS

1. Philosophy courses
   a) Philosophy 80
   b) 16 units over the following areas:
      2) Ethics and value theory: Philosophy 170 or 171.
      3) Epistemology, metaphysics, and philosophy of language: Philosophy 180, 184, 186, 187.
      4) History of philosophy: Philosophy 100, 102, or 103

2. Religious Studies courses: 20 units, including at least two courses in diverse religious traditions (e.g., an Eastern and a Western, or a literate and a preliterate, tradition) and including at least one seminar.

General Major Requirements—An additional five courses (approximately 20 units) divided between the two departments. No more than 5 of these units may come from courses numbered under 99 in either department. Each student must also take at least one undergraduate seminar in religious studies and one undergraduate seminar in philosophy.

Special Concentration—With the aid of an advisor, students 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.

Directed Reading and Satisfactory/No Credit Units—Units of directed reading for fulfilling requirements of the joint major are allowed only with special permission. No more than 10 units of work with a grade of "Satisfactory" count toward the joint major.

HONORS PROGRAM

Students pursuing a joint major in Philosophy and Religious Studies may also apply for honors by following the procedure for honors in either of the departments.

COTERMINAL DEGREE

It is possible to earn an A.M. in Philosophy while earning an A.B. or B.S. This can usually be done by the end of the fifth undergraduate year, although students whose degree is not in philosophy may require an additional year. Standards for admission to, and completion of, this program are the same as for A.M. applicants who already have the bachelor's degree when matriculating. Applicants for the coterminal program are not, however, required to take the Graduate Record Exam. Information about application is available from the Graduate Program Office.

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.

Applicants to graduate programs in the Department of Philosophy are obtained from and returned to the Graduate Admissions Office, Stanford University. Applicants must take the Graduate Record Examination in October of the year the application is submitted.

MASTER OF ARTS

Two sorts of programs lead to the A.M. in Philosophy. One is a general program providing a grounding in all branches of the subject. The other provides 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.

Admissions—All prospective master's students, including those currently enrolled in other Stanford programs, must apply for admission to the program. The application deadline is April 15 of the academic year preceding entry into the program. No fellowships are available. Entering students must meet with the director of the master's program and have their advisors' approval, in writing, of program proposals. The master's program should not be considered a stepping-stone to the doctoral program; these two programs are separate and distinct.

Unit Requirements—Each program requires a minimum of 36 units in philosophy, though students in a special program may be allowed or required to replace up to 9 units of philosophy by 9 units in the field of specialization. Although the requirements for the A.M. 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 need longer. Students should also keep in mind that although 36 units is the minimum required by the University, quite often more units are necessary to complete departmental require-
ments. Up to 6 units of directed reading in philosophy may be allowed. There is no thesis requirement. A special program may require knowledge of a foreign language. At least 36 units must be completed with a letter grade indicator of "B-" or better at Stanford. Students are reminded of the University requirements for advanced degrees, and particularly of the fact that for the A.M., students must complete three full quarters as measured by tuition payment.

GENERAL PROGRAM

The General Program requires a minimum of 36 units in philosophy courses numbered above 99. Courses taken to satisfy the "undergraduate core" may not be counted in the 36 units. The requirement has three parts:

1. Undergraduate Core—Students must have when they enter, or complete early in their program, the following undergraduate courses. (Students entering from other institutions should establish equivalent requirements with a master's advisor upon arrival or earlier):
   a) Logic 57, 159, or 160A.
   b) Philosophy of science: any course in history of science or philosophy of science offered by the Philosophy Department.
   c) Moral and Political Philosophy: one from 170-173.
   d) Metaphysics and epistemology: one of 180-188.
   e) History: Two courses numbered 100 or above.

2. Graduate Core—Students must take at least one course numbered over 105 from three of the following five areas (courses used to satisfy the undergraduate core cannot also be counted toward satisfaction of the graduate core):
   a) Logic and semantics.
   b) Philosophy of science and history of science.
   c) Ethics, value theory, and moral and political philosophy.
   d) Metaphysics, epistemology, and philosophy of language.
   e) History.

   Each master's candidate must take at least two courses numbered above 200. One may be a graduate core seminar (264, 270, 280, 281), but no student is admitted to a core seminar before completing undergraduate requirements in the area of the seminar and securing the approval of the instructor.

3. Specialization—Students must take at least three courses numbered over 105 in one of the five areas.

SPECIAL PROGRAM IN THE HISTORY AND/OR PHILOSOPHY OF SCIENCE

Only students with substantial preparation in philosophy or in the history of science in one of the natural or social sciences are admitted. Entering students whose primary preparation has been in science may be required to satisfy all or part of the undergraduate core requirement as described in the General Program. Students whose preparation has not been in science may be required to take additional science courses.

COURSE REQUIREMENTS

1. At least four courses in the Philosophy Department in the history or philosophy of science. At least two of these must be graduate-level courses, or graduate sections of undergraduate courses, and at least one of the four must be in the philosophy of science and one in the history of science.

2. In most cases, one upper division or graduate course outside the Philosophy Department in the natural or social sciences or in history.

3. Remaining courses are to be chosen in consultation with and approved by an advisor.

SPECIAL PROGRAM IN THE PHILOSOPHY OF LANGUAGE

Admission is limited to students with substantial preparation in philosophy or linguistics. Those whose primary preparation has been in linguistics may be required to satisfy all or part of the undergraduate core requirements as described in the General Program. Those whose preparation is primarily in philosophy may be required to take additional courses in linguistics.

COURSE REQUIREMENTS

1. Philosophy of language: two approved courses in the philosophy of language numbered 180 or higher.


3. Logic: at least two approved courses numbered 160A or higher.

4. An approved graduate level course in mathematical linguistics or automata theory.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree (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, Epistemology, Philosophy...
of Language, Logic, and History) in which students should have proficiency in order to obtain a Ph.D. Demonstrating proficiency takes the form of coursework, intensive seminars, and papers, as detailed below.

Students must have completed this work by the end of their second year and all courses must be passed with a letter grade indicator (LGI) of "B-" or better (no Satisfactory/No Credit) to be advanced to candidacy.

At the end of the first year, the department reviews the progress of each first-year student to determine whether the student may continue in the program.

Any student in one of the Ph.D. programs may apply for the A.M. when all University and departmental requirements have been met.

PROFICIENCY REQUIREMENTS
1. Course requirements, to be completed during the first two years:
   a) Six of the seven items listed below:
      1) Four-quarter "core" graduate courses and seminars, in philosophy of language (281); philosophy of mind, metaphysics, and epistemology (280); value theory (270); and philosophy of science (264). These are given every other year. To enroll, the student must be a Ph.D. student in Philosophy or have special permission of the instructor.
      2) Three history units, each consisting of an approved graduate level course in the history of philosophy. The six-out-of-seven requirement must include at least one history unit in ancient philosophy, one in modern.
      b) First-order logic (Philosophy 160A) or the equivalent.
      c) Breadth Requirement: a course in Eastern or Continental philosophy, or some other course establishing breadth.
   2) Three history units, each consisting of an approved graduate level course in the history of philosophy. The six-out-of-seven requirement must include at least one history unit in ancient philosophy, one in modern.

2. Teaching Assistance: six quarters of teaching assistance at 25 percent time, usually during the second and third years.
3. Candidacy: to continue in the Ph.D. program, each student must be approved for candidacy during the sixth academic quarter (normally the Spring Quarter of the student's second year). Approval for candidacy indicates that in the department's judgment the student is prepared to proceed to the dissertation stage. In reaching this judgment the department considers the overall quality of the student's work during the first six quarters and the student's success in fulfilling course requirements.
4. During the third year of graduate study, a Ph.D. student should successfully complete at least one graduate-level course/seminar in philosophy each quarter.
5. Dissertation Work and Defense: the third and fourth (and sometimes fifth) years are devoted to dissertation work.
   a) Dissertation Proposal—By Spring Quarter of the third year, students select a dissertation topic, a reading committee, and some possible thesis relative to that topic. The topic and thesis should be sketched in a proposal of three to five pages, plus an annotated bibliography indicating familiarity with the relevant literature. The proposal should be approved by the reading committee before the meeting on graduate student progress late in Spring Quarter.
   b) Departmental Oral—During Autumn Quarter of the fourth year, students take an oral examination, called the "Departmental Oral," based on at least 30 pages of written work, in addition to the proposal. The aim of the exam is to help the student arrive at an acceptable plan for the dissertation and to make sure that the student, thesis, topic, and advisor make a reasonable fit. In cases where such an exam is deemed inappropriate by the reading committee, the student may be exempted by filing a petition with the Director of Graduate Studies, signed by the student and the members of the reading committee.
   c) University Oral Exam—Once a draft of the dissertation has been essentially completed, there is a second exam, called the "University Oral Exam." A portion of it consists of a student presentation based on the dissertation and is open to the public. A closed question period follows. If the draft is ready by Autumn Quarter of the fourth year, the student can request that the University oral count as the departmental oral.

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 waive some of the Ph.D. 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 specialize 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.

Special-program students may be exempted from two of the following:
1. One additional item from the seven items listed in (la).
2. Philosophy 160A (but then they must take Philosophy 57 or 159).
3. The breadth requirement.

Students with special interests in philosophy of science, requiring detailed knowledge of science and perhaps history of science, can design an individual program of study in close consultation with an advisory committee from the faculty. Such students are expected to satisfy proficiency requirements (2) and (3) above.

Ph.D. MINOR

To obtain a Ph.D. minor in Philosophy, students must follow these procedures:
1. Consult with the Director of Graduate Studies to establish eligibility, and select a suitable advisor.
2. Give to the department academic assistant a signed copy of the program of study (designed with the advisor) which offers:
   a) 30 units of courses in the Philosophy Department with a LGI 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 moral 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 (b) five areas.
3. A faculty member from the Philosophy Department (usually the student's advisor) serves 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 beginning the program.

INTERDEPARTMENTAL PROGRAMS

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. It is described in the “Humanities Special Programs” section in this bulletin.

GRADUATE PROGRAM IN COGNITIVE SCIENCE

Philosophy participates with the Departments of Computer Science, Linguistics, and Psychology in an interdisciplinary program in Cognitive Science. It is intended to provide an interdisciplinary education as well as a deeper concentration in philosophy and is open to doctoral students. Students who complete the requirement within Philosophy and the Cognitive Science requirements receive a special designation in Cognitive Science along with the Ph.D. in Philosophy. To receive this field designation, students must complete 30 units of approved courses, 18 of which must be taken in two disciplines outside of philosophy. The list of approved courses can be obtained from the Cognitive Science program located in the Psychology Department.

SPECIAL TRACK IN PHILOSOPHY AND SYMBOLIC SYSTEMS

Students interested in interdisciplinary work relating philosophy to artificial intelligence, cognitive science, computer science, linguistics, or logic may pursue a degree in this program.

Prerequisites—Ideally, admitted students will have covered the equivalent of the core of the undergraduate Symbolic Systems Program requirements as described in Courses and Degrees, including courses in philosophy, logic, artificial intelligence (AI), cognitive science, and linguistics. The graduate program is designed with this background in mind. Students missing part of this background may need additional coursework. Aside from the required coursework below, the Ph.D. requirements are the same as for the regular program.

Courses of Study—The program consists of two years of courses and two years of dissertation
work. Students are required to take the following courses in the first two years:

1. Six Philosophy courses:
   a) 280, the philosophy core seminar in metaphysics and epistemology.
   b) 281, the philosophy core seminar in philosophy of language.
   c) One course in the history of modern philosophy.
   d) Two quarters of graduate logic courses from among 390A, 391A, 392A, 393A.
   e) At least one additional seminar in the general area of symbolic systems: i.e., philosophy 289, 326, 396, etc.

2. Five cognitive science and computer science courses:
   a) Cognition (Psychology 205).
   b) One or two additional courses in cognitive psychology.
   c) Two or three graduate courses in computer science, at least one in AI and one in theory.

3. Three linguistics and computational linguistics courses:
   a) Graduate courses on natural language that focus on two of the following areas: phonetics and phonology, syntax, semantics, or pragmatics.
   b) One graduate course in computational linguistics, typically Linguistics 227.

4. At least two additional graduate seminars, at a more advanced level, in the general area of the program, independent of department. These would typically be in the area of the student’s proposed dissertation project.

The requirements for the third year are the same as for other third-year graduate students in philosophy: a dissertation proposal and creation of a dissertation committee. The latter must include at least one member of the Philosophy Department and one member of the Symbolic Systems Program outside the Philosophy Department.

The requirements for the fourth year are the same as for the other graduate students in philosophy: a department oral on an initial draft of part of the dissertation, and a University oral exam when the dissertation is essentially complete.

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 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 six quarters of teaching assistance at 25 percent time. Details of this program may be obtained from the department. If teaching a section, the student may register for 239, Teaching Methods in Philosophy.

COURSES

See the quarterly Time Schedule for revised listings.

INTRODUCTORY

These acquaint the student with some of the most important problems, positions, and methods in philosophy. Some are designed to give general preparation for further work in philosophy. Some apply the philosopher’s approach to particular problems and subjects encountered in other areas of study. Courses 5A, B, C form a Cultures, Ideas, and Values sequence, sponsored by the Department of Philosophy as part of the Cultures, Ideas, and Values Program. Note: Any one of 5A, B, C may count as the introductory philosophy course requirement for the major.

5A. Cultures, Ideas, and Values: Philosophy and Human Nature—Introduces important works in Western culture, and attempts to set them in their historical contexts.

5A, B, C. Cultures, Ideas, and Values: Philosophy and Human Nature—Introduces important works in Western culture, and attempts to set them in their historical contexts.

5A. Cultures, Ideas, and Values: The Origins of Western Philosophy—Origins of philosophical thought in antiquity, with some comparison to ancient Chinese thought. Early conceptions of male and female, and of the soul. Selections from Greek philosophy and literature, Chinese philosophy, and the Bible. Recommended for entering students. (DR:1; three quarter sequence)

5A units, Aut (Staff) MWF 10 plus 2-hour section

5B. Cultures, Ideas, and Values: The Enlightenment and its Victims—Introduces major scientific, philosophical, and political ideas of the 17th and 18th centuries. The way in which non-Europeans and women were excluded from Enlightenment ideals such as liberty and equality. Readings: Galileo, Descartes, Locke, Hume. (DR:1; three quarter sequence)

5B units, Win (Staff) MWF 10 plus 2-hour section

5C. Cultures, Ideas, and Values: Ideas of Human Liberation—The 19th and 20th centuries have seen major political and intellectual movements in which philosophical ideas have played an important role. Major innovations in science and political philosophy and the rise of the social sciences. The positive
and negative consequences of these movements. (DR:1; three-quarter sequence)

5 units, Spr (Staff) MWF 10
plus 2-hour section

10. God, Self, and World: Introduction to Philosophy—Some of the basic problems, concepts, and methods of Western philosophy. The nature and existence of God, minds, and things are approached through contemporary and classical philosophical texts. (DR:3)

5 units, Spr (Rozemond) MWF 11
plus section


5 units, Win (Cohon) MWF 11 plus section

24. Philosophical Analysis of Contemporary Moral Issues—A reasoned, analytical approach to three or four controversial moral conundrums in contemporary life. Possible topics: abortion, criminal punishment, racism, sexism, and affirmative action; the "right to die," surrogate motherhood, mandatory drug testing.

5 units, given 1991-92

30. Introduction to Political Philosophy—(Same as Political Science 51D.) Concepts of equality, justice, tolerance, liberty, utility, and rights through some major works in political philosophy. Each presents a distinct and systematic conception of human nature and social and economic conditions of a just association. Readings: Hobbes, Locke, Mill, Marx, Rawls, and Nozick. (DR:3)

5 units, Aut (Hampshire) MWF 11 plus section

42. Philosophy of Religion—(Enroll in Religious Studies 42.) (DR:3)

4 units, Spr (Gerber) MWF 1:15

46. Introduction to Chinese Thought—(Same as 104, Asian Languages 46, Religious Studies 55.) Religious and philosophical thought of early China, especially the "Classical" period, 550-200 B.C. Development of an extended dialogue among various thinkers who provided uncommon and often contradictory answers to a common set of problems. Limited enrollment. (DR:3*)

4 units, Aut (Iaconho) MWF 10
plus section by arrangement

57/157. Introduction to Logic.

57/157. Section 1. Computer-based; no lectures. Axioms and rules of inference for sentential and first-order predicate logic. Elementary applications to a variety of domains. Individual choice of topics for a grade beyond "satisfactory." Students progress at own pace. First class is organizational meeting only, held at 12:45 on first class day of quarter. (DR:6)

5 units, Aut, Win, Spr (Suppes

57/157. Section 2. Lecture. 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 (Jones)

MWF 1:15-2:30

60. The Growth of Scientific Knowledge—(Same as History of Science 60.) Philosophers, including Thomas Kuhn, who have tried to account for growth of scientific knowledge. The adequacy of their views against the theory of sociobiology (the biological explanation of social behavior) as it was developed from Darwin to Dawkins. Writing focus course. (DR:3)

5 units, Win (Horan) MWF 10

61. Introduction to the Philosophy of Social Science—(Same as Education 111.) Focuses on differences writers have noted between the natural and social sciences, and topics in the social sciences; explaining human action, the functional explanation of social phenomena, and holistic vs. reductionist orientations. Examples from contemporary social sciences research literature. For majors in the social sciences and beginning graduate students in related areas such as education.

3 units, Win (Phillips) T 7-10 p.m.

62. History of Biological Thought—(Same as History of Science 62, History 116A, VTSS 127.) Central issues in biological thought since Darwin: teleological vs. mechanistic explanations, vitalism, reductionism, the units and levels of biological organization, the origins of life, development, inheritance, and evolution.

4 units, Win (Smocovitis) MWF 9

75. Computers, Ethics, and Social Responsibility—(Enroll in Computer Science 201, Symbolic Systems 100, VTSS 212.) Analysis of ethical and social issues related to the development and use of computer technology. Introduction to relevant background in ethical theory, and social, political, and legal considerations. Analysis of scenarios in a number of specific problem areas, such as privacy, reliability, risks of complex systems, and the responsibility of professionals.
for the applications and consequences of their work. Small group discussion. Emphasis on developing analytical skills. Primarily for majors entering computer-related fields. Prerequisite: Computer Science 106B or equivalent.

3 units, Spr (Nissenbaum, Winograd)
MWF 11-12:15

77. Ethics in International Relations—Topic: World Destitution—(Same as Ethics in Society 77.) Focuses on the phenomena of hunger and malnutrition in poor countries, including analytical and empirical material drawn from moral and political philosophy, economics, and nutrition science. Methods of quantitative assessment of the extent and distribution of well-being and basic needs in a society. Readings from contemporary sources. Prerequisite: 30 or consent of instructor.

4 units, Win (Dasgupta) MWF 10

78. Medical Ethics—(Same as Human Biology 173.) Philosophical analysis of moral dilemmas in health care from the perspective of the health care professional and the concerned layman (patient, family member, or observer.) Traditional insights about rights, compassion, respect for persons, and other moral matters illuminate such issues as euthanasia, informing vs. lying to seriously ill patients, treatment of deformed newborns, and the just allocation of scarce lifesaving therapies.

4 units, not given 1990-91

79. Philosophy of Law—(Graduate students register for 179.) The relationship of law and morality with regard to the nature of law and legal systems, notions of coercion and legal responsibility, issues of civil disobedience, paternalism and privacy.

4 units, Win (Lott) MWF 1:15

80. Mind, Matter, and Meaning—Intensive survey of some central and perennial topics in philosophy: free will and determinism, the mind-body problem, personal identity, and basic issues in the philosophy of language. Prerequisite: one course in philosophy other than logic. Writing focus course.

5 units, Aut, Spr (Dretske, Zalta) MWF 10

HISTORY OF PHILOSOPHY

100-106 are surveys of 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. Prospective philosophy majors should take as many as possible during the sophomore year.

100. Greek Philosophy—(Same as Classics 65.) The philosophies of Plato and Aristotle, with some pre-Socratic background. (DR:3)

4 units, Aut (Judson) MWF 1:15

101. Medieval and Renaissance Religious Philosophy—(Same as Religious Studies 167.) Medieval and Renaissance philosophy focusing on the puzzles which arise when God and world are viewed as creator and created. Medieval and Renaissance debates over time and eternity, necessity and contingency, free will and determinism, knowledge of God. Readings: Augustine, Anselm, Aquinas, Scotus, Ockham, Erasmus, and Luther.

4 units, Win (Gelber) MWF 11

102. Modern Philosophy, Descartes to Kant—Origins and early development of modern philosophical thought. Descartes, Leibniz, Locke, Hume, and Kant. Emphasis on metaphysical issues. Prerequisite: one course in philosophy. (DR:3)

4 units, Win (Rozemond) TTh 11-12:15

103. 19th-Century Philosophy—Ideas and conceptions that shaped 19th-century philosophy. Fichte, Hegel, Marx, Kierkegaard, Nietzsche.

4 units, Win (Frster) TTh 11-12:15

104. Introduction to Chinese Thought—(Same as Philosophy 46.) For philosophy majors.

116. Plato’s Philosophy—(Graduate students register for 216.) The development of Plato’s metaphysical theories.

4 units, Spr (Moravcsik) TTh 11-12:15


4 units, Aut (Judson) T 1:15-3:05

118. The Ethics of Socrates, Plato, and Aristotle—(Enroll in Classics 169.) Introduction to the ethical thinking of Socrates, Plato, and Aristotle. Reading of one or two Greek tragedies. The “doctrines” presented by these philosophers and the methods they employed in addressing ethical issues.

2-3 units, Spr (Nightingale) MW 2:15-3:45

120. Aquinas—(Graduate students register for 220.) Systematic and historical exploration of Aquinas’ metaphysics and epistemology. Topics: the human soul, metaphysical structure of substances, knowledge.

4 units, Aut (Rozemond) Th 3:15-5:05
123. British Empiricists—Metaphysical and epistemological ideas in the principal works of Locke, Berkeley, and Hume.
4 units, Win (Zalta) MWF 2:15

125C. Kant’s Critique of Judgment—(Graduate students register for 225C.) A study of both parts of Kant’s Critique of Judgment, concentrating on the philosophical content and its subsequent influence on philosophy and literature.
4 units, Aut (Forster) TTh 11-12:15

129. Confucian Ethics—(Graduate students register for 229.) Introduction to the best secondary literature on the ethics of Confucius, Mencius, Xunzi, the Cheng-Zhu School, and Wang Yang-ming. Readings from the works of Graham, Fin-garette, Lau, Hansen, Rosemont, Munro, and the “Stanford School.” Knowledge of Classical Chinese not required, although a special reading section may be arranged if there is sufficient interest. Prerequisite: 46 or one other previous course in philosophy. Recommended: previous study of Confucianism.
4 units, Spr (Van Norden) MWF 11

133. Hermeneutics and Critical Theory—Introduction to two of the most important and influential schools in 20th-century German philosophy through the leading representatives of these schools: Heidegger, Gadamer, Horkheimer, and Habermas.
4 units, given 1991-92

HISTORY OF SCIENCE


138A. Ancient Period—(DR:3; also satisfies Area 6 when taken in sequence with 138B or 138C.)
4 units, Aut (Knorr) MWF 2:15

138B. Middle Ages to Newton—(DR:3; also satisfies Area 6 when taken in sequence with 138A.)
4 units, Win (Knorr) MWF 2:15

138C. Newton to Einstein—(DR:3; also satisfies Area 6 when taken in sequence with 138A.)
4 units, Spr (Knorr) MWF 2:15

150. Origins of Life—(Same as History 133D, History of Science 156.) Assumptions underlying research and debate on the origins of life from 1850-present. The role of representations in authorizing frameworks for interpreting the origins of life. Two main lines of research, one originating with A.I. Oparin’s (1924) The Origins of Life emphasizing a biochemical-metabolic approach to life, the second emphasizing a genetic-informational approach beginning with H. J. Muller’s (1926) The Gene as the Basis of Life. Tracing these two to the present, compares reductionist strategies with recent attempts to articulate a concept of “autopoesis”—the notion that living systems are self-assembling, self-enclosing networks of production.
4 units, Spr (Lenoir) TTh 2:15-3:30

152. The Darwinian Revolution—(Same as History of Science 152, History 133, Human Biology 152, VTSS 130.) Conceptual developments leading to the establishment of the major unifying paradigm of biological science, the theory of evolution by natural selection. Biological thought before Darwin, 1750 to 1836. The formation of Darwin’s thought in terms of its broader intellectual and social context; the Origin of the Species. The difficulties the theory had to overcame and their resolution in the union of evolutionary biology and population genetics.
4 units, Aut (Lenoir) TTh 2:15-3:30

LOGIC AND PHILOSOPHY OF SCIENCE

156. Popper, Kuhn, and Lakatos—Three controversial figures in recent philosophy of science. Popper: scientific methods as openness to refutation and rational criticism. Kuhn: science develops discontinuously via scientific revolu-
tions. Lakatos: scientific research programs have a "hard core" which adherents try to protect by making changes in the "protective belt." Interactions and criticisms.

157. Introduction to Logic—(Same as 57.) For graduate students.

158. Axiomatic Set Theory—Zermelo-Fraenkel axioms. Operations on sets, relations, and functions. Equivalence and ordering relations. Equivalence of sets and cardinal arithmetic. Topics on ordinal numbers and axiom of choice as time permits. This is computer-based; no lectures. Students progress at own pace. The first meeting is organizational only, at 2:15 the first class day of quarter.

4 units, Aut, Win, Spr (Suppes)

159. Basic Concepts in Mathematical Logic—(Same as Symbolic Systems 159, Linguistics 135.) Informal introduction to basic concepts and techniques used in mathematical logic: sets, functions, structures, formalization, proof, mathematical induction, enumerability, and effectiveness. (DR:6)

4 units, Aut (Etchemendy) MWF 9 plus section

160A. First-order Logic—(Same as Symbolic Systems 160A.) Syntax and semantics of sentential and first-order logic. Introduction to basic concepts of model theory. Gödel's Completeness Theorem and its consequences (the Löehnheim-Skolem Theorem and the Compactness Theorem) discussed and applied. Prerequisite: 159 or consent of instructor.

4 units, Win (Mason) MWF 9 plus section

160B. Computability and Logic—Different approaches to effective computation: recursive functions, register machines, and various programming styles. Proof of their equivalence, discussion of Church's Thesis. Development of some elementary recursion theory. These techniques are used to prove Gödel's Incompleteness Theorem for arithmetic, whose technical and philosophical repercussions are surveyed. Prerequisite: 160A.

4 units, Spr (van Benthem) MWF 9 plus section

162. Foundations of Measurement—Fundamental theories of measurement from a formal standpoint. Their empirical inadequacy. Basic representation theorems for extensive, conjoint, and difference measurements. Organizational meeting 3:15 on the first class day.

3 units, not given 1990-91

164. Topics in Philosophy of Science: Explanation and Prediction—Scientists use predictive success as evidence for the explanatory power of their hypotheses. The relation between prediction and explanation with this practice in mind. Do the qualities that make a hypothesis good at predicting also make it good as an explanation? Conversely, are good explanations the best predictors?

4 units, Spr (Horan) TTh 1:15-2:30

165. Philosophy of Physics—Examination of the philosophical foundations of quantum mechanics, emphasizing the role of probability.

4 units, Win (Suppes) MW 2:15

166A. Literature and Philosophy: Complexity and Self-Reference in the Humanities and Social Sciences—(Enroll in French 277.) Undecidability, infinite deferment, structural incompleteness, bifurcation and structural stability, the test as a machine, etc. Interdisciplinary approach exploring conceptual foundations of modern critical theory.

2-3 units, Win (Dupuy)

167. Philosophy of Biology—Whether the aims and methods of biology differ from, or coincide with, those of the other natural sciences, e.g., physics and chemistry, e.g., is the mathematical character of physics a necessary feature of a successful biological science? Issues in the philosophy of biology: teleological laws and explanations, the power of molecular biology, the character of evolutionary theory, the role of fitness and adaptation, and the nature of biological species.

4 units, Win (Horan) MWF 10

168. History and Philosophy of Physics—(Same as History of Science 168, VTSS 126.) Philosophical questions raised by historical developments in 20th-century physics. Late 19th-century reductionist world-views leading to special and general relativity. Einstein's response. How did early workers in quantum mechanics attack the wave-particle duality? The problem of scientific realism in quantum mechanics. Nuclear fission, the bomb, and growth of large-scale experimental high-energy physics. What is meant by "unified" field theories in contemporary physics? Readings: scientific, historical, and philosophical texts. (DR:3)

5 units, Win (Galison) TTh 11-12:15

169. Basic Concepts in Modal Logic—Logical and philosophical issues concerning and connecting such concepts as necessity, possibility, time, knowledge and belief, and obligation. Language, semantics, and deductive principles of several propositional and predicate modal systems are developed, concentrating on
“possible world semantics.” Prerequisite: 
4 units, Aut (Mints) MW 11-12:15

ETHICS, AESTHETICS, AND SOCIAL AND POLITICAL PHILOSOPHY

170. Reason and the Good in Ethical Theory—
The Aristotelian tradition in ethics examined against major alternatives including human subjectivism and utilitarianism. Prerequisite: two courses in philosophy.
4 units, Spr (Clark) MWF 2:15

171. Political Philosophy—In-depth topics in political philosophy, especially the ability of contemporary liberal political thought to respond to its critics’ attacks on its psychological and methodological foundations. Also Marxist, communitarian, conservative, and anarchist critics.
4 units, Win (Bogart) MWF 1:15

171A. Problems in Political Theory: Punishment—(Enroll in Political Science 156.) Central concepts of political theory (authority, freedom, justice, obligation) considered by focusing on problems raised by legal punishment. By what right does the state punish? For what actions is it legitimate to punish? Can punishment be just in an unjust society? Why punish at all? Concern is with classic political theories of punishment, but draws on literature and empirical studies and considers political debates currently taking place.
5 units, Win (Tunick)

172. Topics in Moral Philosophy—Moral realism and anti-realism. Theories asserting the objective reality of moral values, and challenges to such theories, including moral subjectivism, relativism, and noncognitivism. Mainly 20th-century articles, by Mackie, Hare, Harman, Blackburn, McDowell, Williams, and Railton.
4 units, Aut (Cohon) MWF 11

173. Political Thought in Contemporary Eastern Europe—Philosophical and historical perspectives on recent political changes in Eastern Europe, especially Poland.
4 units, Win (Amsterdamski) MW 11-12:15

174. Morality of Peace and War—(Same as Religious Studies 164.) Moral, political, and religious issues surrounding conflict and conflict-resolution, especially in a nuclear age. General nature of peace and war, their theory and practice, just war tradition, and pacifism. (DR:3)
5 units, not given 1990-91

175. Hegel’s Political Philosophy—(Enroll in Political Science 155.) Critical reading of his "Philosophy of Right." Emphasis on his concept of freedom, criticism of Kantian morality, and distinction between state and civil society. Aim: a lucid account of his text and an understanding of its relevance to current controversies in political theory. Additional readings in Aristotle, Kant, and other works by Hegel.
5 units, Aut (Tunick)

4 units, Win (Lott) MW 3:15-4:30

177. Feminism and Philosophy—(Graduate students register for 277; same as Feminist Studies 102B/202B.) Feminist approaches to political philosophy and philosophy of science. Feminist critiques of the main Western political feminism; specific issues such as affirmative action, abortion, and pornography. Feminist responses to specific areas of science, especially sexual difference; critical consideration of general assumptions about scientific objectivity. Undergraduate prerequisite: Feminist Studies 101, or permission of instructor.
5 units, Win (Dupré) TTh 2:15-3:30

178. Ethics in Society Honors Seminar—(Same as Ethics in Society 190.) Interdisciplinary. Students present issues of public and personal morality. Topics chosen with the advice of instructors. Student proposed reading list made available prior to the presentation. Group discussion follows.
3 units, Win (Cohon, Dasgupta) Th 3:15-5:05

179. Philosophy of Law—(Same as 79; for graduate students.)

EPISTEMOLOGY, METAPHYSICS, AND PHILOSOPHY OF LANGUAGE

Philosophy 80 or permission of instructor is a prerequisite for the 180 series.

180. Philosophy of Language—Basic issues in the relationship between language, mind, and world through the work of Frege, Russell, Wittgenstein, Kripke, and others. Prerequisites: 80 and some background in logic. (DR:4)
4 units, Win (Moravcsik) MWF 1:15

183. Meaning and Experience—(Graduate students register for 283.) Interrelationships between meaning and experience, emphasizing how our judgments concerning meaning may
be based on empirical evidence. Philosophers: W. V. Quine and Donald Davidson. Recommended: some acquaintance with the philosophy of language.

4 units, Spr (Follesdal) MWF 1:15

184. Theory of Knowledge—Some central problems of epistemology, including the analysis of knowledge and memory, the nature of perception, and an evaluation of skepticism.
4 units, Aut (Dretske) MWF 1:15

186. Philosophy of Mind—The mind-body problem, including behaviorism, functionalism, and other forms of materialism; intentionality and the nature of mental representation; the explanation of action in terms of the agent's reasons.
4 units, Spr (Dretske) MWF 1:15

188. Science and Knowledge—(Graduate students register for 288.) Empiricists try to base all claims on experience. Is this a reasonable constraint? Which, if any, domains of modern science meet it? The role of instruments in science and how scientific knowledge can be constituted not just by theoretical claims but in practices, machines, and technological spin-off.
4 units, Win (Amsterdamski) TTh 1:15-2:30

189. Intensional Semantics—(Graduate students register for 289.) Survey of development of semantics for so-called intensional languages. Basic works by Tarski, Carnap, Kanger, Kripke, Kaplan, Hintikka, and Montague. Also, recent work in the area, if time permits.
not given 1990-91

191. Philosophical Problems in Intelligent Robotics—Philosophical problems encountered in the design of robots that can understand natural language and interact with humans. Topics: robots that learn through instruction, problems of command interpretation, and robot plans and intentions.
2 units, Win (Crangle) M 3:15-5:05

194. Undergraduate Seminars in Philosophy—A series of advanced undergraduate seminars. Enrollment is limited to 16 in each seminar. Preference given to undergraduate majors. For those in the Philosophy honors program, seminars serve as preparation for writing an honors thesis.

194A. Practical Reasoning—The practical syllogism in its relation to theoretical reasoning, desires, teleological explanation, value, rationality, and ethical theory.
4 units, Aut (Clark) T 2:15-5:05

194B. Human Knowledge, Human Nature: Philosophy and Feminist Thought—Does recent work in feminist philosophy require a reconceptualization of traditional questions about epistemology, the self, and ethics. The possibility and implications for philosophy of a "distinctive female voice," especially amid tensions in feminist philosophy itself between reason and emotion, universality and individuality, autonomy and interdependence.
4 units, Win (Horan) T 2:15-5:05

194C. Topic to be announced.
4 units, Spr (Staff) T 2:15-5:05

194D. Hobbes—The system of ideas that Hobbes presented in De Cive, De Corpore, and De Homine. Topics: scientific method, metaphysics, psychology, morality, politics, and religion.
4 units, Spr (Lott) W 2:15-5:05

196. Tutorial—Senior Year.
5 units, any quarter (Staff) by arrangement

197. Individual Work for Undergraduates.
any quarter (Staff) by arrangement

PRIMARILY FOR GRADUATE STUDENTS

216. Plato's Philosophy—(Same as 116; for graduate students.)
217. Aristotle—(Same as 117; for graduate students.)
220. Aquinas—(Same as 120; for graduate students.)
225C. Kant’s Critique of Judgment—(Same as 125C; for graduate students.)
229. Confucian Ethics—(Same as 129; for graduate students.)
237A,B,C. Graduate Colloquium: Methods in History and Philosophy—(Same as History of Science 237A,B,C.) Contemporary methodological and historiographical problems in the history of science based on readings from the history of physics, biology, chemistry, and medicine. Diverse approaches: "internal," philosophical, institutional, Marxist, sociological, and anthropological. Guest lecturers from a variety of specialties. After introduction of core material, students pursue individual research topics in consultation with the instructor.
3 units, Aut, Win (Lenoir, Dupré) Th 4:15-6:05
Spr (Galison) Th 4:15-6:05

238A. Graduate Seminar in the Philosophy of Science: Instruments, Experiments, and Realism—(Same as History of Science 238A.) How do the preliminary, fragile results of experiments become transformed into the shared foundation of modern science? Using methods from philosophy, history, and sociology of science, explores experimentation and instrumentation
from a variety of times and disciplines. Focuses on the physical sciences. Topics: realism and social constructivism, the role of social history in the history of science, and changing standards of argumentation within modern physical experimentation. Enrollment limited to 15.

5 units, Aut (Galison) T 3:15-5:05

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

240. Individual Work for Graduates.
any quarter (Staff) by arrangement

242A. Seminar in the Philosophy of Science: Quantum Mechanics.
3 units, Aut (Suppes) M 3:15-5:05

245. Scientific Revolution—(Same as 145; for graduate students.)

255. Interdisciplinary Workshop in Equity and Social Choice Theory—(Same as Political Science 267, Economics 387.) Recent work on social choice theory and related literatures in economics, philosophy, and political science, as it concerns the equitable allocation of resources and respect for individual rights.
1-3 units, Win (Suppes, Ferejohn) T 3:15-5:05

264. Philosophy of Science—Core seminar in philosophy of science for first- and second-year students in the Philosophy Ph.D. program.
4 units, Spr (Staff) MW 3:15-5:05

265A.B. Graduate Seminar: Philosophy of Physics—Current philosophical concerns about modern physics including questions about theory (quantum mechanics and relativity) and experimental practice.
3 units, Aut, Win (Cartwright) T 7:30-9:30 p.m.

270. Moral Philosophy—Core seminar in moral philosophy for first- and second-year students in Philosophy Ph.D. program.
4 units, given 1991-92

4 units, Aut (Jackson) TTh 4:15-6:05

274. Morality and Reasons for Action—The rationality of moral conduct. Specifically: are there, necessarily, reasons for each person to behave as morality requires? Investigation of practical rationality, and the nature of moral motivation and reasons to be moral. Readings mostly from contemporary writers.
3 units, Spr (Cohon) Th 3:15-5:05

275. Justice And Human Nature—(Same as Religious Studies 275.) The relation between various accounts of justice (Rawls, Walzer, Niebuhr) and conceptions of the self (Charles Taylor, Alasdair Maclntyre, and Wolfhart Pannenberg). Has a post-Enlightenment consensus emerged on these topics, or is the liberalism/communitarianism distinction still significant? Do we need a theory of human nature for political philosophy?
5 units, Win (Jackson) TTh 2:15-4:05

277. Feminism and Philosophy—(Same as 177; for graduate students.)

278. Graduate Seminar in Applied Ethics—Interdisciplinary. Students present issues of public and personal morality, topic chosen with the advice of the instructors. Student prepared reading list is available to class members a week prior to their presentation. Group discussion follows.
3 units, Aut (Dasgupta, Moravcsik) T 3:15-5:05

280. Metaphysics and Epistemology—Core seminar in metaphysics and epistemology for first- and second-year students in the Philosophy Ph.D. program.
4 units, given 1991-92

281. Philosophy of Language—Core seminar in philosophy of language for first- and second-year students in the Philosophy Ph.D. program.
4 units, Aut (Perry) MW 3:15-5:05

283. Meaning and Experience—(Same as 183; for graduate students.)

286. Graduate Seminar in Thought and Language.
3 units, Win (Moravcsik) W 3:15-5:05

287. Seminar on Object Theory—Focuses on an axiomatic theory of objects and relations, and considers it as a general philosophical foundation. From this, derives theories of PRP's, situations, worlds, monads, Fregean senses, and intentional objects. Use of foundations for developing an understanding of intensional logic and philosophical theory of mathematical objects and relations.
3 units, Aut (Zalta) Th 2-3:30

288. Science and Knowledge—(Same as 188; for graduate students.)

289. Intensional Semantics—(Same as 189.) not given 1990-91

326. Nonmonotonic Reasoning—(Same as Computer Science 323.) Formalisms for representing nonmonotonic reasoning and their applications
to AI. Nonmonotonic aspects of commonsense knowledge and reasoning. Default logic, autoepistemic logic, and circumscription. Computational nonmonotonic reasoning. Applications of nonmonotonic formalisms to inheritance systems, to logic programming, and to reasoning about action using the situation calculus. Prerequisite: a basic knowledge of logic such as 160A.

3 units, Win (McCarthy) TTh 11-12:15

346. Seminar in the Philosophy of Action.
3 units, not given 1990-91

371. Graduate Seminar: Competing Conceptions of Property—Private property, public property, state property, dispersed property, and the different theories of human nature which underlie them. Readings: Hayek, Hegel, Schumpeter, Rousseau, and Marx as well as anthropological and sociological literature. Special interests are changing conceptions of what can legitimately be bought and sold.

3 units, Win (Sats) W 3:15-5:05

380B,C. Graduate Seminar on Mind and Action—Research seminars on topics in the philosophy of mind and action. Prerequisite: 280 or permission of instructor.
3 units, Win, Spr (Dretske, Bratman) T 3:15-5:05

390A. Model Theory—(Enroll in Mathematics 290A.) Language and models of the first order predicate calculus. Validity and definability. Complete and decidable theories; applications to algebra. Saturated models, ultraproducts, categoricity in power. Infinitary languages. Prerequisites: 158 and 160A,B, or equivalent.

not given 1990-91

390B. Model Theory—(Enroll in Mathematics 290B.)
not given 1990-91


3 units, Spr (Mason)

393A. Proof Theory—(Enroll in Mathematics 293A.) Gentzen's natural deduction and/or sequential calculi for first order predicate logic. Normalization, cut-elimination procedures. Extensions to infinitary calculi; ordinal complexity of proof trees. Subsystems of analysis and their reduction to constructive theories. Prerequisites: 160A,B and 161, or equivalent.

3 units, Aut (Mints) MW 3:15-4:30

394. Topics in Logic—(Enroll in Mathematics 294.) Categorical structures in natural languages and formal languages, developing a logical theory which brings together ideas for categorial grammar, lambda calculus, linear logic, and dynamic logic. Relevant background from these areas are explained.

3 units, Spr (van Benthem)


3 units, Win (Smith) TTh 1:15-2:30

395B. Philosophy of Cognitive Science—(Same as Symbolic Systems 295.) A foundation analysis of modern cognitive science, emphasizing the role of computation. Topics: traditional symbol manipulation (Fodor, Haugeland, Newell, Pylyshyn, Simon); full-scale critiques (Dreyfus, Searle, Taylor, Winograd); the role of connectionism (Cussins, Fodor, Smolensky); and anti-representationalism (Brooks, Chapman, Dretske, Rosenschein).

3 units (Smith) given 1991-92

3 units, Aut (Etchemendy) Th 10-11:30

450. Thesis.
any quarter (Staff) by arrangement
Emeriti: (Professors) Stanley S. Hanna, Robert Hofstadter, Paul H. Kirkpatrick, David M. Ritson, J. Dirk Walecka
Chairman: Steven Chu
Director of Graduate Study: Robert V. Wagoner
Director of Undergraduate Study: Mason R. Yearian


Associate Professor: Blas Cabrera
Assistant Professors: Bryan W. Lynn, Zein-Eddine Meziani, Peter F. Michelson, Ann E. Nelson (on leave Autumn, Winter, Spring)

Professors (Research): John A. Lipa, Todd I. Smith, John P. Turneaure

Acting Assistant Professors: Sebastian E. Kuhn, Karol Lang, Stavros Theodorakis

Consulting Professors: Bernard Couillaud, Theodor W. Hansch, Marc D. Levenson, Melvin Schwartz, Frank H. Shu

By Courtesy: Peter Galison

OFFERINGS AND FACILITIES

The Russell H. Varian Laboratory of Physics, the adjacent Physics Lecture Hall, and the nearby High Energy Physics Laboratory (HEPL) 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 Graaff accelerator. A 120 MeV superconducting electron linear accelerator is currently available to provide free electron laser radiation. Separate from this group is the Stanford Linear Accelerator Center (SLAC), a high energy physics laboratory which has as its principal tools a two-mile-long 50-GeV electron accelerator and a 6-GeV electron-positron storage ring. Also at SLAC are a 30 GeV electron-positron storage ring (PEP) and the Stanford Synchrotron Radiation Laboratory (SSRL). A new high-energy facility, the Stanford Linear Collider (SLC), provides electron-positron collisions at about 100 GeV in the center of mass.

Professor Yearian is director of HEPL, and Professors Cabrera, Lipa, Michelson, Schwettman, Smith, and Turneaure are on the staff. The staffs of Ginzton Laboratory, SLAC, and SSRL are listed in the "Independent Research Laboratories, Centers, and Institutes" section of this bulletin.

The Physics Library, a center for the reading and study of physics and astronomy at all levels, 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.

Coursework is designed to provide students with a sound foundation in both classical and modern physics. Students who wish to specialize in astronomy, astrophysics, or space science should also consult the "Astronomy Course Program" section in this bulletin.

Three introductory series include laboratories in which undergraduates carry out individual experiences. The Intermediate and Advanced Physics Laboratories offer facilities for increasingly complex individual work. Undergraduates are also encouraged to participate in research; most can do this through the honors program.

Graduate students find opportunities for research in the fields of astrophysics, theoretical physics, low temperature physics, molecular physics, nuclear and atomic collision physics, intermediate energy physics, high energy physics, coherent optical radiation, and condensed matter physics. Opportunities for research are also available with the faculty at SLAC in the areas of theoretical and experimental particle physics and accelerator design and with the faculty in Applied Physics in the areas of astrophysics, theoretical and experimental condensed matter physics, materials research, quantum electronics, photon science, and novel imaging technology.

The number of graduate students admitted to the Physics Department is strictly limited. Students should complete application by January 1 for the following Autumn Quarter. 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. Physics 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

Requirements for the degree of Bachelor of Science in Physics are: Physics 61, 63, 64, 65, 66, 105, 106, 107, 110, 111, 120, 121, 122, 130, 131, 132, 170, 171, 181, 200, 201 and Math. 41, 42, 43, 44, 130, 131, and any one additional math course numbered 100 or higher. Physics 51, 53, 54, 55, 56, and 57 can replace the Physics 60 series requirements. Students who have taken Physics 55 or its equivalent may substitute Physics 135, 167, 172 or 204 for 181. Math. 43H, 44H, and 45H may be substituted for Math. 43, 44, and 130. The department advises the study of some Chemistry, e.g., 31 or 32, 33, and 35; some Computer Science, e.g., 106; 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 taken to satisfy the Physics Department's major requirements cannot be taken on a + /No Credit basis.

Students can follow either of the two course sequences. Sequence I (based on Physics 61, 63, and 65) is preferable for students who have had physics and some calculus in high school. In this sequence, Math. 41 is not required. Sequence II (based on Physics 51, 53, 55, and 57) is mainly for students who have 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. Students who enter the physics program after the freshman year are normally advised to take the Physics 61, 63, 65 sequence, provided they have previously taken Math. 41.

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 should work out, in consultation with their advisors, a program which best fulfills individual aims. The Undergraduate Office of the Physics Department has more detailed information on how to obtain an A.B. 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 permits, by petition, flexibility in the requirements so that the student may fit a period abroad into the program.

### SEQUENCE I

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>A</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 61, 63, 65. Advanced Freshman Physics</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Physics 64, 66. Advanced Freshman Laboratory</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Math. 42, 43, 44. Analytic Geometry, Calculus</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

**FIRST YEAR**

**SECOND YEAR**

| Physics 110, 111. Intermediate Mechanics | 3 | 3 | |
| Physics 105, 106, 107. Intermediate Physics Laboratory, Seminars | 3 | 3 | 3 |
| Physics 120, 121, 122. Intermediate Electricity and Magnetism | 3 | 3 | 3 |
| Math. 130, 131, 132. Ordinary Differential Equations, Partial Differential Equations I and II | 3 | 3 | (3)† |

| Physics 130, 131, 132. Quantum Mechanics | 3 | 3 | 3 |
| Physics 135. Computational Physics | 3** | |
| Physics 181. Optics | 3** | |
| Physics 167. Essential General Relativity | (3)** | |
| Physics 170, 171, 172. Theromodynamics, Kinetic Theory and Introduction to Statistical Mechanics, Physics of Solids | 3 | 3 | (3)** |
| Physics 210, 211, 212. Advanced Mechanics (Particle and Continuum, Nonlinear, Statistical) | (3) | 3 | (3)† |
| Math. 103, 106, or 109. Linear Algebra and Matrix Theory, Complex Variables or Modern Algebra | (3) | 3 | (3)† |

| Physics 200, 201. Advanced Physics Laboratory | 3 | 3 | |
| Physics 220, 221. Classical Electrodynamics | (3) | 3 | (3)† |
| Physics 205. Honors Program | (3) | 3 | 3 | (3)† |

| Physics 204. Senior Seminar in Theoretical Physics | (3) | 3 | 3 |

### SEQUENCE II

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>A</th>
<th>W</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 51, 53. Mechanics, Electricity, Magnetism</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Physics 54. Electricity, Magnetism, Laboratory</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Math. 41, 42, 43. Analytic Geometry and Calculus</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
SECOND YEAR*

Physics 55, 57. Light and Heat, Modern Physics 4 3
Physics 56. Light and Heat Laboratory 1
Physics 110, 111. Intermediate Mechanics 3 3
Math. 44, any additional math course numbered 100 or higher 3 3
Math. 130, 131, 132. Ordinary Differential Equations, Partial Differential Equations 3 3 (3)†

THIRD YEAR*

Physics 105, 106, 107. Intermediate Physics Laboratory Seminars 3 3 3
Physics 120, 121, 122. Intermediate Electricity and Magnetism 3 3 3
Physics 130, 131, 132. Quantum Mechanics 3 3 3
Math. 103, 106 or 109. Linear Algebra, Matrix Theory, Complex Variables, or Modern Algebra (3 3)†

FOURTH YEAR*

Physics 135. Computational Physics (3)**
Physics 170, 171, 172. Thermodynamics, Kinetic Theory and Introduction to Statistical Mechanics, Physics of Solids 3 3 3 (3)**
Physics 167. Essential General Relativity (3)**
Physics 181, 204. Optics. Senior Seminar in Theoretical Physics (3)** (3)**
Physics 200, 201. Advanced Physics Laboratory 3 3
Physics 210, 211. Advanced Mechanics, (Particle and Continuum, Nonlinear) (3 3)†

* Additional elective units must be added to bring the total number of units to 180 as required by the University.
† Not required for the degree in physics.
** Students who have taken Physics 55 or its equivalent may elect to take any one of these five courses (see text).

Undergraduates are offered help with physics problems in the departmental counseling and tutoring center called the "Reference Frame." The center is staffed Monday through Thursday, 9 a.m. to 5 p.m. and 7 p.m. to 9 p.m. and Fridays 9 a.m. to 3:15 p.m.

HONORS PROGRAM

The department offers a program leading to the degree of Bachelor of Science in Physics with Honors:
1. Students should find a physics project, either theoretical or experimental.
2. The student submits a proposal to the honors subcommittee, which decides on its suitability as an honors project.
3. Course credit for the project is assigned by the advisor within the framework of Physics 205.
4. A written report of the work at its completion is required for honors.
5. Before the end of the year, each candidate gives a seminar on his or her work. This seminar is announced publicly and is open to the general audience. The expectation is that the student's advisor, along with all the other honors candidates, will attend the seminar.
6. The decision as to whether a given independent study project does or does not merit award of honors is made jointly by the honors subcommittee and the student's advisor. This decision is based on the quality of both the honors work and the other work in physics.
7. The work done in the honors program may not be used as a substitute for regularly required courses.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The department does not offer a separate program for the M.S. degree, but this degree may be awarded for a portion of the Ph.D. degree work.

University requirements for the master's degree, discussed in the "Degrees" section of this bulletin, include registration for at least three quarters at full tuition as a graduate student and completion of 36 units of coursework after the bachelor's degree. Among the departmental requirements are an average letter grade indicator of at least "B" in courses 200, 201, 210, 211, 212, 220, 221, 230, 231, or their equivalent. Up to 6 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 Ph.D. (residence, dissertation, examination, etc.) are discussed in the "Degrees" section in this bulletin. The minimum departmental requirements for the Ph.D. degree in Physics consist of completing all courses listed below, and at least one quarter from each of two subject areas (among condensed matter, quantum optics and atomic physics, astrophysics and gravitation, nuclear and particle physics) chosen from courses with numbers above 232, except 290, 294, and 330. The requirements in this list may be fulfilled by passing the course at Stanford or passing an equivalent course elsewhere: 200, 201, 210, 211, 212, 220, 221, 230, 231, 252, 290, 294, 330.

All Ph.D. candidates must also take the following mathematics courses or have taken their
equivalent previously: 106, 113, 114, 130, 131, 132. An average letter grade indicator of at least "B" is required in all the courses taken toward the degree.

Prior to making an application for candidacy, each student is required to pass a written comprehensive examination on undergraduate and first-year-graduate physics. This exam is given annually before the start of Autumn Quarter. The examination should be taken at the end of Summer Quarter after the first-year graduate courses have been taken. After completion of the dissertation, each student must take the University oral examination (defense of dissertation). The Physics faculty believes that a scientist should have facility with a foreign language for cultural reasons as well as to establish better contact at meetings in foreign countries.

Three quarters of teaching (plus a demonstrated ability to teach) are a requirement for obtaining the Ph.D. in Physics.

Students 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" section in this bulletin.

Ph.D MINOR

Minors in Physics must take at least six courses numbered 210 to 232 among the 20 required units. All prospective minors must obtain approval of their Physics course program from the Physics Graduate Study Committee at least one year before award of the Ph.D.

The department office has more detailed information on how to obtain an advanced degree in physics and should be consulted by prospective candidates.

FELLOWSHIPS AND ASSISTANTSHIPS

The Physics Department makes an effort to support all its graduate students, through fellowships, teaching assistantships, research assistantships, or a combination of sources. Information on application procedures is mailed with the admission information.

TEACHING CREDENTIALS

For information on teaching credentials, consult the "School of Education" section in 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 those who have a teaching credential and wish 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. A suggested minimum would be Physics 57, 64, 66, 105, 110, 111, 120, 121, and Math. 130, 131. Detailed requirements for the degree are outlined in the "School of Education" section in this bulletin.

COURSES

There are four series of beginning courses, The Ten Series (11, 14, 15, 19) is recommended for the humanitites or social science student who wishes to become familiar with the methodology and content of modern physics. The Twenty Series (21, 22, 23, 24, 25, 26) is recommended for general students and for students preparing for medicine or biology. The Fifty Series (51, 53, 54, 55, 56, 57, 58) is for students of engineering chemistry, geology, mathematics, and some physics majors. The Advanced Freshman Series (61, 63, 64, 65, 66) is for the well-prepared student and is the preferred introductory series for physics majors.

Both the Twenty and Fifty Series consist of 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 is that topics are discussed more thoroughly and treated with greater mathematical rigor in the Fifty Series.

Courses beyond 66 are numbered in accordance with a three-digit code. The first digit indicates the approximate level of the course: undergraduate courses (1); first-year graduate courses (2); more advanced courses (3); research, special or current topics (4). The second digit indicates the general subject matter: laboratory (0); general courses (1), (2), (3); nuclear physics (4); elementary particle physics (5); astrophysics, cosmology, gravitation (6); condensed matter physics (7); optics and atomic physics (8); miscellaneous courses (9).

II. Symmetries of Nature—For humanities and social science students. Concepts of atomic and subatomic physics; 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. (Offered occasionally)

(DR:7) 3 units, not given 1990-91
12. The Nature of the Universe—(Enroll in Applied Physics 15.) (DR:7)
3 units, Win (Staff)

3 units, Win (Schwettman) MWF 10 or 11
Sum (Gillespie) MTWThF 10-12
one-hour discussion by arrangement

24. Electricity and Optics Laboratory—Concurrent or prior registration in 23 is required. Mandatory Satisfactory/No Credit grading.
1 unit, Win (Schwettman) by arrangement
Sum (Gillespie) TW or Th 2:15-5:05

25. Modern Physics—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
one-hour discussion by arrangement

26. Modern Physics Laboratory—Concurrent or prior registration in 25 is required. Mandatory Satisfactory/No Credit grading.
1 unit, Spr (Little) by arrangement

3 units, Aut (Petrosian)

51. Mechanics—Vectors, particle kinematics and dynamics, work, energy, momentum, angular momentum; conservation laws; rigid bodies, oscillations. Discussions based on use of calculus. Prerequisites: Math. 20 or 41 and continuation in Math. 42, or consent of instructor. (DR:7)
4 units, Win (Dimopoulos) MWF 9 or 11
discussions by arrangement

53. Electricity and Magnetism—Electric charges and currents, electric and magnetic fields, capacitance, inductance, resistance. Maxwell’s equations, electromagnetic oscillations and waves. Prerequisites: 51 and Math. 21 or 42, or consent of instructor. (DR:7)
4 units, Win (Dimopoulos) lec MWF 9 or 11
discussions by arrangement

54. Electricity and Magnetism Laboratory—Concurrent or prior registration in 53 is required. Mandatory Satisfactory/No Credit grading.
1 unit, Spr (Michelson) 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. Prereq-
uisites: 53 and Math. 23 or 43, or consent of instructor. (DR:7)
4 units, Aut (Osheroff) lec MWF 9 or 10 discussion by arrangement

56. Light and Heat Laboratory—Concurrent or prior registration in 55 is required. Mandatory Satisfactory/No Credit grading.
1 unit, Aut (Osheroff) by arrangement

57. Modern Physics—Relativity, experimental basis of quantum theory, Schrödinger equation, atomic structure, nuclear structure, high energy physics, elementary particles. Prerequisite: 55 (DR:7)
3 units, Win (Jaros) TTh 11-12:15

58. Modern Physics Laboratory—Concurrent or prior registration in 57 is required. Mandatory Satisfactory/No Credit grading.
1 unit, Win (Jaros) by arrangement

61,63,65. Advanced Freshman Physics—Fundamental structure of classical physics including Newtonian mechanics, special relativity and electricity and magnetism; selected topics in heat and light in Spring Quarter. Lectures and small discussion sections. Recommended for students contemplating a major in Physics and other students interested in a more rigorous treatment of physics. Prerequisites: high school physics and familiarity with calculus (differentiation and integration in one variable); prior or concurrent registration in Math. 42. Physics 61, 63, and 65 are all (DR:7)

61. 4 units, Aut (Cabrera) TTh 9-10:50
63. 4 units, Win (Spooner) TTh 9-10:50
65. 4 units, Spr (Spooner) TTh 9-10:50


64. 1 unit, Win (Spooner) by arrangement
66. 1 unit, Spr (Spooner) by arrangement

105,106,107. Intermediate Physics Laboratory Seminars—Year-long series of mini-courses in experimental techniques. Required of all Physics majors. Two to eight weeks depending on subject matter. Must be taken in sequence. Each of the series schedules a one-hour weekly lecture, usually Friday noon. Topics: electronics, detectors and radioactive sources, optics and lasers, statistics and data handling, microwaves, low temperatures and computer interfacing. 105, 106, and 107 are required for all Physics majors. Prerequisites: 54 and 56, or 64 and 66; concurrent registration in the 120 series.

105. Laboratory Seminar I: Electronics—(DR:8)
3 units, Aut (Lang) by arrangement

106. Laboratory Seminar II.
3 units, Win (Osheroff) by arrangement

107. Laboratory Seminar III.
3 units, Spr (Schawlow) by arrangement

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 or 61, and Math. 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 or 63 and prior or concurrent registration in 110; concurrent or prior registration in Math. 130 or 131 with Physics 120 and 121, respectively. Recommended: concurrent or prior registration in Math. 101.

120. 3 units, Aut (Kuhn) MWF 11
121. 3 units, Win (Kuhn) MWF 11
122. 3 units, Spr (Kuhn) 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. Reference to problems in atomic and nuclear physics explaining the basic phenomenology of these disciplines. Invariance principles and conservation laws in the context of quantum theory. Prerequisites: 57 or equivalent and 110, 111; concurrent or prior registration in 120, 121, 122, and Math. 130, 131.

130. 3 units, Aut (Meziani) TTh 1:15-2:30
131. 3 units, Win (Meziani) TTh 1:15-2:30
132. 3 units, Spr (Meziani) TTh 1:15-2:30

135. Computational Physics—Development of computational methods with application to
problems in classical dynamics, electrodynamics, quantum mechanics, and statistical mechanics. Numerical integration; solution of ordinary differential equations including the Runge-Kutta method; solutions of the heat equation and Poisson's equation with relaxation methods, etc.; Monte Carlo methods; matrix methods and eigenvalue problems. Prerequisites: 110, 111, 120; concurrent or prior registration in 121, 122, 130, 131, 132, and Math. 130, 131; knowledge of Fortran, Basic or C.

3 units, Spr (Cabrera) by arrangement

160. Introduction to Stellar and Galactic Astrophysics—(Enroll in Applied Physics 160.) 3 units, Aut (Staff)

161. Introduction to Extragalactic Astrophysics and Cosmology—(Enroll in Applied Physics 161.) 3 units, Win (Staff)

167. Essential General Relativity—Mathematical development emphasizes the component tensor calculus rather than the abstract differentiable manifold approach. Cosmological solutions are obtained and discussed. Prerequisites: 111, 120, Math. 131.

3 units, Win (Michelson)

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 Math. 130.

3 units, Aut (Kapitulnik) MWF 9

171. 3 units, Win (Kapitulnik) MWF 9


3 units, Spr (Beasley) MWF 9

181. 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.

3 units, Aut (Little) MWF 11

190. Independent Study—Experimental or theoretical physics under supervision of a faculty member. Prerequisites: superior work as an undergraduate physics major; approval of the instructor and of the Undergraduate Study Committee of the department.

any quarter (Staff) by arrangement

198. History and Philosophy of 20th-Century Physics—(Enroll in History of Science 168, Philosophy 168, VTSS 126.) 5 units, Win (Galison) TTh 11-12:15

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 the senior year and 201 no later than Winter Quarter. Prerequisites: 105, 121, and 131.

200. 3 units, Aut, Win (Meyerhof)

Spr (Hulskotter) by arrangement

201. 3 units, Aut, Win (Meyerhof)

Spr (Hulskotter) by arrangement

204. Senior Seminar in Theoretical Physics—Topics of recent interest in theoretical physics: string theory, supersymmetry, inflationary cosmology, chaos, and others. Work in the seminar may provide a basis for an honors project in theoretical physics. Prerequisite: 132 or permission of the instructor.

3 units, Spr (Susskind) by arrangement

205. Honors Program—Experimental or theoretical 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. Planning of the thesis project should begin no later than middle of the junior year.

1-3 units, Aut, Win, Spr (Yearian) Sum (Staff)

207, 208. Laboratory Electronics—(Enroll in Applied Physics 207, 208.) Prerequisite: some undergraduate level device and circuit exposure.

207. 3 units, Win (Fox)

208. 3 units, Spr (Fox)

ticity, (waves) and heat conduction. Prerequisite: 111 and 122.

3 units, Aut (Wagoner) MW 9:30-10:50

211. Nonlinear Mechanics—Examples from fluid mechanics (instabilities, turbulence, etc.) and other fields are provided as a physical background. Simple nonlinear mathematical models analyzed. Emphasis on phase-plane analyses, attractors, and transition to chaos. Prerequisite: 210.

3 units, Win (Wagoner) MW 9:30-10:50


3 units, Spr (Fetter) MWF 9


220. 3 units, Aut (Susskind) MW 1:15-2:30
221. 3 units, Win (Susskind) MW 1:15-2:30


230. 3 units, Aut (Theodorakis) MWF 11
231. 3 units, Win (Theodorakis) MWF 11
232. 3 units, Spr (Theodorakis) MWF 11

242. Introduction to 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.

3 units (Hanna) not given 1990-91


3 units, Spr (Burke)

262. Introduction to Gravitation and Astrophysics—Tensor analysis: special relativity, the energy-momentum tensor, and curvature. Einstein's equations: weak fields, tests, spherically-symmetric solutions, gravitational waves. Cosmology, black holes, stellar structure, and other topics in astrophysics. Prerequisites: 210, 211, 221.

3 units, Spr (Wagoner) TTh 9:30-10:50


3 units, Spr (Harrison)


3 units, Aut (Harrison)

274. Electronic Structure—(Enroll in Applied Physics 274.)

3 units, Win (Harrison)


3 units, Spr (Kapitulnik)

290. Research Activities at Stanford—Review of research activities in the department and elsewhere at Stanford at a level suitable for en-
293. Literature of Physics—Intensive study of literature of any special topic. Preparation, presentation of reports. 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 required.

Any quarter (Staff) by arrangement

294. Teaching of Physics—Techniques of teaching physics by means of lectures and laboratories. Registration required of all teaching assistants in Physics.

0-3 units, Aut (Jacobs)

312,313. Basic Plasma Physics I and II—(Enroll in Applied Physics 312 and 313.)

Alternate years, not given 1991-92

312. 3 units, Win (Sturrock)

313. 3 units, Spr (Sturrock)


3 units, Spr (Lathrop)

320. Quantum Optics and Selected Topics in Atomic Physics—Quantization of the electromagnetic field, photon states, and vacuum fluctuations and atomic transitions of real atoms. Two-level atoms, the optical Bloch Equations, dressed states, coherent transients, resonance fluorescence, laser cooling and trapping of atoms and ions, tests of quantum mechanics and Bell’s Theorem, photon statistics, coherence, antibunching, squeezed states, and parity non-conservation and time-reversal invariance tests in atomic physics.

3 units (Staff)

Alternate years, given 1991-92


3 units, Aut (Levenson) MWF 2:15

322. Bound States and High Precision Tests of QED and Electroweak Unification—Relativistic effects, configuration mixing, multiple-photon transitions, parity nonconservation in atoms, atomic electric dipole movements, high-Z (overcritical) atoms, cavity quantum electrodynamics, quantum theory of measurement, Bell’s theorem and photon polarization correlation experiments, Bethe-Salpeter equation. Lamb shift, hyperfine splitting, positronium and muonium structure and decay, precision tests of quantum electrodynamics, electroweak effects in atoms. Prerequisites: 320, 321.

3 units, Spr (Lynn)

Alternate years, not given 1991-92

324,325. Physics of Particle Accelerators—(Enroll in Applied Physics 324, 325.)

3 units (Staff)

Alternate years, given 1991-92

326. Microwave Linear Accelerator—(Enroll in Applied Physics 326.)

3 units, Spr (Miller, Wilson)


330. 3 units, Aut (Lynn) MW 11-12:30

331. 3 units, Win (Lynn) MW 11-12:30

332. 3 units, Spr (Dimopoulos) MW 11-12:30

351,352. Elementary Particle Physics—Phenomena of elementary particle interactions, and their theoretical interpretation. Winter: introduction to the Standard model—features of high-energy interactions of hadrons; deeply inelastic lepton-hadron scattering; structure functions; the parton model; QCD, gluons and scaling violations; jets and quark fragmentation in pp and $e^+e^-$ annihilation to hadrons; radiative corrections in QED and QCD; running coupling constants; experimental measurements of the strong coupling; Monte Carlo techniques. Spring: Hadron spectroscopy in the static quark model; properties of heavy quarks and quarkonium systems. Weak interactions: muon, pion, and beta decay; weak mixing angles; the $K_l$-$K_S$ system on CP violation; charged and neutral
current neutrino scattering; the standard model of electroweak interactions; determinations of $\sin^2(\theta_W)$; properties of W and Z bosons; gauge symmetries and the Higgs mechanism; properties of Higgs particles. Introduction to topics beyond the standard model: grand unification, proton decay, supersymmetry. Prerequisite: 330.

351. 3 units, Win (Wojdcki) not given 1991-92

352. 3 units, Spr (Swartz) MWF 9-10

360. Stellar Physics—(Enroll in Applied Physics 360.)
3 units, alternate years, given 1991-92

3 units (Staff) alternate years, given 1991-92

3 units (Staff) alternate years, given 1991-92


3 units, Win (Staff) not given 1991-92

365. Extragalactic Astrophysics and Cosmology—(Enroll in Applied Physics 365.)
3 units (Petrosian) alternate years, given 1991-92


3 units, Win (Doniach) TTh 1:15-2:30


3 units, Spr (Laughlin) alternate years, not given 1991-92

383. Introduction to Atomic Processes—(Enroll in Applied Physics 383.)
3 units, Aut (Harris) alternate years, not given 1991-92

450. 451, 452. Theoretical Physics of Particles and Fields—Advanced topics in theoretical high-energy physics. Topics change quarterly and each year to survey the elements of formalism needed for theoretical research. Topics for Autumn: particle physics and cosmology. Winter: Theory of Anomalies, superstring theory. Spring: supersymmetry, supergravity, superstrings. Prerequisite: 332.

450. 3 units, Aut (Dixon)
451. 3 units, Win (Peskin)
452. 3 units, Spr (Staff)

453B,C, Special Topics in Elementary Particle Physics.
453B. 3 units, Win (Kallosh)
453C. 3 units, Spr (Linde)

470,471. Seminar in Condensed Matter Physics—Reviews key discoveries in condensed matter physics in the past 15 years, with emphasis on experiment. Topics: sliding charge density waves in layer compounds, the first pressure-induced Mott transition, the first organic superconductor, the discovery of superfluid 3He, quasicrystals, the Sharvin effect, the quantum hall effect, and re-entrant superconductivity. Journal club format, with presentations by students on assigned topics.

470. 3 units, Aut (Laughlin) MW 12:45-2:05
471. 3 units, Win (Laughlin) MW 12:45-2:05

473A. 3 units, Win (Huberman)
473B. 3 units, Aut (Doniach)

490. Research Orientation—Familiarizes students with activities of one or more research groups, within the department or outside. Registration limited to one quarter per research group with overall limitation of two quarters. Prerequisite: consent of student's advisor.

any quarter (Staff) by arrangement

491. Research—Work is in experimental or theoretical problems in research, as distinguished from independent study of non-research character in 190 and 293. Open only to graduate physics major students, with consent of instructor. If taken under the supervision of a faculty member outside the department, Physics Graduate Study Committee approval required.

any quarter (Staff) by arrangement
Undergraduate Programs
Bachelor of Arts

A total of 60 units is required for the degree of Bachelor of Arts in Political Science. These are composed of:

1. Completion of 45 units of political science which must include at least one advanced course in three different areas chosen from:
   a) Public administration and public policy (100-109, 200-209);
   b) Comparative Politics (110-129, 210-229);
   c) International Relations (130-149, 230-249);
   d) Political Theory (150-169, 250-269);
   e) American Politics (170-198, 270-298);
   (Introductory courses numbered below 100 do not fulfill a field distribution requirement but do count toward the 45-unit total.)

2. Completion of at least one seminar.

3. Completion of an additional 15 units which may be in political science (including honors thesis work), or may be in another department which relates in a direct way to the student's interest within political science.

Directed reading, although numbered above 100, may not be used to fulfill the distribution requirement. No more than 10 units of directed reading may be counted toward the 45 units of political science.

No more than 20 units of political science transfer work may be counted toward the total of 45 units of political science.

Courses used to fulfill the major requirements must be taken for the standard letter grade, although units in excess of the required 60 may be taken Satisfactory/No Credit.

Public Policy Emphasis

The student who wishes to receive an A.B. degree with a focus on public policy may choose the "public policy concentration" within the political science major. This program introduces the student to political and economic institutions and processes, analytical techniques, and to substantive courses in public policy. For further information, consult with the Chair of Undergraduate Studies in Political Science.

Prizes

There are three annual prizes for undergraduate students—the Edwin A. Cottrell Memorial Prize for the best student in Political Science, 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.

Honors Thesis Program

This program offers qualified students an opportunity to conduct independent research, and to write a thesis of superior quality summarizing the results of their research. It 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 through the process of research, analysis, drafting, rethinking, and redrafting 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. 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 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 then approved by the Director of Undergraduate Studies, who supervises the program. Normally, the thesis advisor is a faculty member with whom the student has already worked. Normally, too, students enroll in the program by the Autumn Quarter of the senior year and have at least a letter grade indicator (LGI) of 3.3 in political science courses when they apply.

The program is based on the assumption that good writing takes time. Students are, therefore, strongly discouraged from attempting to complete an honors thesis in less than two quarters. While details are always worked out on an individual basis between students and thesis advisors, the following patterns are typical: (1) If a student already has substantial background on the thesis topic, the honors thesis program can be completed in two or three quarters (for a total of 10-15 units). (2) If a student has done little or no previous work on the topic, but the thesis advisor believes that the proposed project is viable, then the honors thesis program should be spread over three quarters (for a maximum of 15 units).

Successful completion of Honors in Political Science requires (1) completion of all requirements for the major and (2) successful completion of a thesis of honors quality (LGI of "B" or better). Honors work done for credit (Political Science 199) may not be counted toward the required 45 units in political science but may be counted as all or part of the additional 15 units which relate to the student's interest in political science.

GRADUATE PROGRAMS

Admission—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 General Test of the Graduate Record Examination. Applicants whose native language is not English must take the Test of English as a Foreign Language (TOEFL). The TOEFL requirement is waived for applicants who have recently completed two or more years of study in an English-speaking country. The Test of Spoken English (TSE) is also mandatory. For details concerning these tests see “Guide to Graduate Admission.” The application deadline is January 1. 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 A.M. 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 university's professional schools. The student should apply for admission to the A.M. program in Political Science during Autumn Quarter of the first year in the Stanford professional school.

Terminal A.M. students, and doctoral candidates who wish to apply, are awarded the A.M. degree when they have met the following requirements: completion of at least three quarters of residency as a graduate student, with 45 units of credit, of which at least 25 units must be taken in political science 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 10 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 letter grade indicator 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 coterminous bachelor's and master's degree program.

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 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 program
requirements are outlined in the “School of Education” section in this bulletin.

**DOCTOR OF PHILOSOPHY**

The University’s basic requirements for the Ph.D. degree are discussed in the “Degrees” section of this bulletin.

Programs of study leading to the Ph.D. degree are designed by the student, in consultation with 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 is recommended to the University Committee on Graduate Studies to receive the Ph.D. degree in Political Science when the following program of study has been completed:

1. The candidate for the Ph.D. degree must offer three of the following fields of political science: American politics, comparative politics, international relations, political theory, and public organizations. Upon petition a special field, e.g., public law, urban politics, or methodology, may be offered as a third field. Students concentrate on two of these fields by fulfilling, depending on the field, combinations of the following: written qualifying examinations, research papers, research design, coursework. The requirement for the third field may be satisfied by taking either a written examination in that field or by offering a minimum of 10 units with a letter grade indicator (LGI) of “B” or better in the third field from among the formal graduate level courses in the five divisions of the department. The third field cannot be satisfied by courses taken as a requirement for a first or second field. A third field in theory requires two courses in addition to the 5 units necessary to fulfill the program requirement. A third field in methodology requires two courses in addition to the two core courses offered by the department.

2. The Ph.D. candidate is required to demonstrate competence in a language and/or skill that is likely to be relevant to the 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 is determined by the student’s advisor. 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 must take 5 quarter units of graduate instruction in political theory.

4. All candidates must complete 5 units of statistical methods or its equivalent. Students who are in the field of International Relations, American Politics, or Public Organizations are required to take an additional 5 units of methods. Previous instruction can be counted towards this requirement only if approved by the Director of Graduate Studies.

5. By the end of the third quarter in residence, each first-year graduate student submits to the student’s advisor a statement of purpose. This statement indicates 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/or research papers, and, where possible, dissertation ideas or plans. This statement is discussed with, and must be approved by, the student’s advisor. In the September following completion of their first year, students are reviewed at a regular meeting of the department faculty. 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.

6. When both the student and advisor feel that the student is ready, he or she takes one or two comprehensive examinations or completes one or two research papers, depending on the fields chosen. Comprehensive examinations are offered at the discretion of the faculty. If scheduled, they are given in the third week of Autumn and Winter Quarters, and late in Spring Quarter. Students should normally expect to complete these examinations and papers by the end of their second year.

7. During the sixth quarter, and upon completion of three out of four of the field requirements in his/her two major fields, the student files an Application for Admission to Candidacy for the Ph.D. which details program plans and records. This document, along with a student’s examination performance, is reviewed by the faculty at a regular
meeting. If it is approved, the student is advanced to candidacy.

8. During the third year, a formal dissertation proposal is submitted by the student to a thesis committee of three faculty members, including the principal advisor.

9. A candidate for the Ph.D. in Political Science must serve as a teaching assistant (TA) in the department for three quarters. The student normally begins serving as a TA after the sixth quarter and completes service as a TA by the end of the ninth quarter.

10. Doctoral candidates who apply for the A.M. degree are awarded that degree upon completion of the requirements outlined in the description of the A.M. program.

11. The candidate must 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.

12. The candidate must complete a dissertation satisfactory to the Dissertation Reading Committee and the University Committee on Graduate Studies.

**Ph.D. MINOR**

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 an LGI of "B" or better. Candidates are 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.

**COURSES**

**SUMMER QUARTER**—During 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.

The department uses the following course numbering system:

- **1-99 Introductory Courses**
- **100-199 Advanced Courses and Undergraduate Seminars** (at the instructor's discretion, graduate students may enroll and be given graduate credit when additional work is assigned and the appropriate department Graduate Credit Authorization form is completed)
- **200-299 Graduate-Undergraduate Seminars** (principally for graduate students; at the instructor's discretion, undergraduates may be admitted)
- **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 quarterly Time Schedule for up-to-date information.

**INTRODUCTORY**

1. **Major Issues of American Public Policy**—Alternative public policies in selected areas, including control of monopoly, poverty, foreign policy. Political process: influence of cultural, economic, and political factors and the location of political power on determination of public policy. (DR:5)

   5 units, Aut, Win (Marshall)

10. **American National Government**—Critical thinking about American politics and government by comparing class and pluralist explanations of the national system. (DR:5)

   5 units, Win (Manley)

20. **Introduction to Comparative Politics**—Introduction to basic concepts and theories of comparative politics (Marxist, Weberian, and Structural Functionalist) and to the major types of political systems: liberal democratic, communist, authoritarian. Countries studied: Britain, France, U.S.S.R., China, and Mexico.

   5 units, Spr (Halpern)

22. **The World Outside the West in the Age of European Imperialism**—(Same as Anthropology 22, History 22.) Confrontation and accommodation as non-European societies respond to Western Europeans, and to Western institutions and ideas, from the 19th century to the present. Changes in production and trade, in social and political structures, and in religious and ethical values in Egypt, Japan, and Nigeria. Recommended: Anthropology/History 21. (DR:5; also satisfies Area 3 when taken in sequence with Anthropology 21, History 21.)

   6 units, Win (Abernethy, Befu, Beinin)
25. Colonialism and Nationalism in the Third World—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 (Abernethy) given 1991-92

35. International Politics—Approaches to the study of world politics including realism, Marxism, and bureaucratic politics. WWI, the nuclear arms race, and international economic relations, and the normative and policy implications of different theories. (DR:5)
5 units, Aut (Krasner)

50. The Idea of Freedom in Western Political Thought—Introductory survey of political thought since Machiavelli and the Reformation, emphasizing the major conceptions of freedom and the conditions of the development of political and social freedom.
5 units, Win (Drekmeier)

51D. Introduction to Political Philosophy—(Same as Philosophy 30, Public Policy 103B.) The concepts of equality, justice, tolerance, liberty, utility, and rights approached through a close study of major works in political philosophy. Each work presents a distinct and systematic conception of human nature and of the social and economic conditions of a just association which expresses that nature. Readings: Hobbes, Locke, Mill, Marx, Rawls, and Nozick. (DR:3)
5 units, Aut (Hampshire)

60. The American Dream—The history of the American dream as experienced by women, African-Americans, labor, and immigrants. (DR:5)
5 units, Spr (Brady)

101. Political Analysis—(Same as Business 338.) Introduction to some ideas used in the analysis of political processes: rational actors, information, cognitive analysis of choice.
5 units (Bendor) given 1991-92

101P. Politics and Public Policy—(Same as Public Policy 101, Urban Studies 132.) Overview of the domestic policy-making process. Prerequisite: 10.
5 units, Spr (Brady)

106M. Bureaucratic Politics—Introduction to the organization, activity, and performance of public bureaucracy. Topics: presidential and congressional control, interest group influence, budgetary politics, and bureaucratic routines.
5 units, Win (Moe)

5 units, Aut (March) MF or TTh 9

108. Organizational Leadership—(Same as Sociology 165, Business 379.) Problems of leadership in complex organizations: universities, schools, hospitals, business firms, armies, and public bureaucracies. Attention to the role of major executives.
5 units (March) given 1991-92

109. Directed Reading/Research in Public Administration—Advanced individual study in public administration.
any quarter (Staff) by arrangement

ADVANCED UNDERGRADUATE

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 consent of instructor. They are intended for juniors and seniors, but may admit graduate students. Sign-up sheets for undergraduate seminars are posted in the department office at class list sign-up time. Undergraduates should also consider the graduate-undergraduate seminars, numbered 200-299, in the next section.

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.

101. Political Analysis—(Same as Business 338.) Introduction to some ideas used in the analysis of political processes: rational actors, information, cognitive analysis of choice.
5 units (Bendor) given 1991-92

101P. Politics and Public Policy—(Same as Public Policy 101, Urban Studies 132.) Overview of the domestic policy-making process. Prerequisite: 10.
5 units, Spr (Brady)

106M. Bureaucratic Politics—Introduction to the organization, activity, and performance of public bureaucracy. Topics: presidential and congressional control, interest group influence, budgetary politics, and bureaucratic routines.
5 units, Win (Moe)

5 units, Aut (March) MF or TTh 9

108. Organizational Leadership—(Same as Sociology 165, Business 379.) Problems of leadership in complex organizations: universities, schools, hospitals, business firms, armies, and public bureaucracies. Attention to the role of major executives.
5 units (March) given 1991-92

109. Directed Reading/Research 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 coursework in more than one country or region.
112D. Readings in Political Science and International Relations in German—(Same as German Studies 52D.) For students with a knowledge of German (one year or equivalent) who want to acquire reading proficiency in various disciplines. Reading materials include excerpts from scholarly works and professional journals. Students may introduce material they need to read for their coursework or research. Open to undergraduate and graduate students.

3-4 units, Aut (Lohnes)

112M. Modern British Politics—Introduction to the government and politics of the United Kingdom. Attention to areas difficult to understand from an American perspective, e.g., the problem of Northern Ireland and the lack of a written constitution. Also, recent work in political economy and public choice.

5 units, Aut (McLean)

113A. Politics and Development in Latin America—Survey of the major political systems in Latin America (normally Brazil, Mexico, Cuba, and Argentina), the patterns of economic and social development associated with them, and their historical and international contexts. (DR:5)*

5 units, Spr (Packenham)


5 units, Spr (Packenham)

114K. The Political Economy of Development—Introduction to major theories of political development, emphasizing interplay between economic and political processes, and national and international factors from Latin America, and also Africa and Asia. Cases include Brazil, China, Cuba, El Salvador, India, Taiwan, Nigeria, and Venezuela (DR:5)

5 units, Aut (Okimoto) given 1991-92

115. Politics in the People's Republic of China—Introduction to politics in China: the historical background of the communist revolution; post-1949 political development; and selected topics— institutions, ideology, policy-making process, and state-society relations. (DR:5)*

5 units, Aut (Halpern)

116A. European Politics and Society (I)—First of a two-quarter series introducing the diversity and complexity in European politics from the 16th century to WWI: Italian city-states and Cantonal Switzerland to Republican France, the German Reich, and British constitutional monarchy. Emphasis on the interrelated processes of capitalist development, nation-building, state formation, and democratization. The state: how this form of political organization emerged in Western Europe and how the system of unequal competing states conditioned economic, social, and political outcomes up to its collapse in WWI. Substantial reading required. Useful for those taking Stanford Overseas courses in Europe. (DR:5)

5 units (Schmitter) given 1992-93

116B. European Politics and Society (II)—The rebuilding of bourgeois Europe and the rise of Fascism and National-Socialism following WWI, and national reconstruction and regional integration in the aftermath of WWII. Emphasis on the rise of the modern welfare state and its consequences. Substantial reading required. Useful for those taking Stanford Overseas courses in Europe. Recommended: 118A. (DR:5)

5 units (Schmitter) given 1992-93

116C. The Integration of Europe—Analysis of efforts reducing national barriers to trade and investment, promoting social exchange and geographic mobility, and creating common institutions and supra-national authorities in Europe since the 1950s. Emphasis on the European Coal and Steel Community, the European Economic Community, the European Free Trade Association, and to the recent commitment to "complete Europe's Internal Market" by 1992. Lectures/discussion sections. Computer-assisted instruction introduces students to quantitative analysis of data on the unity and diversity of European countries.

5 units, Aut (Schmitter)

116L. The Social Foundations of Democracy—(Same as Sociology 146.) Social, cultural, political, economic, and international factors favorable to the development and consolidation of democracy in historical and comparative perspective. Attention to worldwide development and re-emergence of democracy in the past decade. Case studies of individual country experiences with democracy.

5 units (Lipset) given 1991-92

117A, B. Eastern Europe in Transition—Analyzes the social, political, and economic development of E. European societies since 1945. Hungary is focus and serves as reference for the analysis of similar and contrasting developments in Poland and Czechoslovakia, the Soviet Union, and other E. European countries.

117A. 5 units, Win (Hankiss)

117B. 5 units, Spr (Hankiss)

118A. Political Change in Tropical Africa—The colonial situation, growth of nationalism, achievement of political independence, ethnic patterns in new states, civilian and military leadership, role of party and bureaucracy, problems in stimulating economic development, and cases
of cooperation and conflict among African states. (DR:5*)

5 units, Spr (Abernethy)

118B. Politics of Race and Class in Southern Africa—The political history of the region’s 10 countries, emphasizing relations among racial and ethnic groups. Diplomatic, economic, and military interactions among these states. The impact of movements, corporations, and international organizations based outside the region. Attention to domestic politics and foreign policy of South Africa. (DR:5*)

5 units (Abernethy) given 1991-92

119A. 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. (DR:5)

5 units, Spr (Dallin)

121W. Seminar: Politics, Literature, and Film in Germany—Writers and filmmakers reveal different aspects of politics and social change, and provide new and often startling interpretations. Uses (in English translation) novels by Grass, Böll, Wolf, Lenz, Heym, and others, and contemporary German films, to analyze key political issues in both German states: the legacy of the past; the changing role of women; and challenges to secular and religious authority.

5 units, Spr (Weiler)

122G. Problems in Contemporary European Politics—Analysis of two issues of fundamental importance in contemporary W. European politics: (1) political responses to economic decline and the balance of power between Left and Right—Thatcherism, Mitterrand’s socialist experiment, and the decline (?) of Scandinavian social democracy, and (2) the politics of economic integration and the European free market of 1992—the tensions between domestic politics, the dynamics of the European Community, and broader international competition (the U.S. and E. Asia).

5 units, Win (Garrett)

122M. Seminar: The Theory of Voting in Comparative Perspective—Examines possibilities for creating electoral systems that are truly democratic. What does democracy mean? Can it be achieved through electoral procedures? What are the political consequences of different electoral laws? Contemporary cases drawn from across the democratic countries.

5 units, Win (McLean)

123P. Seminar: Dominance, Subordination, and the Politics of the Peasantry in Colonial India—

(Same as History 286S, Anthropology 213.) The domination of the peasantry and forms of peasant politics studied through secondary and primary texts. The invariables of “peasant insurgency.” Official, nationalist, and judicial discourse on peasant political action. Insurgency as a “semiotic break,” rumor as carrier of belief and as subversive trigger, the production of judicial truths and the construction of the testimony of peasant rioters in courts of law. The relationship between popular religion and “message” of Mahatma Gandhi. The structure and process of small-peasant production. Open to Anthropology, History, and Political Science majors. Recommended: familiarity with peasant society, traditions of pre-industrial protest, and the reading of documents as texts.

5 units, Win (Amin)

124. Seminar: Latin American Dependency—Basic concepts and theoretical frameworks, single country case studies, and research and political strategies regarding dependency and development in Latin America.

5 units, Win (Packenham)

125. Seminar: Rise of Industrial Asia—(Same as Economics 130, VTSS 152.) Interdisciplinary seminar on the political, economic, security, social, and cultural aspects of industrial development and change in Asia as a region. Enrollment limited to 15. Prerequisite: consent of instructors.

5 units, Aut (Okimoto, Lewis, Staff)

126F. Seminar: Politics and the Novel—Examination of “realist” 20th-century works of fiction that deal with key political issues of our time. American and European novels are read with a view to understanding the conditions which produced them and their impact. Open only to juniors and seniors. Preference given to Political Science and International Relations majors.

5 units, Spr (Fagen)

126K. Seminar: The United States and Central America—The crisis of development in Central America and the challenge it poses for U.S. policy towards Latin America. Emphasis on the historic roots of the crisis and the emergence of specific policy dilemmas in the issue areas of democratization, national security, and human rights.

5 units, Spr (Karl)

127F. Seminar: Approaches to the Holocaust—Through reading and discussing memoirs, fiction, poetry, drama, social science, seminar attempts a fuller understanding of the Holocaust. Readings highlight the human beings and the choices involved, for victims, perpetrators, and
bystanders. Students and former students in Stanford's program in Krakow, Poland given preference.

5 units, Win (Eagen)

128R. Seminar: Development and Human Rights in Latin America—Overview of current social and economic situation of Latin America, emphasizing issues of ethnic conflict and indigenous rights. Topics: urbanization, agrarian problems, the authoritarian state, indigenous movements, and the demise of traditional politics.

5 units, Aut (Stagenhaven)

129. Directed Reading/Research 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, International Politics. While not a formal prerequisite for many of the courses listed below, 35 provides a desirable background for more advanced work.

The courses in international relations offered by the Political Science Department can 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 in this bulletin, which lists international relations courses in other departments.

132D. Political and Ethical Aspects of Foreign Aid—General and case study materials examine the characteristics of bilateral and multilateral "official development assistance"; trends in its volume and composition; the complex relationship between aid providers and recipients; ethical problems posed in the allocation, monitoring, and evaluation of development assistance; international disaster relief operations.

5 units, Spr (Abernethy)

133. Peace Studies—(Same as Psychology 142, Sociology 108, VTSS 143.) Interdisciplinary, dealing with the challenges of pursuing peace in a world where the sources of conflict are many and regional/ethnic/religious antagonisms are rising. Creating and maintaining peace is analyzed from historical, social, psychological, and moral perspectives. The nature of peace and peaceful processes (e.g., historical and political perspectives, questions of harmony and aggression at different social levels, and feminist analyses). Peace at the operational level (e.g., social-psychological analyses, studies of bureaucracy, theories of structural violence, analyses of the defense economy and economic conversion, and the making of Renemies). Peace-moral and normative considerations (e.g., pacifism and its critics, studies of moral disengagement and of concepts of responsibility). Hopeful developments and important successes.

5 units, Spr (Drekmeier, Bernstein, Ross, Moses, Bland, Dornbusch)


(DR:5)

5 units (Sagan) given 1991-92

134P. The Role of Technology in National Security—(Same as Engineering-Economic Systems 170.) Examines critical decisions made by the U.S. including development of the A- and H-bomb, the crash development of the ICBM and SLBM after Sputnik, the decisions made in the wake of the energy crisis in the 70s, the space program, and current issues, e.g., high-density TV, the human genome project, and the SDI program. Also, briefly, how decisions to develop the A- and H-bombs were made in the U.S.S.R. and China, and comparison of the role of the U.S. and Soviet governments in their respective space programs. Focus: the process by which technical issues are synthesized into the decision process, and how they are explicated for the policymaker with no background in technology; the role of technical agencies, governmental committees, and science advisory boards and the way these groups interact to bring a broad spectrum of informed advice to the senior policymaker. Guest specialists from business, technological, and government areas provide key lectures.

3 units, Aut (Perry) MW 4:15-5:30

136. Soviet Foreign Policy—(Same as History 122B.) Foreign and domestic determinants of policy; intentions and capabilities; continuity and change since 1917; institutions and personnel, war and peace; perceptions, priorities, and attitudes; alternative futures. (DR:5)

5 units, Win (Dallin)
138A. Arms Control and Disarmament—(Same as VTSS 154A.) Introductory survey of international security relations since 1945, from the breakdown of the WWII alliance through recent political and military changes in the Soviet Union, Europe, and Asia. Lectures on development of nuclear weapons, arms competition, and efforts at arms control and disarmament in post-WWII period. Stresses political, technological, and conceptual problems of security policies and arms control.

5 units, Win (Lewis) MTWThF 1:15

138B. Seminar: Arms Control—(Same as VTSS 154B.)
5 units, Spr (Lewis)

139. Seminar: Chinese Foreign Policy—Chinese foreign policy and its sources: historical, ideological, strategic, political, economic, and the decision making process. Relations with the two superpowers and the Third World. Crisis behavior. Prerequisite: 115 or equivalent or permission of the instructor.

5 units, Win (Halpern)

139A. Japanese Foreign Policy—Analysis of the origins of WWII in the Pacific; Japan's role in international security; and the U.S.-Japan trade conflict. (DR:5*)

5 units, Win (Okimoto)

140A,B,C. Ethics of Development in a Global Environment (EDGE)—(Same as Engineering 297A,B,C.) A series of speakers on current development issues emphasizing problems of the poorer nations. Autumn Quarter: basic world resources, energy, food, housing, population and environment, and the political development and dependencies of developing regions. Winter Quarter: 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: the roles of individuals in national and international institutions dealing with the problems of developing countries. Speakers represent a range of political, professional, and national backgrounds and present candid and differing points of view. Gives students who plan to work in developing countries or in institutions dealing with developing countries a better knowledge of the challenges and issues. One unit credit for attendance of the speaker (lecture) series; 3 units additional credit for optional workshops treating selected issues more in depth. (Sequential registration not required.)

1-4 units Aut, Win, Spr (Fagen, Lusignan, Siegel) lectures W 7:30-9 p.m., workshops by arrangement

141K. Ethics and International Relations—How moral claims function in the foreign policy process and in relations between states. Arguments for and against normative approaches to making and studying policy. The moral dimensions of selected foreign policy issues. Paper required. Limited enrollment. Prerequisites: 35, 243, or consent of instructor.

5 units, Spr (Gaubatz)

142K. Seminar: The Causes of War—Review of theoretical literature on the causes of war and implications of these theories for the prevention of war. Case studies of specific wars and considerations of different proposals for controlling war. Prerequisites: 35 or consent of instructor.

5 units (Gaubatz) given 1991-92

143K. Seminar: Public Opinion in International Relations—The role of public opinion in the formation and conduct of foreign policy. Relationship between domestic opinion and international pressures on decision-makers. Influence of democracy and democratization on international relations. Prerequisite: 35 or consent of instructor.

5 units, Spr (Gaubatz)

144J. Seminar: America in Vietnam—The history and politics of American involvement in the Vietnam War. Emphasis on the historic roots of the war, its impact on politics in the 1960s, disengagement and the long term effects of the war on contemporary foreign policy.

5 units, Spr (Goldstein)

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-WWII era. Topics: origins of cold war, containment, Vietnam, and foreign economic policy. Prerequisite: 35 or equivalent.

5 units (Goldstein) given 1991-92

145L. The Political Sociology of American Security Policy—(Same as Sociology 136.) By what internal social and political processes are the ends and means of national security policy determined? Utilizes various approaches (rational actor; organizational, neo-Marxist, and sociology of technology) to explore goal-setting and the development of policy instruments in post-WWII American foreign and military policy. Issues: early Cold War strategy, nuclear weapons development, and thought and behavior of military organizations.

5 units, Spr (Eden) TTh 10-12
149. Directed Reading/Research in International Relations—Advanced individual study in international relations.

\textit{any quarter (Staff) by arrangement}

**POLITICAL THEORY**

150. Ancient and Classical Political Thought—From the beginning of political speculation in preliterate societies to the Stoics; Greek thinkers are emphasized.

5 units (Drekmeier) given 1991-92

151. Religion and Politics—Early Christian and medieval political thought. Attention to the divergent demands on the individual who must choose between two authoritative values. Comparison with other religions. Reformation theories and the sharpening of the problem. Final three weeks are in seminar form to discuss current-day religious involvement in political campaigns.

5 units (Drekmeier) given 1991-92

152. Social Contract Theory and its Critics—Whether and if so, why, anyone can be understood to have agreed to obey his/her government. The social contract theories of Hobbes, Locke, and Rousseau, and critics of such theories from the 18th to the 20th centuries.

5 units, Spr (Okin)

153. Utopian Political Thought—How utopias function as blue prints for social change or as thought experiments. Examination of classical and modern utopias (Plato, More, Bellamy, Gilman, Piercy) and anti-utopias (Orwell, Le Guin, Borges). Limited enrollment. (DR:3)

5 units, Aut (Hansot)

154. Feminist Theory: Gender, Power, and Justice—Emphasis on recent feminist theories. How feminist perspective complicates and enhances political thought. Types of contemporary feminist thought and the effects of men’s and women’s different perspectives on moral, social, and political issues.

5 units, Win (Okin)

155. Hegel’s Political Philosophy—Critical reading of his \textit{Philosophy of Right}. Emphasis on his concept of freedom, criticism of Kantian morality, and distinction between state and civil society. Aim is a lucid account of his text, and an understanding of its relevance to current controversies in political theory. Additional readings in Aristotle, Kant, and other works by Hegel.

5 units, Aut (Tunick)

156. Problems in Political Theory: Punishment—Central concepts of political theory (authority, freedom, justice, obligation) considered by focusing on problems raised by legal punishment, including: By what right does the state punish? For what actions is it legitimate to punish? Can punishment be just in an unjust society? Why punish at all? Classic political theories of punishment, literature and empirical studies, and current political debates.

5 units, Win (Tunick)

161S. Seminar: Democratic Theory—The major questions in modern democratic theory, including obedience to authority, alienation, participatory democracy, and political tolerance.

5 units (Sniderman) given 1991-92

163. Seminar: Contemporary Issues in Feminist Thought—(Same as Feminist Studies 102C/202C.) Undergraduate seminar on recent developments in feminist political thought. Explores understandings of the “political” and the extent to which these constructions exclude women; theories of moral choice and women’s reproductive rights; and how implicit gender norms affect the structure of men’s and women’s careers. Prerequisite: Feminist Studies 101 or consent of instructor. (DR:5)

5 units, Spr (Hansot)

164. Seminar: Authority and Freedom in Weber, Durkheim, and Freud—Their contributions to the understanding of political behavior, institutions, and values.

5 units, Spr (Drekmeier)

165. Seminar: An Introduction to Marx and Socialist Thought—Topics: Marx’s Hegelian roots; the economic theory of capitalism; the concept of ideology; relating theory to practice; alienation; Marxist theories of the state and law. Limited enrollment. Consent of instructor required.

5 units, Spr (Tunick)

169. Directed Reading/Research in Political Theory—Advanced individual study in political theory.

\textit{any quarter (Staff) by arrangement}

**LAW/JUDICIAL POLITICS**

170. Judicial Politics and Constitutional Law: The Federal System—Interaction of law and politics, and the role of the U.S. Supreme Court in constitutional interpretation and the political system generally. Focuses on major court cases dealing with separation of powers and federalism. Prerequisites: 10 or equivalent and sophomore standing.

5 units, Aut (Barker)

171. Judicial Politics and Constitutional Law: Civil Liberties—Role and participation of courts, primarily the U.S. Supreme Court, in public policy making and the political system. Judicial activity in civil liberty areas (religious liberty,
free expression, race and sex discrimination, political participation, and rights of persons accused of crime). Prerequisites: 10 or equivalent and sophomore standing.
5 units, Win (Barker)

176. Seminar: The Supreme Court—Intensive study of the U.S. Supreme Court and its role in the governing system. Topics: nature of court as a political-legal institution, judicial recruitment and selection, nature and dynamics of judicial decision-making in individual and collegial contexts, and differential role and responsiveness of court as compared to other governing institutions. Prerequisites: 170 or 171 and junior standing, or consent of instructor.
5 units, Spr (Barker)

177. Seminar: Courts, Politics, and Public Policy—The role and interaction of courts with other political institutions and interests in the formulation and implementation. Prerequisite: 170 or 171 and junior standing, or consent of instructor.
5 units (Barker) given 1991-92

AMERICAN POLITICS

180. Civil Rights, Children, and Poverty in America: Strategies of the Future—(Same as Education 140X.) Overview of the challenges and controversies facing American society in the 1990s: race and sex discrimination, children in poverty, reform of our education system, and abortion and privacy rights. The roles of America's political, legal, and educational institutions in addressing fundamental social and political problems, and strategies for positive change. (APA)
5 units, Spr (Steyer)

181. African Americans and the Political System—African Americans as political actors and the development and use of political resources as means to achieve policy objectives. Emphasis on the role and differential responsiveness of governing institutions to concerns of African Americans.
5 units (Barker) given 1991-92

182F. Introduction to American Law—(Same as American Studies 179, Law 106.) American law for undergraduates. The structure of the American legal system, including the courts; American legal culture; the legal profession and its social role; the scope and reach of the legal system; the background and impact of legal regulation; the relationship between the American legal system and American society in general. (DR:5)
5 units, Aut (Friedman) MTWTh 9

183D. The Politics of Welfare Policy—Examines contemporary welfare policy against the background of the politics of welfare policy development from the 16th to the 20th centuries. Why "insufficiency" is considered a "problem" for the community and, therefore, a question to be addressed by public policy. The ideological roots of the problem of insufficiency and attitudes that constrain solutions to the problem. Cases from regimes as diverse as Henry VIII and President Carter.
5 units (Brody) given 1991-92

187. The Social Sciences and Educational Analysis: Introduction to the Politics of Education—(Same as Education 220B.) The relationships between political analysis and policy formulation in education; focus is 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 policy analysis, implementation, and politics of reform emphasized.
3 units, Win (Kirst)

5 units, Aut (Kirst)

189. Voting in the American Electoral System—Focus is on the citizen; object is to make voting behavior comprehensible. What lies behind electoral participation, the turnout decision, the candidate choice, the voting decision? The effect of the legal context on behavior, the social background of the voter, partisanship, issue concerns, media effects, campaign and candidate effects. Voting behavior in primary and general elections, both Presidential and Congressional.
5 units, Aut (Brody)

191. Seminar: The President, the Press, the Public, and Politics—(Same as Communication 163.) The interactions between the President, the media, and the public in contemporary American politics. Standard and new conceptions of the sources of presidential power in policy making. Whether the evidence justifies the new conceptions of the role of President in the politics of policy making.
5 units, Spr (Brody)

192. Seminar: Political Psychology—Introduction to the principal topics in political psychology: consistency theory, preference estimation, personality, and categorization.
5 units (Sniderman) given 1991-92
   5 units (Ferejohn) given 1991-92

194C. Seminar: Political Communication—(Same as Communication 160/260) Analysis of the role of the mass media and other channels of communication in political and electoral processes.
   4 units (Chaffee) given 1991-92

   5 units (Rivers) given 1991-92

198. Directed Reading/Research in American Politics—Advanced individual study in politics. Prerequisite: 10 or equivalent.
   any quarter (Staff) by arrangement

199. Senior Honors Thesis.
   any quarter (Staff) by arrangement

GRADUATE-UNDERGRADUATE SEMINARS

Conducted as seminars or colloquia, and open to advanced undergraduates and graduates. In most cases non-majors and majors are welcome, but enrollments are limited. Sign-up sheets for these courses are posted in the departmental office on class list sign-up days. Sheets should be checked for specific enrollment information.

GENERAL

201A. Seminar: Foundations of Political Economy—(Same as Business 680.) Political economy is the study of collective decision-making and the institutions used to make and implement collective decisions. Objective is to survey the central issues and techniques in political economy and to lay a foundation for original research using methods of positive political science. Topics: social choice, majority rule, strategic behavior, agendas, norms, institutions, interest groups and lobbying. First in a three-course sequence; and a prerequisite for the remaining courses. Material is somewhat technical but accessible to most graduate students in political science, economics, and business.
   5 units, Aut (Krehbiel)

201B. Seminar: Economic Analysis of Political Institutions—(Same as Business 681.) Addresses an expanded set of issues using the methods of information economics, games with incomplete information, repeated games, sequential bargaining, and rational expectations.
   5 units, Win (Rivers)

201C. Seminar: Applied Formal Models—Congressional Decision-Making—(Same as Business 682.) Focuses on empirical applications of formal models to the study of legislatures. Presumes students have acquired basic technical skills from 201A, B, or their equivalents. Objective: to learn how such skills can be applied to obtain a more comprehensive and systematic understanding of collective decision-making.
   5 units, Aut (Krehbiel)

202. Seminar: Ideas and Politics—How ideas matter in politics. Readings from the fields of American and comparative politics and international relations. Topics: relationship between ideas and interests; norms; political culture; social movements; and the diffusion of ideas within and across nations.
   5 units, Spr (Goldstein)

203A. Introduction to Political Data Analysis—Introduction to data analysis and statistical methods with applications to political science. Topics: probability theory, estimation, confidence intervals, hypothesis testing, contingency tables and linear regression models.
   5 units, Win (Rivers)

203B. Statistical Modeling for Political Science—Specification and estimation of statistical models of political processes. Topics: linear and nonlinear regression, discrete choice, simultaneous equations, measurement error, misspecification and aggregation bias, model selection, panel data, time series analysis.
   5 units, Aut (Rivers)

203C. Seminar: Advanced Topics in Statistical Modeling—Possible subjects: measurement models, multidimensional scaling, multivariate analysis, causality testing, Bayesian methods, semiparametric and robust methods.
   5 units, Aut (Rivers)

PUBLIC ADMINISTRATION

206. Politics and Organization—Provides an analytical foundation for understanding organized activity as it reflects the organization of political life. Coverage of theories is eclectic and interdisciplinary. Emphasis is on political institutions and formal organizations generally, and the norms, expectation, and routines characteristic of informal political structure.
   5 units, Win (Moe)

206W. The Political Economy of Institutions—Survey of economic approaches to organization.
POLITICAL SCIENCE 591

emphasizing theory and application, with attention to politics.
5 units, Spr (Moe)

207M. International Perspectives on Organizations—(Same as Sociology 265, Business 475.) Perspectives and research on organizations by foreign scholars and in non-American contexts. Emphasis on identifying a few key concepts from the foreign literature and contrasting the points of view, research results, and experiences with those based on research in the U.S. Prerequisites: Business 270, Sociology 160, or Industrial Engineering 100; consent of instructor.
5 units, Win (March) MTh 3:15-5:05

209. Directed Reading in Public Administration.
any quarter (Staff) by arrangement

COMPARATIVE POLITICS

212P. The Politics of Regional Cooperation and Integration—Theory and practice of "regionalism"; bilateral and multilateral efforts to resolve conflicts between countries peacefully, to increase mutual exchanges, and even to create supra-national institutions. Attention to the European Community, to the U.S.-Canadian Free Trade Area, and to recent experiences in Latin America. Open to advanced undergraduates and graduate students.
5 units (Schmitter) given 1991-92

5 units, Aut (Okimoto)

215B. Seminar: Japanese Political Economy—Research seminar aimed at acquiring the skills needed to complete a term paper on a subject related to the Japanese political economy. Prerequisite: 215A, or instructor's permission.
5 units, Win (Okimoto)

220. Seminar: Legitimacy, Consensus, and Conflict in European Democracies—The performance and the normative basis of the political process and of key political institutions in Western democracies have become the subject of public criticism and critical scholarship, particularly in the realms of representation and policy. Using France and W. Germany as examples, analyzes the sources and symptoms of this phenomenon. Reading knowledge of French or German useful, but not required.
5 units (Weiler) given 1991-92

221. Education and Political Change—(Same as Education 306B.) The relations between education and politics from a comparative perspective. Topics: different theoretical approaches to the study of education and politics; problems of legitimacy in educational policy; international factors in educational development; the politics of educational reform; processes and conditions of political learning.
5 units, Win (Weiler) TTh 2:15-4:05

223G. Seminar: Comparative Political Parties and Party Systems—Analyzes classics in the study of political parties: Downs, Duverger, Michels, Sartori, Lipset, and Rokkan. Recent developments in the literature, including Laver and Schofield on party coalitions, Przeworski and TsebelisIT party activists and party leaders, and Shepsle and Robertson on theories of party competition. The empirical focus is on advanced industrial democracies. Prerequisite: consent of instructor.
5 units, Spr (Garrett)

225. Seminar: Political Economy of Socialist Reform—The political economy of reform in selected socialist countries, including the U.S.S.R., China, and Eastern Europe. The political economy of the original Stalinist model; past efforts at economic reform in these countries; and the implications of recent political changes for the future of economic reform in the socialist world.
5 units, Spr (Halpern)

225A. Introduction to Comparative Political Economy—Introduces theoretical and empirical issues in comparative political economy. The merits of applying rational choice-microeconomic approaches to substantive issues. The role of the state, why people vote the way they do, the impact of parties on the economy, the "new" institutionalism and endogenizing political change; the interrelationships between governments and organized economic interests (capitalists and workers), analysis of state-socialist systems, and rational choice reinterpretations of normative political philosophy.
5 units, Win (Garrett)

225B. Seminar: Advanced Topics in Comparative Political Economy—Examines contemporary scholarship on comparative political economy. The merits of microfoundational approaches to the interaction between the capitalist economy and democratic politics. Topics: impact of parties on the economy, politics of institutional change, coalitional politics, macroeconomics and micropolitics. For advanced graduate students. Prerequisite: 225A or consent of instructor.
5 units, Spr (Garrett)

226. Seminar: Politics and Society—(Same as Sociology 246.) Theoretical and empirical analysis of the relationships between politics and society in a wide range of countries, as for-
mulated by political scientists and sociologists. Focuses on the sources of variation in political systems.

5 units (Lipset) given 1991-92

226C. Colloquium: Major Problems in Soviet Politics and Society—(Same as History 319A.)

5 units, Win (Dallin)

227H. Seminar: The Rise of New Elites in East European Societies—The fall of ancien regimes and the rise of new ruling elites or classes in E. European societies. Focuses on Hungary in the 1980s with systematic references to similar and contrasting processes in European history and in other E. European societies.

5 units, Spr (Hankiss)

227P. Seminar: Democratization—East and West—Comparison of political changes possibly leading to more democratic institutions in Eastern and Southern Europe, with reference to Latin America and perhaps Asia: differences in previous regimes and economic systems; in levels of development and international context; in modes of demise and efforts at reform; in eventual institutions and practices. Open to advanced undergraduates and graduate students.

5 units (Schmitter) given 1992-93

229. Directed Reading in Comparative Politics.

any quarter (Staff) by arrangement

INTERNATIONAL RELATIONS

236. The Soviet Union and the International System—The emergence of the Soviet Union as a superpower, and its possible decline. Domestic sources of Soviet power and policy, and the effects of international rivalry on the Soviet system. Topics: economic and technological bases of power; ideology and foreign policy; the armed forces and military doctrine; the Soviet Union in the world economy; Gorbachev's New thinkingS; Eastern Europe and Soviet security. Prerequisites: 136, History 122B, or consent of instructor.

5 units, Spr (Holloway)

241. International Political Economy—Major theoretical approaches emphasizing structural/mercantilism, liberalism, and Marxism applied to a variety of historical and contemporary issues. Lectures/class presentations on readings.

5 units, Spr (Krasner)

243. International Relations Theory—Introduction to contemporary theories of international politics. Micro and macro approaches to the study of conflict and cooperation in world politics, including the work of Carr, Waltz, Gilpin, Keohane, and Bueno De Mesquita. Format emphasizes student oral and written presentation of assigned readings.

5 units, Aut (Goldstein)

245H. International Policy Studies: Core Seminar—The end of the Cold War and the transition to a new international system. Only for students taking the A.M. in International Policy Studies.

5 units, Win (Holloway)

248. Seminar on International Cooperation in Educational Development—(Same as Education 207.) Critical review of current policies, priorities, and practices in international cooperation in education, emphasizing the role of international organizations (World Bank, Unesco, OECD), and of national development assistance agencies.

5 units, Aut (Weiler)

249. Directed Reading in International Relations.

any quarter (Staff) by arrangement

POLITICAL THEORY

Graduate students in Political Theory should also see courses numbered 150-169.

250. Classics of Modern Political Theory—Intended (not exclusively) for graduate students wishing a basic knowledge of the works of Machiavelli, Hobbes, Locke, Rousseau, and Marx. Lectures/discussions on conceptions of power, and legitimation and models of society.

5 units (Drekmeier) given 1991-92

251D. Marx—(Same as Philosophy 276.) Marx’s criticism of morality, his concept of ideology, and his theory of history. Also, recent contributions by “analytical Marxists.”

3 units (Sato) given 1991-92

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)

259A. Limits of Economic Rationality I: The Nature of the Social Bond—(Same as French 288A.) Confrontation of three ways to account for society in an individualistic framework: (1) the Social Contract (Hobbes, Rousseau); (2) the “Invisible Hand” of the Market (Smith, Walras); (3) society as a crowd (Tarde, Freud, Keynes.) Comparison with the Durkheimian tradition.

2-3 units, Spr (Dupuy)

262. Seminar: Thought and Action—The relation between knowing and doing, and making and doing; the ranges from ideological presuppositions of psychological theories, the nature of revolutionary consciousness, various types of knowing and types of ideology, and the respon-
sibilities of science and role of knowledge as a factor of production.
5 units, Win (Drekmeier)

264H. Seminar: Professions and Professional Ethics—Explores tensions between professional ethics and pressures in the workplace. How the structure of careers and implicit gender norms affect men and women differently.
5 units (Hansot) given 1991-92

266. Seminar: Gender and Political Theory—Reads/analyzes major works and parts of works from the Western tradition of political thought, viewing them through the prism of gender. The ideological roots of inequality between the sexes. Ways in which assumptions about sexual difference have shaped the essential concepts of our tradition, including reason, nature, politics, justice, and the separation of public from private life. Compares different and sometimes contrasting interpretations of the primary works read. Prerequisite: introductory course in political theory or consent of instructor.)
5 units, Spr (Okin)

268. Seminar: Contemporary Theories of Justice—Social and political justice. Facilitates understanding of major contemporary debates in political theory. Analyzes major recent works that develop principles of justice and the political arrangements that best satisfy their requirements.
5 units, Win (Okin)

269. Directed Reading in Political Theory.
any quarter (Staff) by arrangement

AMERICAN POLITICS

288. Seminar: Issues of Race in American Politics—Surveys the forms that racism takes in contemporary American political thinking and the connections, if any, between central values in the American political tradition such as self-reliance and individualism, attitudes toward Blacks, and ideas about racial policies. Relies on recent, large scale surveys of the opinions and attitudes of Americans.
5 units (Sniderman) given 1991-92

290A,B. Seminar: Voting Research—Models of the vote in survey data. Readings cover theories of voting behavior and empirical research on aspects of the vote. Students formulate and execute research projects; the preliminary stages of these research projects are discussed during the last six weeks. Prerequisites: undergraduates—189 or 292B; graduate students—292B or an equivalent course. Recommended: some familiarity with statistical data analysis.
5 units (Brody) given 1991-92

292A. Seminar: American Political Institutions—Theories of American politics, interest groups, political parties, Federalism.
5 units, Aut (Brady)

292B. Seminar: Introduction to Political Behavior—Analysis of public opinion, ideology, political tolerance and political values, racism, and voting.
5 units, Win (Brody)

292C. Seminar: American Political Institutions—Overview of the state of American political institutions with attention to bureaucracy, the Presidency, and Congress.
5 units, Spr (Moe)

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

306. Seminar: Advanced Organization Theory—(Same as Business 676, Sociology 365.) Topics in organization theory for advanced students. Prerequisite: consent of instructor.
5 units (March) given 1991-92

307. Organizational Analysis—(Same as Business 670, Sociology 367.) Doctoral-level introduction to research on organizations. Emphasizes recent organizational research in social science. Prerequisite: enrollment in a doctoral program.
5 units, Win (March) TTh 8-10

311. Seminar: Comparative Political Analysis—For political science Ph.D. candidates. Required for all students with comparative politics as a first or second field. Qualified Ph.D. candidates in other departments and A.M. candidates in political science may be admitted with permission of the instructors. Enrollment limited to 12.
5 units, Aut (Okimoto, Schmitter)

313F. Seminar: The Political Economy of National Development—Focus is on late-developing peripheral nations and problems of accumulation, distribution, state and class forces, and the international system as it affects development. Participants select a country and a problem and examine them in detail. Prerequisites: 311 and consent of instructor.
5 units, Win (Fagen)

314. Seminar: Business and the State—The politics of capitalists in advanced industrial societies emphasizing the role of interest associations, the arrangements for sectoral governance, and
differences in industrial relations systems in Europe, North America, and Japan.

5 units, Win (Schmitter)

316. Seminar: Democratization in Latin America—Comparison of political changes possibly leading to more democratic institutions in Latin America, differences in previous regimes and economic systems; in levels of development and international context; in modes of demise and efforts at reform; and in eventual institutions and practices.

5 units, Win (Karl)

318R. Ethnic Conflict and Minorities in the Contemporary World—Comparative international study of ethnic conflict, emphasizing Latin America. The role of external interests, domestic agrarian structures, and the internationalization of such conflicts.

5 units, Win (Stagenhaven)

323. Seminar: Theories of Development—Literature-review seminar for graduate students in the social sciences and area studies. Analysis of major theoretical approaches and empirical studies regarding political, economic, and social developments in national units.

5 units, Win (Packenham)

324. Seminar: Politics and Development in National Units—Research-oriented workshop for graduate students in the social sciences and area studies. Theoretical issues and research strategies regarding politics and development in national units. Prerequisite: 323 or permission of instructor.

5 units, Spr (Packenham)

328. Knowledge and Legitimation: The Politics of Social and Educational Research—(Same as Education 307.) Within framework of different theoretical approaches to the study of knowledge and power, seminar analyzes the political nature of the production and utilization of knowledge about social and educational realities. Attention to the paradigmatic and structural characteristics of transnational knowledge systems. Research seminar for doctoral students; consent of instructor required.

5 units, Spr (Weiler)

332. Research on Decision Making and Strategic Interaction in International Relations—Examines theories of decisionmaking and strategic interaction in international security affairs. Prerequisite: 243 or consent of instructor.

5 units, Win (Gaubatz) by arrangement

341. Seminar: Theoretical Issues in International Political Economy—Examination of major contemporary theories affecting global economic relations and related national policies.

5 units, Spr (Krasner)

343. Research in International Relations—Graduate seminar for doctoral students working on international political economy, international security, or foreign policy research papers. Prerequisite: 243 or consent of instructor.

5 units, Win (Krasner)

346. Seminar: Nuclear Weapons and International Relations: Theories and History—Theories of arms racing, deterrence, and nuclear diplomacy, evaluating these in light of the emerging field of nuclear history. Draws on the experience of the main nuclear weapons states.

5 units, Win (Holloway)

360. Seminar: The American Dream—Research seminar on the historical development of the American dream as experienced by women, immigrants, labor, and African Americans.

5 units, Spr (Manley)

380A,R,C. Workshop on Political Economy. 5 units (Ferejohn) given 1991-92

401. Seminar: Graduate Orientation—Open to first-year graduate students in Political Science.

1 unit, Aut (Goldstein)

OVERSEAS STUDIES

These courses are approved for the Political Science major and taught overseas at the campus indicated. Students are encouraged to discuss with their major advisors which courses would best meet individual educational needs. Course descriptions can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

111X. Contemporary French Politics: A Comparative Approach—Tours. (DR:5)

5 units, Spr (Gorgues)

120X. French Foreign Policy—Tours. (DR:5)

5 units, Aut, Spr (Billard)

121X. U.S. and Western Europe after WWII—Florence. (DR:5)

4 units, Spr (Mammarella)

125X. Contemporary European Politics—Florence. (DR:5)

4 units, Spr (D'Alimonte)
Although Stanford University at present does not have a formal degree program in Population Studies, it does have scholars of international reputation in such specialties as population biology, population genetics, epidemiology, demographic methods, demographic history, economic demography, and in the sociology and anthropology of population.

The Morrison Institute for Population and Resource Studies is an interdisciplinary group serving three major functions: (1) encouraging graduate work in population studies through fellowship grants and supervision; (2) instituting courses and seminars in population studies; and (3) bringing visiting faculty to Stanford to strengthen existing course offerings. The institute also organizes an Interdisciplinary Colloquium in Population Studies to introduce upper-division and graduate students to a variety of issues in population-related specialties.

For the convenience of interested students, offerings of population studies at Stanford are listed below.

**COURSES**

**ANTHROPOLOGY**

146. Urban Problems in Anthropological Perspectives.
5 units, Spr (Staff)

164. Ecological Anthropology—(Same as Human Biology 134.)
3-5 units (Durham) given 1991-92

168. Medical Anthropology—(Same as Human Biology 168.)
5 units, Aut (Becker)

250. Nutritional Problems of Developing Nations—(Same as Food Research 250, Human Biology 110.)
5 units, Spr (Martorell)

**BIOLOGICAL SCIENCES**

117. Biology and Global Change.
3 units, Win (Vitousek, Mooney)

175H. Problems in Marine Biology.
15 units, Spr (Gilly, Baxter, Denny, Epel, Thompson, Powers)

3 units, Win (Roughgarden)

178. Biology of Natural Populations.
4 units, Spr (Mooney)
alternate years, not given 1991-92

183. Colloquium on Population Studies—(Same as Food Research 188/288, Human Biology 60.)
1 unit, Win (Feldman, Arthur)

188. Ecosystems of the Tropics.
2-3 units (Vitousek)
alternate years, given 1991-92

190. Population Biology of Butterflies—Must be registered in Winter Quarter to get credit for field work in Spring.
2-3 units, Win, 2-5 units, Spr (Ehrlich)
alternate years, not given 1991-92

1-3 units, Aut, Win, Spr (Ehrlich, Field, J. Thomas, Vitousek)

2 units, Spr (Roughgarden)
alternate years, not given 1991-92

1-3 units, Aut, Win, Spr (Ehrlich)

1-3 units, Aut, Win, Spr (Ehrlich, Roughgarden, Thomas, Vitousek, Watt)

1-3 units, given 1991-92

1-3 units, Aut, Win, Spr (Roughgarden)

**ECONOMICS**

119. Development and Population Interactions in the Third World—(Same as Food Research 121.)
5 units, Win (Yotopolous)

133. Population Perspectives in the Third World—(Same as Food Research 136/236, Human Biology 136.)
5 units, Spr (Arthur)

**ENGINEERING**

297A,B,C. The Ethics of Development in a Global Environment (EDGE)—(Same as Political Science 140A,B,C.)
1 or 4 units, Aut, Win, Spr (Fagen, Lucignan, McWhorter, Siegel)
GENETICS
205. Human Population Genetics and Genetic Epidemiology.
3 units (Cavalli-Sforza)
alternate years, not given 1990-91

HEALTH RESEARCH AND POLICY
270. International Health.
2-4 units, Spr (Basch)

HUMAN BIOLOGY
120. Human Nutrition—(Same as Food Research 119.)
4 units, Aut (Martorell, Butterfield)

148. Environmental Policy.
3 units, Spr (Ehrlich)

150C. Gender-Specific Perspectives of Birth Control—(Same as Feminist Studies 145.)
6 units, Win (Djerassi)

MATHEMATICS
126. Mathematical Models in Population Biology—(Same as Biology 179.)
3 units, Win (Karlin)

PSYCHOLOGY

Emeriti: (Professors) Albert H. Hastorf, Ernest R. Hilgard, Douglas H. Lawrence, Eleanor E. Maccoby
Chairman: Mark R. Lepper
Assistant Professors: Laura L. Carstensen, Anne Fernald, Susan K. Nolen-Hoeksema, Felicia Pratto
Associate Professor (Teaching): Barbara Tversky
Department Affiliates: Maureen Callanan, Stuart Card, Douglas Daher, Vincent D’Andrea, Sam Edwards, Ronald Kaplan, Alejandro Martinez, Robert Matano, Thomas Moran, Charles Rebert, Marilyn Reed-Hoskins, Barbaranne Shepard, Andrew B. Watson
Senior Lecturer: Lyn Carlsmith

The Department of Psychology, housed in Jordan Hall, maintains shop facilities and extensive laboratories; the latter are equipped with computers and some are linked directly to the University’s computer center. Bing Nursery School, located on campus at 850 Escondido Road, provides a laboratory for child observation, training in nursery school teaching, and research. It was constructed with funding from the National Science Foundation and a special grant from Mrs. Anna Bing Arnold and Dr. Peter Bing.

The department provides: (1) courses designed for the general student; (2) a major program leading to the degree of Bachelor of Arts which includes honors and a specialization in one of five content area tracks; 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 except as noted below.

UNDERGRADUATE PROGRAMS
BACHELOR OF ARTS

For the A.B. 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. 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 and 60, and at least two courses from each of the two groups listed below. Group A consists of broad content courses in cognition, perception, physiological psychology, and psycholinguistics. Group B consists of courses in social, developmental, abnormal, and personality.

Group A: 102, 106, 107, 109, 120, 146, 147, 163
Group B: 111, 113, 115, 121, 130, 136

The course lists for the two groups may change from year to year. Students should check with the Academic Assistant for additional information.

No more than 10 units of independent study and practicum (104, 167, 184, 185, 188, 257, and 257A) may be counted toward the 45 units. Independent study courses (104, 167, 184, 185, and 188) are graded on a mandatory Satisfactory/No Credit basis.

A transfer student must take at least 15 units of coursework 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 want a “stronger” program than the minimal requirements listed above. This may be achieved in any or all of these ways:

1. Within the general major, the student may take advanced undergraduate or graduate courses in the department and in supporting disciplines, such as anthropology, biology, statistics, and computer science. The student may also take advantage of widespread opportunities for directed research, working closely with individual faculty and graduate students.

2. The student may apply to the senior honors program, described below.

3. The student may elect to pursue one of four specialization tracks: Health and Development, Computational Neurosciences, Decision Sciences, or Cognitive Sciences.

The training obtained from the pursuit of any of these options is valuable not only for students considering graduate work in psychology but also those thinking of professional careers outside of psychology.

**SENIOR HONORS PROGRAM**

The senior honors program is designed for exceptionally able students who wish to pursue a year of intensive supervised independent research. Admission to the program is made at the end of the student’s junior year on the basis of: (1) excellent academic performance, (2) previous research experience, and (3) recommendations by faculty and/or graduate students. An information meeting about the program is held in Winter Quarter.

Students interested in the program should involve themselves in research as early as possible and acquire a broad general background in a chosen area. The program is particularly appropriate for students planning to go to graduate school in psychology, and in other social sciences, as well as computer science, law, medicine, and business.

_Funds for research, though not necessary, are available on a competitive basis in the form of Firestone Grants (applied for early in Spring Quarter of the junior year) and Small Grants (applied for early in Autumn Quarter of the senior year). Information is available at the Undergraduate Research Opportunities office in Sweet Hall._

_During Autumn Quarter of the senior year, students participate in a weekly seminar concerned with general methods and issues in psychological research. At the same time, they plan for research under the supervision of an appropriate faculty member, and proposals are presented orally at the seminar for discussion. A written copy of the proposal is turned in at the end of Autumn Quarter. During Winter and Spring Quarters, students are primarily involved in completing research and writing the dissertation. Students present completed projects at a convention at the end of Spring Quarter, attended by other students, faculty, and graduate students._

**SPECIALIZATION TRACKS**

Students in the major program, including those in the honors program, may elect to specialize in one of four tracks, namely, Health and Development, Computational Neurosciences, Decision Sciences, and Cognitive Sciences. Specialization consists of a coherent sequence of courses leading to advanced undergraduate or even graduate level courses in an area. Typically, the sequence includes 2-4 required courses and 4-6 recommended courses in psychology, along with 4-7 courses in related disciplines. (These courses would count toward satisfying the major requirements stated above.) In the ideal case, the student who specializes would acquire an understanding of a range of psychological processes, as well as an appreciation of the significance of these processes in the chosen area of application. In this way, specialization could facilitate the student’s preparation for a professional career in, for example, medicine, business, or counseling, or for graduate work in psychology and a more academic career.

Two or three faculty members serve as academic advisors for each track. After declaring a major, a student who wants to specialize should discuss the chosen track with an appropriate advisor. Information about the advisors and about the required and recommended courses for each track is available from the Academic Assistant in the department.

**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 selective.

Applicants for admission must submit their scores on the Graduate Record Examination (both general and psychology tests) as part of the application. This examination may be taken at most universities and colleges.

MASTER OF ARTS

The Department of Psychology offers an A.M. program only to students who are concurrently enrolled in another doctoral or professional program at Stanford. Students can be admitted to the master's program by submitting an application to the Psychology Department's Graduate Education Committee. Applicants are admitted based on undergraduate transcripts, letters of recommendation, graduate record exams, and the agreement of a member of the psychology faculty to serve as an advisor.

Candidates for the A.M. degree must take Psychology 252 and five courses from the departmental core group defined in the Ph.D. program requirements. Students must complete 36 units in psychology at Stanford. Serving as a teaching assistant for Psychology 1 or 60 (by registering for 257A—Practicum in Teaching) may be substituted for one 3-unit course. Beyond the coursework, master's students must complete a thesis under supervision of their psychology faculty advisor.

DOCTOR OF PHILOSOPHY

In addition to fulfilling the residence requirement for the degree, the following requirements are stipulated:

First-Year Course Requirement—During the first year of graduate study, the student must take 207 (Pro-seminar for First-Year Graduate Students), at least one approved graduate statistics course, and at least one core course selected from Group H and one core course selected from Group S (listed below).

GROUP H
206. Behavioral Neuroscience
209. Perception
210. Human Memory and Learning
214. Psycholinguistics
215. Mathematical Psychology
218. Mathematical Representation of Structures in Psychological Data
256. Decision and Judgment

GROUP S
211. Advanced Developmental Psychology
212. Social Psychology
213. Personality
216. Abnormal Psychology
254. Personality Change

The student is expected to spend at least half of the time in research from the beginning of the first year of graduate study to the completion of the Ph.D., normally taking no more than 9 units of coursework each quarter. At the end of the first year of graduate study, the student must file with the department a written report of the first-year research activities.

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 and in a second approved graduate course in statistics. Of the five core courses selected during the first and second years of graduate study, at least two must 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 coursework prior to admission to doctoral candidacy should be arranged under guidance of the student's advisor.

Third-Year Major Area Paper—During the first week of Autumn Quarter of the fourth year, the student turns in a Conceptual Analysis of the Dissertation Area (CADA). This paper provides a general framework for the research topic of the dissertation, addresses the central issues within the specialty area, and reviews the pertinent literature(s). Typically, the analysis has the kind of scope found in the opening chapters of the more traditional dissertations, but the exact format and scope of the paper is a joint decision made by student and advisor.

At this same time, the student selects 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, can then become the first section of the actual dissertation proposal. Thus, the student receives 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 does not need to be repeated for the second dissertation topic. The student is still expected to be knowledgeable about the literature and problems of any research topics being pursued for the dissertation, but the formal CADA procedure need not be repeated.

Minor Requirements—The candidate must complete either a University minor satisfactory to the minor department, or elect to have the minor waived by selecting 12 approved units outside the department. A student designing
Dissertation Reading Committee—The candidate must select a dissertation reading committee satisfactory to the department. The minimum membership of this committee must 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.

Orals—The candidate must pass the University oral examination, which is based on the dissertation proposal not on the defense of the dissertation itself. The reason for this policy is to permit the oral to serve the function of guiding and improving the proposed research. This function can best be served if the oral is scheduled early in the year in which the dissertation research is conducted. It is therefore expected that the oral will be taken by the end of the Autumn Quarter of the fourth year.

Dissertation Requirements—The candidate must 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 requires departmental reexamination.

STUDENT EVALUATIONS
First-year Evaluation—It is the department's policy to evaluate the progress of each graduate student at the end of the first year of graduate study. As part of 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 1.

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 primarily based on three factors:
1. The quality of research carried out in the first year.
2. Performances 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 involving the same criteria as the first year; however, the student is not required to submit a paper. Students who do not make satisfactory progress during the second year may be dropped from the program.

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 appropriate to a career of continuing research productivity.

Two kinds of experience are necessary for this purpose. One is 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 attains 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 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 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 fields represented by the faculty's many research interests.

Each student achieves competence in unique ways and rates. Each student and advisor share in planning a program leading to the objectives discussed. The student is expected to spend half of his or her time on research and normally takes no more than 9 units of coursework 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 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 Autumn Quarter of the 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 serve as teaching assistants for four Psychology courses during their graduate study. Of the four courses, one of them should be Psychology 1, General Psychology, and another should be Psychology 60, Statistical Methods.

Students are discouraged from participating in teaching the first year of graduate study. Students typically progress from closely supervised teaching to more independent work. They usually begin by teaching sections of General Psychology and Statistics and then progress to more advanced courses in their area of specialization. They may offer a supervised, but essentially independent, seminar during their final year of graduate study.

Ph.D. MINOR

Candidates for the degree of Doctor of Philosophy in other departments may elect a minor in psychology. To obtain a minor, the student must complete 20 units of coursework at the graduate level in the Psychology Department. Cross-listed graduate courses can be used to satisfy this requirement.

COGNITIVE SCIENCE PROGRAM

Psychology is participating, along with the Departments of Computer Science, Linguistics, and Philosophy, in an interdisciplinary program of cognitive science. The program is intended to provide students with an interdisciplinary education as well as a deeper concentration in psychology. Doctoral students are eligible to participate in the Cognitive Science program. Students who complete the requirements receive a special designation in cognitive science along with the Ph.D. in Psychology. To receive this field designation, students must complete 30 units of approved courses, 18 of which must be taken in two disciplines outside of psychology.

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.

COURSES

SUMMER SESSION

The courses announced for the Summer Session are those regularly scheduled in the department curriculum. Additional courses may be announced in the bulletin Summer Session issued annually in February.

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. Topics: perception, learning, cognition, cognitive and social development, psychopathology, social behavior, and the physiological basis of behavior. (DR:4)

   4 units, Aut, Win (A. Fernald) TTh 11-12:15
   Spr (Carstensen) TTh 10-11:15

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

60. Statistical Methods—The elements of statistical description (measures of average variation, correlation, etc.). Develops an understanding of statistical inference. Emphasis on those statistical methods of principal relevance to psychology and related social sciences. Students who receive credit for 60 are not given credit for Statistics 60. (DR:6)

   5 units, Aut (Lisle) MTWThF 9

102. Perception—A review of the basic processes of vision and hearing. Topics: basic anatomy of the eye and ear, speech perception, color vision, depth perception, and more. (DR:4)

   3 units, Aut (Wandell) TTh 3:15-4:45

103A. Visual Sensing by Humans and Computers—(Graduate students register for 203A.) Topics in basic visual science including the physiology of human vision, basic human visual performance, and computational algorithms that characterize physiology and performance. Prerequisites: 102 or equivalent, calculus. (DR:7)

   3 units, Win (Wandell) TTh 3:15-4:45

103B. Visual Sensing by Humans and Computers—(Graduate students register for 203B.) Topics in the application of visual science to the design of images (television, computer terminals, avionics displays) for viewing, and the design
of sensor systems for analyzing the content of image data (assembly line part inspection, object recognition). Prerequisites: 102 or equivalent; calculus.

3 units (Wandett) not given 1990-91

104. Special Laboratory Projects—Independent study. Satisfactory/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—Survey and analysis of major topics in cognitive psychology, including perception, memory, problem solving and reasoning. Emphasis on contemporary research and theory. Prerequisites: 1 and 60, or permission of instructor. (DR:4)

4 units, Win (B. Toersky) TTh 1:15-2:30

107. Introduction to the Nervous System: Cell Signaling and Behavior—(Same as Biological Sciences 153.) A survey of neural interactions underlying behavior. Prerequisites: 1 or equivalent, and elementary biology.

4 units (Wine) given 1991-92

109. The Neuropsychology of Perception, Attention, and Memory—(Graduate students register for 209.) Analysis of the structure of our sensations and memories as determined by physiological encoding mechanisms. Examination of neuronal machines which produce our perception of color, brightness, movement, shape, and the selective attention and deposition into memory of those events. Prerequisite: 1 or equivalent.

4 units (Wine) TTh 11-12:30

111. Developmental Psychology—Psychological development from birth to adulthood, emphasizing the infancy, early childhood, and middle childhood years. The nature of change during childhood and theories of development. Supervised experience with children at Bing School, Stanford's child development laboratory school, is available if taken for 5 units. Prerequisite: 1 or equivalent. (DR:4)

3 or 5 units, Aut (Flavell) MWF 11

113. Personality—Broad, balanced introduction to the field of personality study. Personality is complex and is best considered from many, often conflicting, points of view. Topics: overview of diverse theoretical approaches and some empirical evidence related to these approaches. Social-learning, psychometric-trait, biological, and psychodynamic concepts related to the study of personality. Introduction to personality disorders and psychopathology. Prerequisite: 1 or equivalent.

3 units, Win (Lisle)

114. Introduction to the Nervous System: Ion Transport and Intracellular Messengers—Ion channels, carriers, and ion pumps, and their regulation by intracellular messengers in a variety of cell types. Prerequisite: consent of the instructor. Recommended: introductory biology or human biology, or psychology 107.

3 units, Spr (Wine) TTh 3:15-4:30

115. Social Development—Socialization and the development of social behaviors. A review of research concerning conscience and conduct, altruism and aggression, cooperation and competition, achievement and self-control. (DR:4)

3-4 units, not given 1990-91

116. The Psychology of Women—(Same as Feminist Studies 126.) Research and theory on the socialization and psychological development of women. The biological, cultural, and social factors that influence gender specific behavior. (DR:4)

3 units, Aut (Carstensen) TTh 10-11:30

117. Observation of Children—Seminar on learning about children through guided observations at Bing School, Stanford's Child Development Laboratory School. Physical, emotional, social, cognitive, and language development studied. Recommended: 111.

3-5 units, Win, Spr (Chandler) Th 4-5:30 and by arrangement

118. Developmental Practicum—Supervised experience with young children at Bing School, Stanford's Child Development Laboratory School. Three units involves four hours per week in Bing classrooms throughout the quarter; 4 units involves seven hours per week; 5 units involves 10.5 hours per week. Weekly seminar on developmental issues in the teaching-learning environment at Bing School. May be repeated for credit up to 15 units. Prerequisite: 111 or 117, or consent of instructor.

3-5 units, Aut, Win, Spr (J. Lepper) T 4-5:30 and by arrangement

120. Cognitive Development—Topics and issues on cognitive development, developmental changes in memory, conceptual organization, logical reasoning, and communication skills. Prerequisite: 1.

3 units, Spr (Markman) MWF 10

121. Social Psychology—Interpersonal behavior. A survey of relevant research concerning attitudes, groups, person perception, and selected topics in social psychology. Prerequisite: 1 or equivalent.

3 units, Win (Pratto)

122. Children's Literature: A Psychological Perspective—The ways of looking at children's literature (ages 2-12) as mirrors for the conscious
and unconscious, as reflectors of what children value, and as indicators of where our society is headed. Writers and illustrators: Maurice Sendak, A. A. Milne, Russell Hoban, and E. B. White, etc. Fairy tales are discussed from several viewpoints including the psychoanalytic represented by Bruno Bettelheim. Enrollment limited to 20. Prerequisites: 1 or 117, and consent of instructor.

3 units, Win (B. Shepard) TTh 1:15-2:30

125. Psychology and Law—(Same as Law 104.) 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 (Rosenhan) not given 1990-91

127. Afro-American Psychology—Introduction to ethnic psychology, specifically, the psychological dimensions of the Black experience in America. Lectures and readings. Black psychology from its evolution as a concentration area in the social sciences to present concerns that impact Black Americans’ mental health. Students are encouraged to expand upon the methodological constructs employed in the study of Black Americans.

3 units, Spr (Staff) MWF 10

128. Research Methods and Experimental Design—Examination of experimental research methods and principles in psychology. Structured research exercises and the design of an individual research project are required. Prerequisite: consent of instructor.

5 units, Spr (M. Lepper) TTh 1:15-3:05

130. Development in Infancy—Development in the first two years of life. Topics: prenatal development and childbirth, perceptual development, cognitive development in infancy, parent-infant interaction, infant social cognition, the development of emotion, and preverbal communication. Four units involve workshops and paper focusing on social policy issues related to early development.

3-4 units (A. Fernald) not given 1991-92

132. Laboratory Course in Developmental Psychology—For students interested in acquiring research skills. Focus is on conceptual and methodological issues related to research on early development; training in experimental design, laboratory, and observational procedures, and the collection, analysis, and interpretation of data. Students conduct a series of supervised experiments, with infants and preschoolers, at the Center for Infant Studies in the Department of Psychology and at the Bing School. Limited enrollment. Prerequisites: 111 or 120 or 130, and consent of instructors.

5 units (A. Fernald, Flavell, Markman) not given 1990-91

132A. Laboratory Section for Psychology 132—One two-hour period per week. Prerequisite: concurrent enrollment in 132.

1 unit (A. Fernald, Flavell, Markman) not given 1990-91

134. The Affective Disorders—(Graduate students register for 234.) Current evidence on the experience of depression and mania in adults and children, including gender differences, socioeconomic class differences, and culture differences in depression. The genetic, biochemical, psycho-dynamic, cognitive and behavioral theories of affective disorders, and the treatments prescribed by these theories. Prerequisite: 136.

3 units, Win (Nolen-Hoeksema) TTh 1:15-2:30

136. Abnormal Psychology—The characteristics, possible causes, and best treatments for many types of psychological disturbance. Emphasis is on how one builds and tests theories of psychological disturbances. Prerequisite: 1 or equivalent.

4 units, Spr (Nolen-Hoeksema) MWF 11

136A. Abnormal Psychology Discussion Section—Optional supplement to 136. Small discussion groups led by graduate teaching assistants. Prerequisite: concurrent enrollment in 136.

1 unit, Spr (Nolen-Hoeksema) by arrangement

137. The Interpersonal Basis of Abnormal Behavior—The role of interpersonal problems and processes in producing different forms of psychopathy, from neurotic reactions to schizophrenia. Combines clinical (case study) approach with conventional empirical approaches to clarify the origin, nature, and treatment of emotional disorders. Prerequisite: 136.

3 units (Horowitz) given 1991-92

138. Carl Jung and Analytical Psychology—Introduction focusing on the person of Jung, his seminal philosophical perspectives and their impact upon modern thought and life. The formation of analytical psychology with regards to Jung’s past relationship with Freud and later emergence as a prominent 20th-century thinker. Extended discussions of archetypal themes of the shadow, animas/animus (feminine/masculine) and puer/senex (youth/elder). Function of dreams and the interplay between the Jungian paradigm and spirituality.

4 units, Aut (Daher) TTh 1:15-3:05
140. Sleep and Dreams—(Same as Human Biology 11.) Multi-media lecture/survey format providing a background of current information and research on how sleep affects our daily life. Topics: physiology of NREM and REM sleep, daytime sleepiness and performance, circadian rhythms, dreaming (i.e., content, psychophysiological correlates, lucidity, etc.), sleep disorders such as insomnia, narcolepsy, sleep apnea, sleepwalking, jet lag, sleeping pills, sleep deprivation, developmental and phylogenetic aspects, sleep and memory, and other areas.

3 units, Win (Dement, Rosekind) TTh 11-12:15

142. Peace Studies—(Same as Political Science 133, Sociology 188, History 143, VTSS 143.) Interdisciplinary, dealing with the challenges of pursuing peace in a world where the sources of conflict are many and regional/ethnic/religious antagonisms are rising. Creating and maintaining peace is analyzed from historical, social, psychological, and moral perspectives. The nature of peace and peaceful processes (e.g., historical and political perspectives, questions of harmony and aggression at different social levels, and feminist analyses). Peace at the operational level (e.g., social-psychological analyses, studies of bureaucracy, theories of structural violence, analyses of the defense economy and economic conversion, and the making of RenemiesS). Peace-moral and normative considerations (e.g., pacifism and its critics, studies of moral disengagement and of concepts of responsibility). Hopeful developments and important successes.

5 units, Spr (Drekmeier, Ross, Moses, Bland, Dornbusch) TTh 2:15-4:05

146. Language and Thought—(Same as Linguistics 145.) The psychology of language, including production and understanding in utterances; from speech sounds to speaker’s meaning; children’s acquisition of the first language; and psychological bases for language systems. Language functions in natural contexts and their relation to the processes by which language is produced, understood, and acquired. Prerequisite: 1 or Linguistics 1. (DR:4)

4 units, Aut (Keysar) TTh 1:15-2:30

147. Animal Behavior—(Same as Human Biology 157.) Ethology, its physiological mechanisms, ecology, and evolution. Introduction to the phylogeny, genetic basis, and adaptive function of species-typical behavior in animals.

3 units (R. Fernald) TTh 11-12:15

152/252. Statistical Methods for Behavioral and Social Sciences—(Same as Education 257.) For students with prior experience and training in empirical research. Analysis of data from experimental designs through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through two-way tables, logistic regression. Use of statistical computing packages. Prerequisite: Statistics 60/160.

5 units, Win (Rogosa) MWF 11-12:30 plus section by arrangement

153. Statistical Theory, Models, and Methodology—(Graduate students register for 253.)

3 units, Spr (Pratto)

155. Human Abilities—(Same as Education 255.) Introductory survey of psychological theory and research on human cognitive abilities; their nature, development, and measurement; and their importance in society. Relation of education and intellectual abilities; examples relating to other social institutions. Cognitive analysis of verbal reasoning and spatial abilities. Individual differences in abilities in relation to motivation, personality, gender, and ethnic differences. Prerequisite: 1 or equivalent. (DR:4)

3 units, Win (Snow) MWF 10

156. Decision and Judgment—(Graduate students register for 256.) Theory and experiments about decision making and judgment under uncertainty. Focuses on the contrast between the rational theory of judgment and choice, and the psychological principles that produce judgment biases and cognitive illusions. Senior Psychology majors who need this course for the Decision Science Track see Academic Assistant. Prerequisite: elementary concepts of probability or statistics.

3 units, Win (A. Tversky) MW 1:15-2:30

162. Theoretical Methods in Cognitive Science and Cognitive Psychology—(Same as Symbolic Systems 162.) Introduction to model building methods in cognitive science and cognitive psychology focusing on computer simulation methods and models. Students study current models and get hands-on experience exploring several examples. Individual modeling projects.

3 units, Aut (Rumelhart) TTh 9-10:15

163. Mathematical Models of Psychological Processes—(See 215.)

164. Mathematical Representation of Structures in Psychological Data—(See 218.)

167A. Peer Counseling: Bridge Community—Instruction in peer counseling. Topics: verbal and non-verbal attending and communication skills, the use of open and closed questions, working with feelings, and summarization and integration. Instruction through lectures, individual training, group exercises and discussion, role-play, and videotaped practice. Students de-
velop and apply the above skills in a variety of contexts. Enroll for credit in only one quarter.

2 units, Aut, Win, Spr (D'Andrea, Staff)
M 3:15-5:05 plus one evening section

167B. Peer Counseling: Chicano Community—
Instruction in basic counseling. Topics: verbal and non-verbal attending and communication skills, the use of open and closed questions, working with feelings, and summarization and integration. Also, counseling issues that may be salient when working with Chicanos, including the significance and process of Spanish-English code switching in communication, the role of ethnic identity in self-understanding, the relationship of culture to personal development, and the experience of Chicano students in university settings. Instruction includes lectures, individual training, group exercises, discussion, role play, and videotape practice.

2 units, Aut, Spr (Martinez) M 3:15-5:05
section by arrangement

167C. Peer Counseling: The Black Community—
Instruction in peer counseling with Blacks. Topics: the concept of culture, Black cultural attributes and their effect on Blacks' reactions to accepting counseling, verbal and non-verbal attending, the use of open and closed questions, working with feelings, summarization, and integration. Geared toward counseling with Blacks; methods of instruction include reading assignments, lectures, guest speakers, group discussion, role play, and videotaped practice. Students develop and apply skills in the Black community on campus or in other settings that the student may choose.

2 units, Aut (Edwards, Hoskins)
M 3-5, W 4-5

167D. Peer Counseling: Contraceptive Advising—
Trains staffers for the student-run Contraceptive Information Center at Cowell. Instructors and guest speakers provide a thorough training in contraceptive issues. Topics: reproductive anatomy and physiology; the effectiveness, mechanism of action, and usage of available birth control methods; all aspects of abortion; and counseling techniques. Also, sexually transmissible diseases, future methods of contraception, and sexuality. Preference is given to students who make a commitment to staff at the Contraceptive Information Center in subsequent quarters, but all interested students are encouraged to enroll as space permits.

3 units, Aut, Win, Spr (Cowell Staff)
T 7-10 p.m.

167F. Peer Counseling: Asian Community—
Instruction in peer counseling with Asian students. Topics: the Asian family structure, concepts of identity, ethnicity, culture, and racism in terms of their impact on individual development and the counseling process. Emphasizes the development of an appreciation and empathic understanding of Asians in America. Lectures, readings discussion, and group exercises.

2 units, Aut (Huang) W 3:15-4:45

168A, B. Tutor Skills Training—(Same as Education 100A, B.) For undergraduates who want to tutor or coach in local schools and educational programs. Opportunities for first-hand experience exist at all grade levels and in a wide variety of subjects. In class, students discuss, experience, and learn relevant interpersonal, analytical, and instructional skills. Student must have concurrent tutoring placement. (Contact UPSE, Upward Bound, or the Public Service Center, or attend the first class meeting.)

168A. Skills Training for Elementary Level Tutors—(Same as Education 100A.)
2-3 units, Aut, Win, Spr (Takemoto)
W 4:15-5:30

168B. Skills Training for Secondary Level Tutors—(Same as Education 100B.)
2-3 units, Aut, Win, Spr (Staff)

170. Identity and Role: A Practicum—(Same as Drama 124.) Topics and concepts at the interface of psychology and drama: emotion, self, madness, situated identity, status transactions, power, and time perspectives. Exploration is academic and experiential, with readings, lectures, demonstrations, class exercises, and dramatic presentations. Team project on one of the major topics is presented to the class as a videotaped performance. Preference given to Psychology and Drama majors. Prerequisite: consent of instructors.

4 units (Zimbardo, Ryan)
not given 1990-91

171. Psychological Aspects of Addiction—
The medical, psychological, and social issues involved with alcohol and drug abuse, and dependence. Students are trained to identify, assess, intervene upon, and refer alcohol and drug problems. Limited enrollment. Prerequisite: 167A, B, or C.

3 units, Aut, Spr (Matano) M 2:15-4

174. The American Drinking and Drug Culture—
The role of alcohol and other drugs in American society and in the university community. Social, political, and physiological factors which influence drinking and drug taking practices are explored through expert guest presentations and student group discussions.

3 units, Spr (Miller) TTh 2:15-3:30

175. Applications of Social Psychology—
The application of social psychological theory and research to a variety of issues and problems.
including: 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, problems of conflict resolution and negotiation, applications of social psychology in legal, medical, educational, and business settings. Prerequisites: 1 and 60, or permission of instructor. 4 units, Win (Ross) TTh 1-2:30

176. The Person and the Situation—(See 276.)

177. Social Psychology of Physical Deviance and Disability—(Same as Human Biology 177.) The issues faced by the disabled and the physically deviant. Focus is on interaction problems (short term and long term). Emphasis on the data needed to formulate policy changes. Enrollment limited.
4 units, Aut (Hastorf, Scott) TTh 11-12:15

178. Psychological Analysis of Time Perspective—Analysis of the ways in which individual differences in time perspective influence emotions, motivation, cognitive functioning, and a range of behavioral choices. The origins, correlates, and consequences of biased time perspectives. Research teams within the class design, execute, analyze, and write an original investigation on the topic.
3-4 units, Win (Zimbardo) W 1:15-3:05 plus hours by arrangement

180. Undergraduate Seminar: Selected Topics in Psychology—(Refer to quarterly Time Schedule for seminar listings.)

182. Senior Honors Seminar—Limited to students in the senior honors program. Autumn Quarter: students participate in a weekly seminar concerned with methods and approaches to psychological research and initiate an independent research project under the supervision of an appropriate faculty member. Winter and Spring Quarters: complete the research and writing the thesis. Students present their completed projects at a convention near the end of Spring Quarter.
4 units, Aut (B. Tversky) T 3:15-5:05

184A,B,C. Paraprofessional Internship Program—Primarily for students interested in counseling, clinical, educational, and community psychology through field experience. Variety of opportunities for working with emotionally and behaviorally disturbed children: with adolescents in high school peer-counseling programs or through Juvenile Probation; with adults at the V. A. Hospitals, mental health clinics, or centers for the elderly. On-site training and supervision provided. No previous experience required, but internships demand a generous commitment of time and energy (8-12 hours per week) for two consecutive quarters. Weekly seminar explores diversity of clinical opportunities and covers specific therapeutic techniques. 1-5 units, Aut, Win, Spr (Carlsmith) T 1:15-2:30 and by arrangement

185A,B,C. Experience-based Study on the Meaning of Being Handicapped—Comprehensive look at a number of handicaps; the life experience of the individual affected and his or her family. Also, the roles of doctor, therapist, special education teacher, counselor, and other professionals involved in the life of the handicapped person. Weekly seminars; students also teach swimming and/or other skills to children and adults with 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 (Carlsmith, Wright) Th 7:30-9:30 p.m. and by arrangement

188. Reading and Special Work—Independent study. Satisfactory/No Credit. Can be repeated for credit. Prerequisite: consent of instructor. 1-3 units, any quarter (Staff) by arrangement

189. Behavioral Endocrinology—(Same as Human Biology 189.) The behavioral and environmental influences on endocrine regulation, particularly hormones which are related to responses to stress. The basic endocrinology and neuroendocrine regulation of stress-related hormones. Emphasis on the interaction of psychological variables and the activity of the pituitary-adrenal system. Also, a detailed examination of the concepts of stress and coping from a theoretical perspective. Prerequisite: Human Biology core, or consent of the instructor.
3 units (Levine) alternate years, given 1991-92

190. Early Experience—(Same as Human Biology 143.) Experimental literature related to the effects of pre- and postnatal environmental factors on development and adult function. Animal and human research, and behavioral and psychological function. Prerequisite: consent of instructor.
3 units (Levine) given 1992-93

191. Undergraduate Seminar: Behavior Change—Analysis of social cognitive approaches to personal and social change. Ethical and value issues in behavior change. Prerequisite: consent of instructor.
3 units, Win (Bandura) T 2:15-4
192. Undergraduate Seminar: Aggression—Analysis of the causes and modification of individuals and collective aggression. Major issues in aggression: the social labeling of injurious conduct, social determinants of aggression, effects of the mass media, institutionally sanctioned violence, terrorism, psychological mechanisms of moral disengagement, and legal sanctions and nuclear deterrence doctrines. Prerequisite: consent of instructor.
3 units, Spr (Bandura) M 2:15-4

194. Undergraduate Seminar: Development of Children's Knowledge About the Mind—Prerequisite: consent of instructor.
3 units, Spr (Flavell) M 1:15-3:05

197. Undergraduate Seminar: History of Psychology—The development of psychological theory from a historical perspective. Major systematic positions: Gestalt theory, behaviorism, and psychoanalysis. Prerequisite: consent of instructor. Recommended: 2 courses in psychology.
3 units, Win (Hastorf) T 1:15-3:25

198. Undergraduate Topical Seminar on the Psychology of Women—(Same as Feminist Studies 186; graduate students register for 238.) In-depth coverage of a specified topic related to psychology and women. Prerequisite: 116.
3 units, Win (Carstensen) T 2:15-4:30

199. The Psychology of Mind Control—Analysis of psychological phenomena in which central aspects of individual functioning undergo dramatic reorganization: attitude and value change, religious conversion. Focus is on techniques (hypnosis, “love-bombing,” sensory deprivation), agents of persuasion (charismatic leaders, supersalesmen, therapists, gurus), contexts (total environments, “normal appearances”) and vulnerabilities of target populations. Goal is to design effective resistance strategies. Prerequisite: 1.
5 units, Spr (Zimbardo) MWF 1:15-3:05

PRIMARILY FOR GRADUATE STUDENTS

Undergraduate students admitted only by consent of instructor.

203A. Visual Sensing by Humans and Computers—(See 103A.)

203B. Visual Sensing by Humans and Computers—(See 103B.)

206. Behavioral Neuroscience—The biological substrates of behavior emphasizing topics currently being investigated by resident and visiting neuroscientists at Stanford. Example topics: neuroanatomical and neurophysiological aspects of vision, audition, motor control and learning and memory, and hormonal and neurochemical aspects of stress and motivation.
3 units, Spr (Wandell, Wine) TTh 1:15-2:30 alternate years, not given 1991-92

207. Proseminar for First-Year Graduate Students—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 (M. Lepper) TTh 10:30-11:30

209. Perception—(See 109.)

210. Memory and Learning—Survey of major topics in human memory emphasizing information-processing approaches to short-term memory, organization and long-term memory, forgetting, retrieval processes, prose memory, imagery, emotional memory, autobiographical memory, and skills. Prerequisite: graduate standing in psychology or consent of instructor.
3 units, Aut (Bower) MW 10:30-12

211. Developmental Psychology—Prerequisite: graduate standing in psychology or consent of instructor.
3 units, Win (A. Fernald, Flavell, Markman) TTh 3:15-4:45

212. Social Psychology—Prerequisite: graduate standing in psychology or consent of instructor.
3 units, Aut (M. Lepper, Ross) TTh 1:15-3:05

213. Personality—Survey of methodologies appropriate for personality research; relations among major theoretical perspectives; parental, peer, and genetic influences; mediating cognitive and emotional processes; and applications to clinical, community, and health psychology. Prerequisite: graduate standing or consent of instructor.
3-4 units (Staff) not given 1990-91

214. Psycholinguistics—(Same as Linguistics 246.) Prerequisite: graduate standing in psychology or consent of instructor.
3 units (H. Clark) not given 1990-91

215. Mathematical Models of Psychological Processes—Survey of uses of mathematical models in psychology emphasizing measurement theory, perception, and learning. Prerequisite: graduate standing in psychology or consent of instructor.
3 units (A. Tuersky, Wandell) alternate years, given 1991-92

216. Abnormal Psychology—Selected literature in abnormal psychology approached from a cognitive and interpersonal perspective. Attempts to integrate psychoanalytic, cognitive, and behavioral views of the nature, origin, and treatment of abnormal behavior. Prerequisite:
3 units, Win (Horowitz) TTh 9:30-11

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, Aut (R. Shepard) TTh 3:15-4:45

219. Graduate Seminar on Selected Topics in Cognition—Prerequisite: consent of instructor.

3 units, Spr (B. Tversky) T 3:15-5

220. Graduate Seminar: Special Topics in Cognitive Development.

3 units (Markman) alternate years, given 1991-92

224. Survey of Research Topics in Artificial Intelligence—(Same as Computer Science 520.) Survey of current research in AI. Topics vary each year. Current research topics: 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. Involves distinguished outside lecturers who are topic specialists. Prerequisite: Computer Science 223 or equivalent.

1 unit, Spr (Latombe) T 11

225. Psychology and Law Proseminar—(Same as Law 345.) Current Stanford research on psycholegal issues. Acquaints faculty and students in the Psychology/Law program with each other's current research and with contemporary issues in the field. Prerequisite: graduate standing in psychology or law, or consent of instructor.

3 units, Spr (Rosenhan) by arrangement

228. Ion Transport—Ion channels, carriers, and ion pumps, and their regulations by intracellular messengers in a variety of cell types. Laboratory demonstrations, and brief hands-on introduction to some techniques (e.g., patch clamping).

3 units, Spr (Wine) TTh 3:15-4:30


4 units (Thoresen) given 1991-92

234. The Affective Disorders—(See 134.)

236. Graduate Seminar on the Development of Children's Knowledge About the Mind—Prerequisite: graduate standing in psychology or consent of instructor.

3 units, Win (Flavell) M 3:15-5:05 alternate years, not given 1991-92

237. Career and Personal Counseling in Culturally Diverse Settings—(Same as Education 134.) The design and implementation of career counseling interventions based on cross-cultural perceptions and definitions of career competence, career development theories, and appropriate counselor behavior. Case studies of bicultural role conflict in work settings are analyzed for their counseling implications.

3 units, Win (Krumboltz, Gallagher-Thompson) M 3:15-5:05

238. Topical Seminar on the Psychology of Women—(See 198.)

239. Advanced Cognitive Development—Current theory and research in cognitive development. Topics: Piagetian and other theoretical approaches; developmental aspects of perception, attention, memory, comprehension, communication, and social cognition. Prerequisite: 211 or consent of instructor.

3 units (Flavell) alternate years, given 1991-92

240. Language Acquisition I—(Same as Linguistics 240.) Survey of present knowledge of processes of language acquisition from a linguistics point of view, and recent and past literature.

4 units (E. Clark) given 1991-92

241. Language Acquisition II: Acquisition of Syntax—(Same as Linguistics 241.) Examines proposals about and evidence of syntactic rules.

4 units (E. Clark) given 1991-92

242. Conceptual Organization and Development—Theories and research in conceptual organization and development critically evaluated. Topics: the acquisition of categories and category terms informed by the general problem of induction, by philosophical and psychological analyses of the nature of human categories (natural kind terms, family resemblances), by recent arguments how the acquisition of category terms is guided by constraints children place on possible word meanings, and by more traditional theories of cognitive development.

3 units, Aut (Markman) by arrangement alternate years, not given 1991-92

243. General Development Seminar—Prerequisite: consent of instructors.

1-2 units, Win (A. Fernald, Flavell) by arrangement
247. Social Development—Current theory and research on social development. Topics: socio-emotional development in infancy, attachment, children's understanding of emotion, gender differentiation, peer relations, and moral development. Prerequisite: consent of instructor.
3 units (A. Fernald) not given 1990-91

248. Introduction to Test Theory—(Same as Education 352.) Concepts of reliability and validity; derivation and use of test scales and norms; mathematical models and procedures for test validation, scoring, and interpretation. Prerequisite: 60 or Statistics 60, or equivalent.
3-4 units, Spr (Haertel) MW 3:15-5:05

249A. Problems in Measurement: Item Response Theory—(Same as Education 353A.) Survey of alternative mathematical models used in test construction, analysis, and equating. 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.
3 units, Aut (Haertel) MW 9:20-10:50

249B. Problems in Measurement: Factor Analysis—(Same as Education 353B.) Models, methods, and applications of factor analysis. Models for factor analysis; estimation procedures; factor rotation; factor scores; using factor analysis in research; confirmatory factor analysis, methods for dichotomous variables. Prerequisites: 152 and 248, or Education 250B and 252, or equivalent.
3 units (Haertel) alternate years, given 1990-91

250. Statistical Methods for Behavioral and Social Sciences—(Same as Education 257.) For students with prior experience and training in empirical research. Analysis of data from experimental designs through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through two-way tables, logistic regression. Integrated with the use of statistical computing packages. Prerequisite: Statistics 60/160.
5 units, Win (Rogosa) MWF 11-12:30 plus section by arrangement

251. Statistical Theory, Models, and Methodology.
3 units, Spr (Pratto)

252. Statistical Methods for Behavioral and Social Sciences—(Same as Education 257.) For students with prior experience and training in empirical research. Analysis of data from experimental designs through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through two-way tables, logistic regression. Integrated with the use of statistical computing packages. Prerequisite: Statistics 60/160.
5 units, Win (Rogosa) MWF 11-12:30 plus section by arrangement

254. Principles of Personality Change—Analysis of the determinants and mechanisms of human motivation and psychological disfunctions. Social cognitive approaches to personal and social change. Prerequisite: graduate standing.
3 units, Aut (Bandura) M 2:15-4

255. Graduate Seminar: Selected Topics in Personality and Abnormal Psychology—Prerequisite: consent of instructor.
3 units, Aut (Horowitz) by arrangement

256. Decision and Judgment—(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

258. Graduate Seminar in Social Psychology Research—For students who are already or planning to become involved in research on social construal and the role that it plays in a wide variety of phenomena, most notably the origin and escalation of conflict.
1-3 units (M. Lepper, Ross, Zimbardo) not given 1990-91

3 units, Spr (Rumelhart) W 10-1

261. Psychology of Problem Solving and Reasoning—(Same as Education 295X.) Introduction to results and methods of research on cognitive processes of solving problems and reasoning. Focus is on accomplishments and limitations of research conducted since 1970.
3 units, Spr (Greeno) MW 3:15-4:40 alternate years, not given 1991-92

262. Selected Topics in Human Learning—Recent empirical and theoretical analyses of verbal learning, learning from text, learning of concepts, and intellectual skills. Emphasis on information processing theories of memory and retrieval. Readings from recent research journals with topics determined partly by students' interests. Discussion format. Prerequisite: 210 or consent of instructor.
3 units, Win (Bower) Th 10-12

265. Parallel Distributed Processing: Explorations in the Microstructure of Cognition—Advanced graduate seminar on the emergence of
intelligence from the interaction of a large number of neuron-like elements. Focuses on current work in the application of brain-style computational models to psychological phenomena and to applications in artificial intelligence.

3 units, Win (Rumelhart) W 12-3

268. Psychophysics and Cognitive Psychology for Musicians—(Same as Music 151.) Basic concepts and experiments in psychophysics and cognitive psychology relevant to the use of sound, especially of synthesized sound, in music. Introduction of elementary concepts; no previous acquaintance with basic concepts or experiments is assumed. Listening to sound examples plays an important part in course. Emphasis is on the salience and importance of various auditory phenomena in music.

3 units, Win (Matthews, Pierse, Schubert, Shepard) Th 9-11

269. Graduate Seminar in Personality Research—Can be repeated for credit. Prerequisite: graduate standing in psychology.

1-2 units, Aut, Win, Spr (Nolen-Hoeksema) by arrangement

272. Special Topics in Psycholinguistics—May be repeated for credit. Prerequisite: consent of instructor.

3 units (H. Clark) not given 1990-91

274. Selected Topics in Judgment and Choice—Seminar addresses some central issues in the analysis of decision and judgment: the determinants of confidence, the assessment of well-being, the basis of wishful thinking and the resolution of interpersonal conflict. Prerequisite: graduate standing in psychology or permission of instructor.

1-3 units, Aut (A. Tversky) T 4-5:30

275. Graduate Research—Research of intermediate nature; undertaken with members of departmental faculty. Prerequisite: consent of instructor.

(Staff) by arrangement

276. The Person and the Situation—(Undergraduates register for 176.) Seminar explores the situationist tradition in social psychology and relates it to the search for consistent, stable, individual differences in the field of personality and to the applied problem of changing beliefs, behavior, and social institutions. Prerequisite: at least one prior course in social psychology or personality, or consent of instructor.

4 units (Ross) not given 1990-91

278. Graduate Seminar: Internal Representation—Can be repeated for credit. Prerequisite: consent of instructor.

1-3 units, Win (R. Shepard) W 1:15-3:15
Government plays an important, ubiquitous role in contemporary society. Moreover, the growing complexity of public policies, the political processes that give rise to them, and the organizations that implement them have created a need in government, business, and the non-profit sector for people who understand how government operates. The Public Policy Program gives students the foundational skills and institutional knowledge for understanding the policy process and provides an interdisciplinary course of study in the design, management, and evaluation of public sector programs and institutions. The major in Public Policy is useful as preparation for employment as an analyst in government agencies or business, as a foundation for postgraduate professional schools in business, education, law, and public policy, and as preparation for graduate study in the social sciences, especially economics, political science, and sociology.

UNDERGRADUATE PROGRAM

BACHELOR OF ARTS

The core courses in the Public Policy Program develop the skills that are necessary for understanding the political constraints faced by policy makers, assessing the performance of alternative approaches to policy implementation, evaluating the effectiveness of policies, and appreciating the sharp conflicts in fundamental human values that often animate the policy debate. After completing the core, students apply these skills by focusing their studies in one of several areas of concentration. The areas of concentration may deal with a specific field of public policy, with types of institutions, or with deeper development of the tools of policy analysis. The fields of concentration are:

1. Resources and Environment
2. Health Care
3. Population
4. Education
5. Social Policy: Poverty, Discrimination, Crime
6. Science and Technology Policy
7. International Relations and Trade
8. Developing Areas
9. The Law and Legal System
10. Government Regulation of Business
11. Urban and Regional Policy
12. Advanced Methods of Policy Analysis
13. Design of Public Institutions

Completion of the program in Public Policy requires 73 units of coursework:

1. Thirty units of prerequisite courses: Statistics 60 and 61; Economics 1, 51 or 51Q, and 52; and Sociology 160 or Industrial Engineering 100. In addition, students are encouraged to take at least one year of coursework in calculus and linear algebra.

2. The 25-unit sequence of 5-unit core courses, which students should plan to complete by the end of their junior year (see below for descriptions).

3. During the senior year, majors must complete 15 units of coursework in a problem-focused area. The 15 units of post-core coursework must be approved by an advisor, who is appointed when the student selects an area of concentration. This usually is done midway through the junior year, and must be done no later than the beginning of Autumn Quarter in the senior year.

4. Seniors are also required to participate in the year long Senior Seminar (Public Policy 200). Majors also must write at least one research paper during the senior year, and present it before the Senior Seminar. The senior paper may be a term paper for another course. Seniors may also write an honors thesis, which requires obtaining approval from a thesis advisor and taking at least 10 units of thesis research (Public Policy 199). Students must apply for admission to the honors program no later than the first week of the Autumn quarter of their senior year.

5. A maximum of 10 units may be taken on a Satisfactory/No Credit basis in fulfillment of the major requirements, but the five core courses must be taken for a letter grade.

6. The Public Policy Program offers several courses to prepare students for making ef-
ffective academic use of an internship (Public Policy 179, 180, 181, 182, 184). Students may also participate in the Integrated Scholar Intern Program combining directed reading and research with an internship.

7. Students must complete the Public Policy core and their concentration area courses with an average letter grade indicator of 2.0 or higher.

8. To become a major in Public Policy and to be nominated for the A.B. degree, students must complete an application, available at Building 60, room 61D. For additional information drop by or phone (415) 723-4551.

COURSES

101. Politics and Public Policy—(Same as Political Science 101P.) The domestic policy-making process, emphasizing how elected officials, bureaucrats, and interest groups shape governmental policies in various areas including tax policy, environmental policy, and social-welfare policy, given their goals and available tactics. How public policies are formulated and implemented. The results of this process using equity and efficiency criteria.
   5 units, Spr (Brady)

102. Organizations and Public Policy—(Same as Sociology 166, Urban Studies 153.) The concepts and methods for analyzing the influence of organizations on the setting and implementation of public policy. Varying conceptions of organizations as corporate actors and as social contexts. The several roles of organizations in relation to public policy, 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 10

102A. Introduction to Political Philosophy—(Same as Philosophy 30, Political Science 51D.) The concepts of equality, justice, tolerance, liberty, utility, and rights through major works in political philosophy; each presents a distinct and systematic conception of human nature and social and economic conditions of a just association. Readings: Hobbes, Locke, Mill, Marx, Rawls, and Nozick. (DR:3)
   5 units, Aut (Hampshire)

103B. Philosophical and Ethical Issues in Public Policy—(Same as VTSS 110.) Philosophical and ethical issues in science- and technology-related public policy conflicts. Develops the capacity for rigorous critical analysis of complex, value-laden policy disputes. Topics: nature of ethics and morality; nature and rationales for liberty, justice, and human rights; and the analysis of case studies illustrating the use (and abuse) of these concepts in recent and current policy disputes. Cases from: biomedicine (abortion, euthanasia, in vitro fertilization, pre-determination of sex of offspring, and genetic testing); environmental affairs (endangered species, wilderness and landmark preservation, coastal development, noise, and high-rise proliferation); work policy (privacy, "whistle-blowing," worker participation); and international relations (warfare, food and development aid, immigration, and repatriation of artistic patrimony). (DR:3)
   5 units, Win (McGinn)

104. Economics and Public Policy—(Same as Economics 150.) The relationship between economic analysis and economic policies. Economic rationales for public policies; methods and techniques of policy evaluation and the role of benefit-cost analysis; economic models of political processes and their connection to the analysis of economic policy-making; and the relationship of income distribution issues to policy choice. How economic analysis is done, and why the political process regards it as useful but not as necessarily determinative of policy choices. Readings: the theoretical foundations of economic policy analysis and policy decisions, and the analysis of the adoption and implementation of programs in a variety of policy areas. Prerequisites: 51, 52 (52 may be taken concurrently).
   5 units, Win (Noll)

105. Quantitative Methods and Their Application to Public Policy—(Same as Statistics 209.) Applications of statistical methods, rather than methodology per se. 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, Statistics 61.
   5 units, Spr (Moses) MW 8-10

106. The Politics of Bureaucracy—(Enroll in Political Science 106M.)
   5 units, Win (Moe)

107. Organizational Decision Making—(Enroll in Political Science 107)
   5 units, Aut (March)

108. Organizational Leadership—(Enroll in Political Science 108, Sociology 165, Business 379.)
   5 units, not given 1990-91

109. Political Analysis—(Enroll in Political Science 101, Business 338.)
   5 units, not given 1990-91
110. Introduction to Urban Studies—(Enroll in Urban Studies 110.)
4 units, Aut (Stout)

112. Science, Technology, and Contemporary Society—(Enroll in VTSS 101.) (DR:5)
4-5 units, Aut (McGinn)
4 units, Sum (McGinn)

113. Technology and Modern Industrial Society—
(Enroll in Economics 113, VTSS 107.)
(DR:5)
4-5 units, Spr (Rosenberg)

114. The Political Economy of Development—
(Enroll in Political Science 114K.) (DR:5)
5 units, not given 1990-91

118. The Economics of Development—(Enroll in Economics 118.)
5 units, Spr (Kochar)

120. Poverty and Public Policy in America—
(Enroll in Sociology 103.)
3-5 units, not given 1990-91

125. Seminar: The Rise of Industrial Asia—(Enroll in Political Science 125.)
5 units, Aut (Okimoto)

3 units Win (Karlin, Feldman)

127. Introduction to the Politics of Education—
(Enroll in Political Science 127.)
4 units, Win (Kirst)

129. Analysis and Management of Development Projects—(Enroll in Food Research 129, Economics 129.)
5 units, Spr (Gotsch)

130E. Environmental Earth Sciences I—(Enroll in Applied Earth Sciences 130.) (DR:8)
3-5 units, Aut (Mader, Remson)

130M. Application of Mathematical Programming to Agricultural Systems—(Enroll in Food Research 130.)
3-5 units, Aut (Gotsch)

130U. Current Issues in Urban Planning—(Enroll in Urban Studies 130.)
3 units, alternate years, given 1991-92

5 units, Spr (Arthur)

140. Public Decision Making Regarding Human Health—(Enroll in Human Biology 40.)
4 units, Spr (Jimison, Staff)

144. Economics of American Agriculture: Structure and Policy—(Enroll in Economics 144.)
4-5 units, Aut (Falcon)

145. American Foreign Policy—(Enroll in Political Science 145J.)
5 units, not given 1990-91

148. Urban Economic Analysis—(Enroll in Economics 148.)
5 units, Aut (Arnott)

150L. Regulation, Welfare, and Public Policy—
(Enroll in Law 150.)
4 units (Rabin) not given 1990-91

150U. Urban Sociology—(Enroll in Sociology 150.)
3-5 units, Win (Conell)

154L. Economics of Legal Rules and Institutions—(Enroll in Economics 154.)
5 units, not given 1990-91

154U. Urban Growth and Change—(Enroll in Sociology 154.)
5 units, Aut (Tuma)

155. Economics of Natural Resources—(Enroll in Engineering-Economic Systems 255.)
5 units, Aut (Sweeney)

156H. Economics of Health and Medical Care—
(Enroll in Economics 156.)
5 units, Spr (Fuchs)

156M. Decision and Judgment—(Enroll in Psychology 156.)
3 units, Win (A. Tversky)

157. Imperfect Competition—(Enroll in Economics 157.)
5 units, Aut (Bresnahan)

158. Antitrust and Regulation—(Enroll in Economics 158.)
5 units, Spr (Boal)

165. International Economics—(Enroll in Economics 165.)
5 units, Aut (Staiger)

166. International Trade Policy—(Enroll in Economics 166, Food Research 166.)
5 units, Spr (Pearson)

167. Environmental Policy Design and Implementation—(Enroll in Civil Engineering 266.)
3-4 units, Spr (Ortolano)

168H. Medical Anthropology—(Enroll in Anthropology 168, Human Biology 168.)
5 units, Aut (Becker)

5 units, Aut (Barker)

5 units, Win (Barker)
172. Introduction to American Law—(Enroll in Political Science 182F.) (DR:5)  
5 units, Aut (Friedman)

176. Seminar: The Supreme Court—(Enroll in Political Science 176.)  
5 units, Spr (Barker)

179. Preparation for Internship Learning—Provides students with knowledge and skills necessary for effective learning through an internship. Focus is on identifying and negotiating internship assignments which yield effective service and substantive learning appropriate to students' academic interests. Introduction to the theory and practice of self-directed "field" learning (e.g., clarifying goals and objectives, critical reflection on experience, problem-solving, assessing experiential learning, and understanding the interplay between experience and analysis in field research). If appropriate, students are connected with faculty who can serve as sponsors of internship-related directed study.  
2 units, Win (Stanton)

180. Washington, D.C.: Issues and Players—For undergraduates interning in a government agency the Summer Quarter following the course, particularly in the federal government in Washington, D.C. Provides a background on how public policy decisions are made in Washington, and develops skills to become effective interns.  
3 units, Win (Milton)

181. Policy Making for California State Government—Overview of major institutions, actors, and policymaking processes in California state government. For students who plan to work in Sacramento. Focuses on recent history and current status of legislative policymaking, electoral campaigns, and coalition building between executive and legislative branches.  
2 units, Spr (Kirst)

182. Policy Making and Problem-Solving at the Local and Regional Level—Public policy issues, processes, and organizations at local and regional level. Focus: public and non-profit sector institutions and organizations; structure and context of community problem-solving and local policy formulation, implementation and analysis. Case study investigation of public issues in the community, e.g., homelessness, toxic waste disposal, child care, land use planning. Opportunity to learn from local policy makers and community leaders.  
4 units, Spr (Stanton)

183. The Politics of Welfare Policy—(Enroll in Political Science 183D.)  
5 units, not given 1990-91

184. California State Government: Politics, Process, Performance—Detailed examination of the development and implementation of public policies in California, beginning with study of elections and campaign strategies for state office; includes organization of state legislature and executive branch, role of the courts, and process and effects of initiative and referendum. Current policy issues illustrate the consequences of the design of state government institutions, including legislative reapportionment, ethics in politics, the budgetary process, and environmental regulation. Term paper. Enrollment limited to 25. Prerequisite: course in American politics (Political Science 1, 10, or Political Science/Public Policy 101.)  
3 units, Win (Keene) F 1:15-4:05

185. The Distribution of Income and Wealth—(Enroll in Economics 185.)  
5 units, not given 1990-91

186. American Education and Public Policy—(Enroll in Education 105.)  
3 units, not given 1990-91

187. American Political Institutions—(Enroll in Political Science 292A.)  
5 units, not given 1990-1991

188. Politics and Policy for Children, Youth, and Families—(Enroll in Political Science 188K.)  
5 units, Aut (Kirst)

193. Political Economy of Institutions—Develops a systematic approach to the study of political and economic institutions. The basic logic of the New Economics of Organization applied to a range of institutions. Topics: modern political contexts (U.S. Congress, bureaucratic decision making, and international relations.) Historical instances of the role of institutions in the stability of feudalism, the rise of the West, Glorious Revolution in England (1688), the French Revolution, and the American Civil War. Prerequisites: Economics 51 and 150.  
3 units, Aut (Weingast)

194. Seminar: Courts and Public Policy—(Enroll in Political Science 194.)  
5 units, not given 1990-91

195. Politics and Economic Policy—The interaction between political processes and resource allocation, emphasizing the political and organizational problems of designing and implementing public policies. Examples: international trade policy, health and safety standards, and environmental regulation. Prerequisites: Political Science 101P, Economics 51.  
5 units, Spr (O'Halloran)
197. Seminar: American Political Parties—(Enroll in Political Science 197.)  
   5 units, Win (Rivers)
198. Directed Readings in Public Policy.  
   1-5 units (Staff) by arrangement
   1-5 units (Staff) by arrangement
200A, B, C. Senior Seminar—Designed to give Public Policy students the opportunity to make oral presentations and to write a seminar-length paper on a topic in public policy. Topic and methods of analysis used are determined by student in consultation with instructor. Also, a limited number of lectures and seminars in which the question of how to conduct "good" research in public policy is discussed. Prerequisite: completion of core courses in Public Policy or permission of the instructor.  
   200A. 1 unit, Aut (O'Halloran)  
   200B. 1 unit, Win (O'Halloran)  
   200C. 1 unit, Spr (O'Halloran)
201. History of Education in the United States—(Enroll in Education 201, History 158.)  
   3 units, Spr (Tyack)
   5 units, Spr (Goldstein)
220A. The Social Sciences and Educational Analysis: Introduction to the Economics of Education—(Enroll in Education 220A.)  
   4 units, Aut (Strober)
   3 units, Win (Kirst)
221. Issues in Policy Analysis—(Enroll in Education 221.)  
   4 units, Win (McLaughlin)
   4-5 units, not given 1990-91
   3 units, Win (Dantzig)

RELIGIOUS STUDIES

Emeritus: David S. Nivison (Asian Languages, Philosophy, Religious Studies)  
Chairman: Lee H. Yearley  
Professors: Rene Girard (French and Italian and, by courtesy, Religious Studies), Edwin M. Good, Van A. Harvey, Lewis W. Spitz (History and, by courtesy, Religious Studies)  
Associate Professors: Carl W. Bielefeldt, Arnold M. Eisen, Bernard R. Faure, Hester G. Gelber  
Assistant Professors: Howard Eilberg-Schwartz, Timothy P. Jackson  
Professor (Teaching): Robert C. Gregg  
Lecturers: Russell Kirkland, Elizabeth Napper  
Acting Assistant Professor: Philip J. Ivanhoe  
Visiting Assistant Professor: Jan Nattier  
Irvine Fellow: Rudy V. Busto

The purpose of Religious Studies is to understand and interpret the history, literature, thought, and social structures of various religious traditions and cultures. The department offers courses at several levels, described below.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The major in Religious Studies is designed to give 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 coursework in the department (no more than 10 units of which can be taken Satisfactory/No Credit), including 9 to 15 units in introductory courses (1-89), at least two of which must be in diverse religious traditions (e.g., Eastern and Western, oral and literate); and at least 40 units in courses numbered above 100, including no fewer than three seminars.

The bachelor's degree with Honors in Religious Studies may be earned by students who are endorsed by their advisors and the undergraduate director and who meet additional requirements, available from the 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. See a description of this joint major under the "Philosophy" section in this bul-
letin, or in the guidelines, which are 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. Complete information is contained in the Handbook of Graduate Religious Studies, available from the department secretary.

The student completes at least 48 units of graduate work at Stanford beyond the A.B. degree, including two required graduate seminars (304A and B). 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 work in particular areas. Advanced and graduate courses in other departments may be taken. 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.

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 the equivalent, in graduate work beyond the A.B. degree, and a minimum of 90 units of graduate coursework (excluding the dissertation) of which the last 72 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 Stanford departments cohere. They are: East Asian religions, Judaic studies, Western religions, and modern Western religious thought. Students who wish to specialize in other fields must obtain early approval by the faculty.

Stages of Advancement—The three stages through which the student advances to the degree are: (1) in the first two years, the student refines an area of specialization within the chosen field of study in preparation for candidacy; (2) after attaining candidacy, the student concentrates on the area of specialization in preparation for the qualifying examination; (3) 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. Each student also demonstrates reading knowledge of other ancient or modern languages necessary for the field of study, the area of specialization, and dissertation topics.

Courses—Each student satisfactorily completes the two graduate seminars (304A and B) before the candidacy decision. Other courses are taken with the approval of a faculty advisor in consideration of the student's field of study.

Candidacy—At the end of each academic year, the departmental faculty recommends second-year students for candidacy on the basis of all relevant information, and especially on the student's candidacy dossier, which includes the approved declaration of an area of specialization, faculty course evaluations, and one prescribed essay.

Teaching Internships—At least two teaching internships under the supervision of faculty members are undertaken at a time negotiated with the graduate director. Students receive academic credit for the required internships, which are projects of academic training and not of employment.

Qualifying Examination—To qualify for writing a dissertation, the student must successfully pass a comprehensive examination in the chosen field, the area of specialization, and the discipline of religious studies.

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 described in the "Humanities Special Programs" section in this bulletin.

COURSES

Course levels.

1-89 Introductory (4 or 5 units)
101-189 Topics in Religion (5 units)
197-199 Undergraduate Directed Reading (variable units)
201-289 Seminars for Undergraduates and Graduates (5 undergraduate units or 4 graduate units)

299 Graduate Directed Reading (variable units)

301-399 Graduate Seminars, Research, and Teaching (variable units)

INTRODUCTORY

1C. Comparative Religious Thought.
4 units (Staff) not given 1990-91

1E. Eastern and Western Conceptions of the Self—Analysis and comparison among models of the self in various traditions, notably classical Greek, Christian, Confucian, Buddhist, Taoist, and Freudian. Limited enrollment. (DR:3*)
5 units (Yearley) not given 1990-91

5 units, Spr (Elberg-Schwartz) MW 11-12:15

7. American Indian Religions—Types of religion among American Indian peoples and themes that characterize them, e.g., myths of origin, ceremonies, Rricksters, views of the world.
4 units, Win (Busto, Good) MW 11-12:15

14. Introduction to Buddhism—Early Buddhist, Mahayana, Vajrayana, Zen, Pure Land theories of mind and personal identity, meditation, compassion, wisdom, and liberation from suffering. Limited enrollment. (DR:3*)
4 units (Staff) not given 1990-91

18. Zen Buddhism—Introduction to Zen Buddhist religious thought, focusing on selected issues in several representative texts. (DR:3*)
4 units, Spr (Bielefeldt) MWF 1:15

section by arrangement

4 units, Aut (Faure) MW 11-12:15

section by arrangement

23. Judaism—Historical development of Jewish religious thought and practice, from biblical period to the present. Various kinds of texts reflecting that development: scriptural, liturgical, midrashic, legal, historical, and philosophical. (DR:3)
4 units, Aut (Eisen) MW 12:50-2:05

24A. Christianity—(DR:3)
4 units (Staff) not given 1990-91

5 units (Good, Gregg) not given 1990-91

4 units (Staff) not given 1990-91

42. Philosophy of Religion—(Same as Philosophy 42.) Classic questions in philosophy of religion: the existence of God, the problem of evil, free will and determinism, the ethics of belief, faith vs. reason. Readings include traditional and modern texts. (DR:3)
4 units, Spr (Gelber) MWF 1:15

47. Modern Christian Thought—Introduction to the important issues and thinkers who have influenced Christian theology (Catholic and Protestant) since WWII: neo-orthodoxy, existentialism, feminism, process theology, liberation theology.
4 units, Win (Harvey) MW 10

52F. Readings in Philosophy and Religious Studies—(Same as German 52F.)
3-4 units, Spr (Staff) MWF 12

55. Introduction to Chinese Thought—(Same as Asian Languages 46, Philosophy 46.) Religious and philosophical thought of early China, especially the “Classical” period, 550-200 B.C. Development of Chinese thought as an extended dialogue among thinkers who provided uncommon and often contradictory answers to a common set of problems. Limited enrollment. (DR:3*)
4 units, Aut (Ivanhoe) MWF 10
section by arrangement

65. Introduction to Christian Ethics—Four central moral concepts (love, freedom, sin, and salvation) as understood by four major Christian authors: Augustine, Kierkegaard, Simone Weil, and Martin Luther King, Jr. Critiques of Christian ethics by Nietzsche and Freud. (DR:3)
5 units, Win (Jackson) MW 1:15
section by arrangement

TOPICS IN RELIGION

III. Religious Classics of Asia—Introduction to the religious thought of Asia through analysis and comparison of selected issues in classical
texts from India and East Asia. Limited enrollment.

4 units, Win (Bielefeldt, Faure, Yearley)
MWF 10 section by arrangement

116. Japanese Buddhism—History and teachings of Buddhism in Japan, emphasizing the early and medieval periods. (DR:3*)
5 units, not given 1990-91

117. Syncretism and Sectarianism in Chinese Buddhism—Focuses on dialectical relationships between sectarian and syncretic tendencies, conservative and subversive elements, and orthodoxy and heterodoxy in development of Chinese Buddhism. Prerequisite: consent of instructor.
5 units (Faure) not given 1990-91

118. Death Rituals in East Asia—Focuses on various rituals and representations dealing with death and the other world in E. Asian religious traditions, e.g., Taoism, Confucianism, Buddhism, Shinto, and Chinese and Japanese popular religions.
4 units (Faure) not given 1990-91

119A. Neo-Confucianism—(Same as Asian Languages 231.) Introduction to later Confucian thought as represented in the Song through Qing dynasties. Brief introduction to Buddhist concepts which provided some of the theoretical foundations for reinterpretation of Confucian thought in its later phase. The thought of Cheng Hao, Cheng Yi, Ju Xi, Wang Yangming, Dai Zhen, and Zhang Xuecheng. Prerequisite: 55 or consent of instructor.
3 units, Win (Ivanhoe) MW 9

121. The Hebrew Bible—Studied as literature, i.e., as narrative, poetry, essay, oracle, and other forms, emphasizing the ways in which the biblical materials present themselves. (DR:2)
5 units, Aut (Good) MWF 9

5 units (Bielefeldt) not given 1990-91

126. Age of Reformation—(Same as History 110.)
(DR:3)
5 units, Win (Spitz) MTWTh 11

128. Women and Judaism—Role and image of women in classical Judaism; responses of modern Jewish women to traditional conceptions of women and femininity. Recent attempts to create a feminist Judaism.
5 units, Win (Eilberg-Schwartz)
MW 2.15-4.05

135. Introduction to Jewish Mysticism.
5 units, not given 1990-91

140. Religious Ethics.
5 units (Staff) not given 1990-91

141. Renaissance, Humanist, and Reformers—(Enroll in History 213.)
5 units, Aut (Spitz)

142. Early Christianity—(Same as Classics 104.)
The Christian movement to 500 A.D. and emergent beliefs/practices as these distinguished Christians from other groups and as they varied among Christians. Study of primary documents (ancient texts in translation) and surviving art/architecture examines early Christianity's modes of community organization, debates about orthodoxy and heteretical teaching, and interaction with other religions. Thematic interest concerns deployment of "holy power" in people, places, objects. (DR:5)
5 units, Win (Gregg) TTh 8:30-9:50

145. Protestantism—Development of Protestantism from Reformation to the present.
5 units (Harvey) not given 1990-91

147. Modern Christian Thought.
5 units (Harvey) not given 1990-91

148. Social Theory and Religion—(Same as Sociology 148.)
5 units (Eisen) not given 1990-91

149. Theories of Religion—Attempts to explain the origin and persistence of religious behavior and belief in the modern period. Philosophical, sociological, historical, and psychological theories, "classic" and contemporary.
5 units, Win (Harvey) MW 12-1:30

150. Systems of Buddhist Thought—Introduction to the Lotus school of Mahayana; its Indian sources, Chinese formulation, and Japanese developments.
5 units, Spr (Bielefeldt) MWF 10

152. New Religions in America—"New Religions" in 19th- and 20th-century America, emphasizing the Latter Day Saints (Mormons), Unification Church ("Moonies"), ISKCON ("Hare Krishnas") and Nichiren Shoshu of America. Historical, doctrinal, and sociological analysis of the origins and expansion of these movements.
5 units, Spr (Bielefeldt) MWF 10

153. Jews and Judaism in America—(Same as Sociology 151.) A particular Jewish community and the religious forms it has evolved, using historical, literary, sociological, and theological materials.
4 units (Eisen) not given 1990-91
154. Creation/Procreation: A Comparative Study—(Same as Anthropology 154, Feminist Studies 154.) An alternative to the study of religion and reproduction as distinct categories and separate domains. The gendered aspects of cosmological or religious systems and the cosmological significance of gender in terms of their symbolic interrelationships. Anthropological and other literature examines these relationships in several cultures, including our own. Emphasis on the ways these beliefs are embedded in practices and structures of social life and on Western categories and meanings, and their implications for theorizing.

5 units, Aut (Delaney) TTh 9-10:30

161. Modern Jewish Thought.
5 units (Eisen) not given 1990-91

162. Ethics, "Abominations," and "Liberations"—What moral abominations and liberations are and whether the particular practices examined qualify as instances. Focuses on gay liberation, the Holocaust, and abortion.

4 units (Jackson) not given 1990-91

163. Religion and Ethnicity—Religion and issues of race, class, and gender in development of ethnic communities in the U.S. Religion as promoting or resisting assimilation. Issues: revitalization; theologies of liberation; dissent and transformation within traditions.

5 units, Spr (Busto) MW 11-12:15

164. Morality of Peace and War—(Same as Philosophy 174.) Moral, political, and religious issues surrounding conflict and conflict-resolution, especially in a nuclear age. General nature of peace and war, their theory and practice, just war tradition, and pacifism. (DR:3)

5 units (Jackson) not given 1990-91

165. Religious Ritual—Classical and contemporary theories of religious ritual with case studies from a variety of traditions.

5 units, Spr (Eisen) MW 11-12:15

166. Anthropology of Ancient Judaism—Reconsideration of major practices and beliefs of ancient Judaism from perspectives of symbolic, cultural, and structural anthropology. Dietary restrictions, circumcision, sacrifice, menstrual laws, rules of impurity.

5 units, Aut (Eilberg-Schwartz) MW 11-12:15

167. Medieval and Renaissance Religious Philosophy—(Same as Philosophy 101.) Survey of Medieval and Renaissance philosophy focusing on puzzles arising when God and world are viewed as creator and created. Medieval and Renaissance debates over time and eternity, necessity and contingency, free will and determinism, knowledge of God. Readings: Augustine, Anselm, Aquinas, Scotus, Ockham, and Luther.

4 units, Win (Gelber) MW 11

171. Medieval Religious Thinkers.
5 units (Staff) not given 1990-91

174. From Kant to Kierkegaard—(Same as German Studies 174D.) Exploration of his writings emphasizing his views on religion. Prerequisite: consent of instructor.

5 units (Harvey) not given 1990-91

174D. Friedrich Nietzsche—(Same as German Studies 174D.) Exploration of his writings emphasizing his views on religion. Prerequisite: consent of instructor.

5 units, Spr (Harvey) MW 9

182. Modern Moral Issues—Nature of ethical reasoning (Christian and secular); examination of political violence, human sexuality, and abortion. Topics: just war theory, pacifism, capital punishment; sexual orientation, promiscuity, rape, monogamy; and pro-life and pro-choice positions.

5 units, Aut (Jackson) MW 11

UNDERGRADUATE DIRECTED READING

198. Honors Essay—Prerequisite: consent of instructor and of the department.

Aut, Win, Spr (Staff) by arrangement

199. Individual Work—Prerequisite: consent of instructor and of the department.

Aut, Win, Spr (Staff) by arrangement

UNDERGRADUATE AND GRADUATE SEMINARS

207. Religion, Culture, and Gender—Interplay between religious ideals and cultural realities in Tibetan Buddhism; examination of the roles of women, particularly nuns, in Tibetan society, with reference to gender issues in Western culture.

5 units, Aut (Napper) TTh 2:15-4:05


5 units, Spr (Nattier) MW 2:15-4:05
210. Speech and Writing in the Buddhist Traditions—Using Western "literature" on writing and morality (Derrida, Ong, Goody), examines various conceptions of speech and writing found in E. Asian religions, specifically the way writing has transformed the Chan/Zen tradition, and our interpretation of it.
4 units (Faure) not given 1990-91

211. The Taoist Religion—History and characteristics of the Taoist religion in Imperial China.
5 units, Win (Kirkland) TTh 2:15-4:05

212. Interpreting Confucian Texts—(Same as Asian Languages 230.) Illustrates critical importance of historical and philosophical issues to task of interpretation. Introduction to Chinese commentarial tradition. Seminar; pace, and range determined by constituents. Prerequisite: consent of instructor.
5 units, Win (Ivanhoe) TTh 2:15-4:05

214. History of Japanese Religions—(Same as History 295.) Pre-modern in focus, examines Japanese religion in terms of doctrinal, political, social, military, and economic history. Primary sources in translation. Structures of belief and practice and the synchronic interaction of such with the contemporaneous ideological environment.
5 units, Spr (Ketelaar) Th 1:15-3:05

217. Seminar: Reality and Fantasy in Chinese Tales—Traditional tales read in translation reveal attitudes about nature of the world, of human existence, and the divine. All the spheres of being (human, animal, diabolic, and divine) often impinge upon each other in unpredictable ways.
5 units (Kirkland) not given 1990-91

218. The Trickster in Asian Religions—The various types of trickster figures (jester, buffoon, madman) and their roles in Asian religious traditions (Taoism, Buddhism, Chinese and Japanese mythologies).
4 units, Win (Faure) MW 2:15-4:05

221. Ch'An/Zen Tradition and Popular Religion—Relationships between Ch'an and Zen tradition(s) and Chinese or Japanese local cults. Forms of symbolic mediation (ritual, meditative techniques, etc. in both religious traditions, and the "unmediated vision" advocated by the "sudden" school of Ch'an. Prerequisite: consent of instructor.
5 units (Faure) not given 1990-91

222A. Rabbinic Literature—Introduction to various genres of Rabbinic literature. Close reading of selected Midrashic texts in translation. Additional section for students with Hebrew.
5 units (Staff) not given 1990-91

230A. Zen Buddhism Seminar—Selected topics in Ch'an and Zen; may be repeated for credit.
5 units (Bielefeldt) not given 1990-91

234B. The Virgin Mary and Images of Power—(Same as Feminist Studies 150.) Studies of emergence of Virgin Mary as a symbol of religious and cultural values from earliest legends to modern era through art and literature. Emphasis on the Middle Ages.
5 units (Kelber) not given 1990-91

245. Comparative Religious Ethics.
5 units (Yearley) not given 1990-91

5 units (Bielefeldt) not given 1990-91

265. The Body in Religion, Culture, and History—Theoretical issues relevant to study of the human body. Ways in which it serves as vehicle for social representations and as locus for cultural processes of domination. The body and ritual, body politics, cultural constructions of body processes, bodily symbolism, the body and gender, the body and race, the body and sexuality.
5 units, Spr (Eilberg-Schwartz) Th 2:15-5:05

266. Medical and Legal Ethics—Ethical problems and assumptions of medicine and law. "Principles and cases" approach to interrelated concerns of the two professions. Topics: euthanasia, informed consent, quality of life vs. medical indications policies, mens rea, confidentiality, and justice within an adversarial system. Prerequisite: consent of instructor.
5 units (Jackson) not given 1990-91

267. Anselm—Significance of Anselm's life and works within 12th-century Medieval culture and for the history of religion and philosophy. His proofs for existence of God, views about free
will and sin, religious language, the Incarnation, Virgin Mary, and the Christian life.

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

268. Model Selves: Francis of Assisi—Formation of model self in myth and history in the Western tradition, emphasizing Francis of Assisi, with reference to other model selves, masculine and feminine.

5 units (Gelber) not given 1990-91


5 units, Aut (Jackson) TTh 4:15-6:05

275. Justice and Human Nature—(Same as Philosophy 275.) The relation between various accounts of justice (Rawls, Walzer, Niebuhr) and conceptions of the self (Charles Taylor, Alasdair MacIntyre, and Wolfhart Pannenbg). Has a post-Enlightenment consensus emerged on these topics, or is the liberalism/communitarianism distinction still significant? Do we need a theory of human nature for political philosophy?

5 units, Win (Jackson) TTh 2:15-4:05

277. Religious Existentialists.

5 units (Harrey) not given 1990-91


5 units, Aut (Eisen) MW 9-12

282. Relativism and the Diversity of Religions—Inquiry into the relationship between conceptual relativism and the diversity of religious beliefs.

5 units, Spr (Harrey) MW 4:15-6:05

286. Character and the Good Life—Is it possible or desirable to revive classical notions of good character and the good life? Are such ideals irrelevant to modern pluralistic societies? These questions pursued in modern works that analyze the issues and classical definitions, Western and Chinese, of human excellence. Limited enrollment.

5 units, Spr (Yearley) MW 2:15-4:05

GRADUATE DIRECTED READING

299. Individual Work—Prerequisite: consent of instructor.

Aut, Win, Spr (Staff) by arrangement

GRADUATE SEMINARS, RESEARCH, AND TEACHING

Topics of directed research (numbers ending in 9) vary each year according to student initiative and faculty research interests.

304A. Theories and Methods in the Study of Religion—Required of all graduate students in Religious Studies. Various approaches to the study of religion. Prerequisite: consent of instructor.

4 units (Staff) alternate years given 1991-92

304B. Theories and Methods in the Study of Religion—(See 304A.) Required of all graduate students in Religious Studies. Theories and methods. Anthropological approaches to religion: Durkheim, Levi-Strauss, Geertz. Prerequisites: consent of instructor, completion of 304A.

4 units, Aut (Faure) MW 2:15-4:05

311. Buddhist Studies Seminar—May be repeated for credit. Topic for 1990-91: History and historiography. The role of history in Buddhist tradition.

4 units, Win (Bielefeldt) by arrangement

315. Ch'an Studies: Methodological Issues—Relevance of recent developments in "theory" (hermeneutics, structuralism, post-structuralism, critical theory) for the study of the Ch'an and Zen tradition. Readings from Foucault, Derrida, Ricoeur, Bourdieu, and Ch'an/Zen classics. Prerequisite: consent of instructor.

4 units (Faure) not given 1990-91

319. East Asian Religions—Directed research (Bielefeldt, Faure, Yearley) by arrangement


5 units, Aut (Eisen) MW 9-12


(Eilberg-Schwartz, Eisen, Good, Gregg) by arrangement
339. Medieval Western Religions—Directed research
   (Gelber, Yearley) by arrangement
342. Interpretations of the Reformation—(Same
   as History 318.)
   5 units (Spitz) not given 1990-91
343. Humanism and the Reformation—(Enroll
   in History 319.)
   4 units, Aut (Spitz)
349. Modern European Religions—Directed research.
   (Eisen, Harvey, Jackson, Yearley)
   by arrangement
359. American Religions—Directed research.
   (Eisen, Harvey) by arrangement
   (Elberg-Schwartz, Eisen, Faure, Jackson)
   by arrangement
371. Selected Problems in Philosophy of Religion.
   5 units (Gelber) not given 1990-91
378. Analytic Philosophy of Religion.
   4 units (Jackson) not given 1990-91
379. Religious Thought—Directed research.
   (Bielefeldt, Eisen, Gelber, Harvey, Jackson,
   Yearley) by arrangement
389. Theory of Religion.—Directed research.
   (Elberg-Schwartz, Eisen, Faure, Harvey,
   Yearley) by arrangement
390. Teaching in Religious Studies—Required supervised internship.
   4 units, Aut, Win, Spr (Staff)
   by arrangement
392. Candidacy Essay—Prerequisite: consent of graduate director.
   variable units, Aut, Win, Spr (Staff)
   by arrangement
   2-9 units (Staff) by arrangement
to the Soviet Union and Eastern Europe, and administers a coterminal A.B./A.M. and an A.M. program in Russian and East European Studies.

PROGRAMS OF STUDY
The degree program in Russian and East European Studies is directed by a committee of faculty members who are affiliated with the center. The program is offered primarily 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 acquire a competence in Russian and East European Studies in preparation for careers in government, journalism, business, law, or teaching at other than the college or university level.

Each A.M. candidate is assigned an academic advisor who monitors his/her program of courses and course performance.

The basic prerequisite for admission to the program is completion of at least three years of study of the Russian language (or the equivalent). A minimum of four years of advanced Russian or the equivalent is to be completed before the awarding of the A.M. degree. With the permission of the master's committee, an East European language may be substituted for Russian (at a similar level) where appropriate for the student's program and objectives.

COTERMINAL A.B./A.M.
To qualify for a coterminal A.M. degree in Russian and East European Studies, a student must, besides completing University requirements for the A.B. degree:

1. Submit a coterminal application for admission to the program no earlier than the beginning of the eighth quarter, and no later than the end of the 11th quarter of undergraduate study. Students with advanced placement and transfer credit must apply at least four quarters before the expected master's degree conferral date. Applications may be obtained from the Graduate Program Office.
2. Include in the application a program which outlines, by quarter, the schedule of courses the student plans to complete toward the A.M. degree. The student should seek the advice of his/her proposed advisor in Russian and East European Studies in drafting this schedule. The application also includes: (a) a current Stanford transcript; (b) a one-page statement of purpose; and (c) two letters of recommendation from Stanford professors.

APPLICANTS must have an average letter grade indicator of at least “B” (3.0).
3. Complete 15 full-time quarters or the equivalent, or three quarters in full-time residence after completing 180 units; and complete, in addition to the 180 units required for the bachelor's degree, a minimum of 40 units for the master's degree.

The same courses may not be counted to meet both undergraduate and graduate requirements, and no courses taken before the junior year may be used to meet the course requirements for the master's degree. (See "Requirements" below for distribution of units.)

A.M. PROGRAM
A limited number of students are admitted as candidates for a terminal master's degree in Russian and East European Studies. Application materials may be obtained directly from the Graduate Admissions Office, Old Union, Stanford University, Stanford, CA 94305-3052.

To qualify for admission to the program, applicants must have the equivalent of an A.B. or a B.S. degree. They must have completed three years of Russian language study (or the equivalent).

Applicants must also take the general test of the Graduate Record Examination and have the results sent to the Office of Graduate Admissions. Applicants whose native language is not English and who have not studied in an English-speaking institution for at least one and a half years must take the Test of English as a Foreign Language (TOEFL). Deadline for submission of applications for admission and financial aid is January 1. Admission is normally granted to begin in the Autumn Quarter only.

Candidates for an A.M. degree must meet University requirements for an A.M. degree as described in the "Advanced Degrees" section of this bulletin. All requirements for the A.M. degree may normally be completed in three academic quarters as a full-time student. The University does not offer a Ph.D. in Russian and East European Studies.

REQUIREMENTS
For students in both the coterminal A.B./A.M. and the terminal A.M. programs, the 40 units toward the master's degree must be distributed as follows:

1. A minimum of five graduate courses in the program field, distributed over at least three different departments. None of the five graduate courses can be directed reading. At least one course must require a research project resulting in a substantial paper. The remaining required units may include ad
advanced undergraduate courses in various departments, but all must deal with the Russian/Soviet and East European field. Of the 40-unit minimum, no courses may be below 100 and at least 50 per cent must be at the 200 level or higher. To count toward the 40-unit minimum, 100-level courses should have additional requirements for graduate students, to be assigned by the instructor.

2. No credit toward the master's degree is given for the first three years of Russian or East European language instruction. Credit is allowed for fourth- and fifth-year Russian courses.

3. All students must enroll in the Core Seminar in Russian and East European Studies (see below).

4. All students must obtain a minimum letter grade indicator of "B" in courses counting toward fulfillment of requirements for the master's degree.

5. All students should have taken introductory courses in Modern Russian History, Modern Russian Literature, and Soviet or East European Politics. These courses, if taken at Stanford, 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 does coursework on both Soviet and East European topics. 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.

For current courses offered within the area of Russian and East European Studies, consult the quarterly Time Schedule, other departmental sections of this bulletin, or contact the Center for Russian and East European Studies.

**COURSES**

**200. Directed Individual Study**—For students engaged in special interdisciplinary work that cannot be arranged by department.

1-5 units, Aut, Win, Spr (Staff) by arrangement

**250, 251, 252. Core Seminar in Russian/Soviet and East European Studies**—Introduction to methodologies and the status of research within the interdisciplinary area studies program. Limited to students enrolled in the A.M. program in Russian/Soviet and E. European Studies.

1 unit, Aut, Win, Spr (J. Kollmann)

---

**SLAVIC LANGUAGES AND LITERATURES**

Emeriti: (Professors) Edward J. Brown, Joseph Frank, Jack A. Posin, Lawrence L. Stahlberger; (Assistant Professor) Elisabeth Stenbock-Fermor

Chairman: Richard D. Schupbach

Professors: Lazar Fleishman, Vjacheslav V. Ivanov, Richard D. Schupbach, Joseph A. Van Campen

Associate Professor: Gregory Freidin

Assistant Professor: Andrew Wachtel

Senior Lecturer: Elena Lifschitz

Lecturers: Patricia Mueller-Vollmer, Wojciech Zalewski (Curator, Russian and East European Collection, Stanford Libraries)

Visiting Assistant Professors: Priscilla Hunt, Waldemar Martyniuk

The department accepts candidates for the degrees 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 an A.B. degree in Russian must have completed the first- and second-year courses in reading, composition, and conversation (or the equivalent).

1. **Concentration in Russian Literature**—Candidates must complete a minimum of 35 units, selected with approval of their advisor and including courses numbered 111, 112, 113, 145, 146, 147, 187, 188.

2. **Concentration in Russian Language**—In addition to the basic first- and second-year sequence or its equivalent, candidates must complete a minimum of 35 units selected with approval of their advisor and including courses numbered 111, 112, 113, and either 195, 196, or 211, 212, and 213. The remaining units are to be selected from: 114, 115, 116, 167, 168, 177, 178, 179, 187, 188.

Majors in Russian must earn a letter grade indicator (LGI) of "C" or better in order to receive credit toward the major.

In addition to the 35 units mentioned above, students majoring in literature or language who are not enrolled in the honors program in Humanities (see the "Humanities Special Programs" section in this bulletin) are to select with help of their advisor a minimum of three general courses (9 units) in support of their major program.
HONORS PROGRAM
Majors with an LGI of "B+" in Russian courses are eligible to participate in the department's honors program. Honors work may be done in Russian Literature or in Russian Language. Requirements are as follows:

RUSSIAN LITERATURE
1. Language prerequisite: Three years of Russian, and a reading knowledge of French, German, or a second Slavic language, demonstrated by passing an examination.
2. Requirements in Russian literature: Slavic 145, 146, 147, 187, 188, 200 (the last taken during the senior year).
3. Minimum requirements in other literatures: Humanities 61, 62, 63, or three courses in one W. European literature selected in consultation with the student's faculty advisor.
4. Slavic 199, Individual Work: 5 units per quarter during Winter and Spring Quarters of the senior year. To receive honors, the candidate must receive an LGI of "B" or better on a thesis written during this period.
5. Recommended: course sequence in Russian history.

RUSSIAN LANGUAGE
Required:
1. Four years of Russian, including Slavic 111-116, 167-168, and 177, 178, 179, 187, or 188.
2. At least two additional department courses to be chosen from: 191, 195, 196, 197, 211, 212, 213.
3. Slavic 199, Individual Work: 6 to 9 units during the senior year. To receive honors, the candidate must receive an LGI of "B" or better on a thesis or project conducted under the close supervision of a member of the professorial staff.
4. Recommended courses in Russian literature: 145, 146, 147, 187, 188.
5. Recommended courses in other departments: Communication 104; Computer Science 101, 106, or 108A,B,C; History 120; Linguistics 4, 5, 25, 35, 71B; Math. 3; Philosophy 57, 180.

GRADUATE PROGRAMS
MASTER OF ARTS
Admission—The requirements for admission to the master's degree program 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 an 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 does 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.

Before registering for the first quarter's work in the department, entering graduate students are required to take placement examinations in language and literature. Students who fail to perform satisfactorily on such examinations must register for remedial courses in the areas in which they are deficient. Such remedial courses, normally completed within the first three quarters of residence, 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 coursework that ensures adequate preparation for the A.M. final examination at the end of the third quarter of work. Ph.D. candidates with a concentration in language and linguistics should include in the first year's work any courses needed for the A.M. examination in that area. Ph.D. candidates with a concentration in literature should attempt to include as many of the department's basic course offerings as possible in the first-year program to insure sufficient time to complete the A.M. thesis during the fourth quarter of registration. In any case, coursework should be planned in consultation with the graduate advisor, whose written approval of the overall course load is required.

Candidates for the A.M. must complete a program of 36 units, of which 27 units must be selected from courses given by the department. The other 9 units may, with approval of the candidate's advisor, be selected from courses in related fields. Of the 27 units in the department, a minimum of 9 must be in language and linguistics and a minimum of 9 in literature. The remaining 9 may be distributed in accordance with needs and interests of the student, with advice and approval of the departmental advisor.

No credit toward the A.M. degree is 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 must demonstrate in a written examination (1) command of the phonology, morphology, syntax, and lexicology of contemporar
Standard Russian sufficient to teach beginning and intermediate courses at the college level;
(2) an ability to read contemporary Standard Russian sufficient to assist 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 a chosen period of specialization.

The examination should be passed at the end of the final quarter of required coursework.

MASTER OF ARTS IN TEACHING

The degree of Master of Arts in Teaching is offered jointly by the department and the School of Education. It is intended for candidates with a teaching credential or relevant teaching experience who wish to further strengthen their academic preparation. Requirements for the degree are outlined in the "School of Education" section in 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.

DOCTOR OF PHILOSOPHY

Students enrolled in the Ph.D. program in Slavic Languages and Literatures are expected to fulfill the following requirements:

1. Minor or Related Fields—During the course of study, students must develop substantial expertise in a field contiguous to the area of specialization. A candidate may elect to present a full minor or, in consultation with the graduate advisor, develop a special program in a related field.
   a) Related Field: 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 is one of the following:
      1) A sequence of three courses in one W. European literature, to be selected in consultation with the advisor, or
      2) three basic courses in comparative literature to be selected in consultation with the graduate advisor and the Comparative Literature Department.
   b) Minor: If the student elects a minor (e.g., French, German, Spanish, or Russian history) he or she should take six graduate courses in that department with a minimum of 20 units at the graduate level. Students considering minors in other areas, such as Asian languages, English, or comparative literature, should consult with the advisor, the chairman of the Slavic Department, and the chairman of the minor department. Students who wish to enroll in the Graduate Program in the Humanities should apply there.

2. Admission to Candidacy—Candidates should read carefully the general regulations governing the degree, as described in the "Degrees" section in this bulletin. For specific departmental requirements and recommendations, the student should consult with the department chairman. No student is accepted as a candidate until the equivalent of the A.M. degree requirements (described above) are completed. Admission to candidacy is determined by the end of the fifth quarter of graduate studies. The candidate by that time must have demonstrated commitment to graduate studies by completion of a minimum of 60 quarter units of credit with an (LCI) of "B+" or better. Candidates specializing in literature must have completed an acceptable thesis before the end of the fifth quarter, and those specializing in Slavic linguistics must have passed a written examination, based on course materials and a reading list. Failure to comply with the above requirements will result in termination of enrollment 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 is then 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 determines whether the student's knowledge of Russian falls below the department's standard. Students who fail this test are asked to complete 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 coursework (36 units) must 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.) The candidate must submit to the Departmental Academic Progress Committee two seminar-level papers completed at the Department of Slavic Languages and Literatures as well as the A.M. thesis.

5. Foreign Languages—A candidate must demonstrate reading knowledge of French and German, by passing written examinations.
6. **Examinations**—A candidate must pass written and oral departmental general qualifying examinations covering:

a) The history and structure of the Russian language and its relationship to the other Slavic languages; (Students specializing in literature are excused from this portion of the examination if they have completed Slavic 211, 212, and 213 with an LGI of "B-" or better.)

b) The history of Russian literature, including its relationship to the development of other Slavic literatures, or W. European literature, or to Russian intellectual history. (Students specializing in Slavic linguistics are excused from this portion of the examination if they have completed with an LGI of "B-" or better, Slavic 221, 222, and either 187 or 188. They should also have taken Slavic 145, 146, and 147 or show equivalent training.)

Following the departmental examination a candidate must pass a University oral examination which is a 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 in literature. Candidates may draw up individual programs of study and research in consultation with the graduate advisor. Requirements vary according to the nature of the specialized program requested.

**Continuation**—Continuation in the Ph.D. program is contingent upon: for first-year students, a high quality of performance in coursework (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 thesis and written examination should be completed no later than the end of the first quarter of the second year.

**Coursework, Breadth Requirements, and Overall Scheduling:**

1. Candidates for the Ph.D. degree are allowed as much freedom as possible in the selection of coursework to suit their individual program of study. However, candidates are held responsible for all of the areas covered by the general examinations, regardless of whether they have registered for the department's offerings in a given field. For this reason, it is strongly recommended that before taking Ph.D. examinations, students specializing in literature complete seminar-level work directly related to the following broad areas:

   - **Russian poetry**
   - The Russian novel
   - 20th-century Russian literature
   - 19th-century Russian literature (the Age of Pushkin and After)
   - 18th-century Russian literature (from the Early 1700's to the Age of Pushkin)
   - Medieval Russian literature
   - A monograph course on a major Russian author
   - Theory of literature

   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 may 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 course requirements for that degree in planning their first year's work. For University residence requirements, see the "Advanced Degrees" section in 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 should be devoted to coursework preparing the student for the general qualifying examination and to fulfill the requirements of the 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 concerned primarily with preparation for the University oral examination, which 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 coursework not directly related to the dissertation proposal. The fourth year should be devoted to completion of the dissertation.

2. Students possessing the equivalent of the Stanford A.M. are normally 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 are required to do four quarters of teaching in partial fulfillment of the requirements of the Ph.D. degree.

**Non-Slavic Language Requirements**—Credit toward either the A.M. or the Ph.D. degrees is not given for first- or second-year courses in non-Slavic languages. It is assumed that, on en-
tering the program, the student has a reading knowledge of both German and French or, at the very least, 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.

COURSES

For additional offerings in literature, see the "Comparative Literature" section of this bulletin.

Students interested in languages not listed should contact the Special Language Program, Department of Linguistics.

GENERAL

These courses may be of interest to students in other literatures, in comparative literature, and in Russian area studies. They are primarily for undergraduates but can be taken for graduate credit by special arrangement with the department.

131. Introduction to the Russian Short Story: 19th Century—Pushkin, Gogol, Dostoevsky, Leskov, and others. Short reading assignments (20-30 pages) facilitate concentration on the individual author's style. The short story as a genre. Offered in English translation for 1 unit, in Russian for 2 units.

not given 1990-91

135. The Other Europe—The sociocultural experience of contemporary Eastern Europe through 20th-century Polish, Czech, and Yugoslav writers: Schultz, Milosz, Kundera, Havel, Andric, Kis, and Pavic. Readings in English translation.

4 units, Win (Wachtel) MWF 11

145/245. Survey of Russian Literature in English Translation I: The Age of Experiment—(Graduate students register for 245.) Part I of a three-quarter survey of the Russian prose tradition. Covers 1800-1840, emphasizing the formative period of Russian prose, the lesser known contributions of poets, and Romantic and popular writers. Recognized "classics," Pushkin's Eugene Onegin, The Belkin Tales, The Captain's Daughter; Lermontov's Hero of Our Time; Gogol's Petersburg Tales and Dead Souls, are considered in the context of "local" literary and stylistic developments and of contemporary European trends. (DR:2)

4 units, Aut (Wachtel) MWF 10

146/246. Survey of Russian Literature in English Translation II: The Age of Realism—(Graduate students register for 246.) Selected novels and short fiction by Turgenev, Dostoevsky, Tolstoy, and Chekhov. A continuation of 145 but may be taken independently. (DR:2)

4 units, Win (Hunt) MWF 10

147/247. Survey of Russian Literature in English Translation after 1917: Invention of Tradition—(Graduate students register for 247.) Major works of Russian fiction and selected poetry, including the emigre and samizdat writings, in their literary and historical context (Bely, Blok, Mayakovsky, Babel, Zoshchenko, Kataev, Scholokhov, Nabokov, Olesha, Pasternak, Grossman, Solzhenitsyn, Sinavsky, Brodsky, etc.). Attention to the way poets and novelists have constituted the post-revolutionary "historical experience" of the Russians. A continuation of 145 and 146, but may be taken independently. Required of all majors in Russian literature. (DR:2)

4 units, Spr (Brown) MWF 10

151. Fyodor Dostoevsky—Major works in English translation with reference to related developments in Russian and European culture and intellectual history. Open to graduates, seniors, and juniors. Lectures and discussion section. (DR:2)

4 units, Spr (Frank) TTh 2:15-4:05

153/253. Leo Tolstoy—(Graduate students register for 253.) The writer's work and thought in the context of Russian and European culture and intellectual history. Readings: Childhood, War and Peace, A Confession, Father Sergius, The Living Corpse, and Hadji Murat. (DR:2)

4 units, Win (Wachtel) WF 2:15-3:40


4 units, not given 1990-91
By special arrangement with the department, courses numbered 100-159 can be taken for graduate credit. Students are urged to take all three quarters of first-, second-, and third-year language series consecutively in the same academic year.

1A. First-Year Russian A—Three-quarter sequence. Optional unit for extra work on pronunciation and grammar, by arrangement. Completion of Russian 1, 2, and 3 fulfills (DR:4).
   5 units, Aut (Schupbach, Staff)
   MTWThF 9, 10, 11, and 1:15

1B. First-Year Russian B—Three-quarter sequence. Continuation of 1. Optional unit for extra work on pronunciation and conversation. Completion of Russian 1, 2, and 3 fulfills (DR:4).
   5 units, Win (Mueller-Vollmer, Staff)
   MTWThF 9, 10, 11, and 1:15

1C. First-Year Russian C—Three-quarter sequence. Continuation of 2. Optional unit for extra work on pronunciation and reading. Completion of Russian 1, 2, and 3 fulfills (DR:4)
   5 units, Spr (Mueller-Vollmer, Staff)
   MTWThF 9, 10, and 1:15

5A. Beginning Polish.
   4 units, Aut (Martyniuk)

5B. Beginning Polish—Continuation of 5A.
   4 units, Win (Martyniuk)

5C. Beginning Polish—Continuation of 5B.
   4 units, Spr (Staff)

6A. Intermediate Polish.
   4 units, Aut (Martyniuk)

6B. Intermediate Polish—Continuation of 6A.
   4 units, Win (Martyniuk)

6C. Intermediate Polish—Continuation of 6B.
   4 units, Spr (Martyniuk)

7A. Advanced Polish.
   4 units, Aut (Martyniuk)

7B. Advanced Polish—Continuation of 7A.
   4 units, Win (Martyniuk)

7C. Advanced Polish—Continuation of 7B.
   4 units, Spr (Staff)

51. Second-Year Russian—Intensive review and expansion of grammar and vocabulary. (Russian majors must also take 51A. Others are strongly advised to do so.)
   3 units, Aut (Van Campen) MWF 12 or 1:15

52A. Second-Year Russian: Conversation—Continuation of 51A. To be taken in conjunction with 52.
   2 units, Win (Mueller-Vollmer) TTh 10 or 11

52B. Second-Year Russian: Conversation—Continuation of 52A. To be taken in conjunction with 53.
   2 units, Spr (Van Campen) MWF 12 or 1:15

111-113. Third-Year Russian—Emphasis on reading, vocabulary building, and textual analysis. Recommended: take 114-116 in conjunction with this series. Prerequisite: 51-53 or equivalent (with 114-116 only).
   3 units, Aut, Win, Spr (Lifschitz, Staff)
   MTWThF 1:15

   2 units, Aut, Win, Spr (Lifschitz, Staff)
   TTh 1:15

119/204. Advanced Russian for Social Scientists—Develops reliable reading skills in technical language of this area. Underscores systematic differences between this level and spoken Russian and the language of literature. Questions of terminology, the use of participles, and other parts of speech, and use of the cases, prepositions, derivational innovations, et al. Extensive practice is provided.
   1 unit, not given 1990-91

120/205. Advanced Russian for Students of the Physical Sciences, Mathematics, and Engineering—Develops reliable reading skills in technical language of this area, emphasizing mathematics and the physical sciences.
   1 unit, not given 1990-91

ADVANCED UNDERGRADUATE AND GRADUATE

167-168. Fourth-Year Russian Seminars I-II—Focus on development of "oral proficiency" in Russian. To be taken in conjunction with 51.
   2 units, Aut (Lifschitz) TTh 10 or 11
history of Russia. Conducted in Russian and open to all.

167. Fourth-Year Russian Seminars I—Closeup of Alexander Pushkin's major poetical works.

4 units, not given 1990-91

168. Fourth-Year Russian Seminars II—Close reading of Tolstoy's Anna Karenina, in literary, historical, and political context. Also, relevant contemporary texts in a variety of genres.

4 units, not given 1990-91

177/201. Advanced Russian—Reading, conversation, and composition.

3 units, Aut (Lifschitz) TTh 3:15


3 units, Win (Staff) TTh 3:15


3 units, Spr (Staff) TTh 3:15

186. 18th-Century Russian Literature—18th-century literature in Russia evolved from a barely appreciated didactic tool to a major force for the expression of a wide variety of social and cultural ideals. The aesthetic development of 18th-century literature and the gradual rise of its socio-political function. Emphasis on the aspects of 18th-century Russian literary culture that paved the way for the age of Pushkin.

4 units, not given 1990-91

187. Russian Poetry of the 19th Century—Major poetic styles of the 19th century as they intersected with late classicism, the romantic movement, and the realist and post-realist traditions. Representative poems by Derzhavin, Zhukovskii, Pushkin, Baratynskii, Lermontov, Tiutchev, Nekrasov, Fet, Soloviev, Nadson. Lectures/discussions in Russian. Open to undergraduates who have completed three years of Russian, and to graduate students.

4 units, Aut (Fleishman) MWF 11

188. Russian Poetry of the 20th Century—Survey of main developments in Russian poetry in this century, focusing on Symbolism and post-Symbolist movements (Aemism, Futurism, Constructivism, OBERIU). Close analysis of representative lyric poems of major modern poets (i.e., Bal'mont, Blok, to Khlebnikov, Maia-kovskii, Tsvetaeva, Pasternak, Sel’vinskii, Kharms, and others). A continuation of 187. Prerequisite: 187 or consent of instructor. Required of all majors in Russian literature.

4 units, Win (Fleishman) MWF II

189/289. Old Russian Literature—From the earliest times through the 17th century. Lectures concentrate on development of literary and historical genres and on links between literature and art, architecture, and religious culture. Readings in English. Graduate students read in original.

4 units, not given 1990-91

191. Grammatical Categories of Russian—Case, gender, number in the noun and aspect, tense, voice, mood, prefixation and transitivity in the verb are analyzed in detail. Comparisons drawn between Russian and English systems.

3 units, not given 1990-91

193. The Orthodox World—Introductory survey of the history, spirituality, and religious culture of Eastern Christian peoples, emphasizing Orthodox theology and spirituality, comparing and contrasting it with that of the Western Church.

3 units, not given 1990-91


3 units, not given 1990-91

196. Advanced Topics in Russian Grammar II: Morphology and Syntax—Problems in government and agreement: verbs, prepositions, quantifiers, and adjectives. Lectures with coordinated exercises. Students should have at least two years of college Russian or the equivalent. Students not possessing a solid control of Russian morphology must take remedial work.

3 units, Aut (Van Campen) MWF 2:15

197. Advanced Topics in Russian Grammar III.

3 units

198A/298A. Structural Typology of the Slavic and Balkan Languages—(Enroll in Linguistics 271.)

3 units, not given 1990-91

198B/298B. The History of Semiotics.

3 units, not given 1990-91

198C/298C. Semiotics of Film.

3 units, not given 1990-91

198D/298D. Literature, Folklore, and Mythology—The relation between early written literary texts and folklore mythopoetic traditions in the light of ancient Oriental, Greek, and Slavic texts. The role of collective and individual creation in relation to genres of oral and written literature. Structure of mythopoetic narration and its transformation in later literature. The use of archaic motifs and images of mythology in different European traditions in classical and avant garde literature. Links between Russian symbolist and post-symbolist (futurist, imagist, and acmeist) poetry and folklore.

4 units, Aut (Ivanov) TTh 11-12:30
198E/298E. Modern Literature and Science—
The relation between modern avant garde art
and literature in the Russian writers Andrej
Bely, Velimir Khlebnikov and artists (Sergej
Eisenshtein) and parallel figures in French and
other traditions. New concepts of space, time,
language, and sign are seen as notions common
to science and art (including verbal art) 1900-
1925. The rise of the Russian formalist school
in the light of its link to Russian avant garde
poetry and prose.
4 units, Spr (Ivanov) by arrangement

198F/298F. Seminar: Cultural and Linguistic
Layers of Different Origins in Russian Poetic
and Prose Texts—In each Russian text there are
Slavic (literary and dialectal Russian) words and
elements of Southern Slavic (Old Church Slavonic) and borrowed Western Slavic (particularly
Polish), Western European, and Oriental
vocabulary. The relation between these elements
is important for diachronic (historic) study of
origins of Russian culture and language and for
literary and linguistic stylistics. Texts of Russian
classic and avant garde writers and other texts
are compared. Stylistic value of each element
is analyzed and criteria for their determination
introduced.
4 units, Spr (Ivanov) by arrangement

199. Individual Work—Open to Russian majors
or students working on special projects. May
be repeated for credit. Prerequisite: consent of
instructor.
1-5 units, any quarter (Staff)
by arrangement

200. Proseminar in Russian Literature—Literary
scholarship as a profession: languages of literary
criticism; rhetoric, poetics, aesthetic theory,
narrative, psychoanalysis, history and sociology
of literature, reception. Students should also
register for 200A. Required of all entering grad-
uate students and all honors majors in Russian
literature.
4 units, Aut (Freidin) M 1:15-3:05

200A. Introduction to Slavic Bibliography—His-
torical and evaluated analysis of Slavic bibli-
ographic and research tools, emphasizing Russian
and Soviet materials. Application of biblio-
graphic search methodology. Final bibliography
project required. Knowledge of Russian and/or
another Slavic language is helpful. Offered at
beginning and advanced levels, which are taken
over two consecutive years. Open to graduate
and undergraduate students.
1-3 units, Aut (Zalewski) Th 3:15-5:05

200B. The Self in the Medieval Literature of
the Eastern Slavs—Uses E. Slavic texts from the
11th-17th century, to investigate the image of
the person in the Middle Ages. Seminar traces
evolution of a concept of self, characterized by
self-consciousness, personal autonomy, and inner
conflict. The impact of the medieval vision of
the person on the modern Russian sense of self.
Prerequisite: knowledge of Old Russian or con-
sent of instructor.
Win (Hunt)

211. Introduction to Old Church Slavic.
3 units (Van Campen) given 1991-92

212. Reading of Old Church Slavic and Old
Russian Texts—Prerequisite: 211.
3 units (Van Campen) given 1991-92

213. History of the Russian Literary Language—
Major structural and semantic changes from the
10th to the 19th centuries. Prerequisites: 211, 212.
4 units, not given 1990-91

220. Literary Translation—Translation into En-
GLISH of Russian literary texts as an exercise in
critical analysis. Readings in the theory of trans-
lation, and criticism of existing translations. Each
student produces a publishable translation of a
literary text.
4 units, not given 1990-91

221. Studies in Russian Fiction: The Age of
Realism—Development of realism over the first
two-thirds of the 19th century with attention to
problems of structure, and social and philo-
sophical contexts, Russian and European.
4 units, not given 1990-91

222. Early Soviet Prose: Osip Mandelstam,
Isaak Babel, and Mikhail Zoshchenko—These
three writers in the literary, social, and historical
context of the decade following the 1917
Revolution.
4 units, not given 1990-91

223. Russian Literature and the Literary Milieu
of the NEP Period: The Problem of Authorship
(1921-1928)—A variety of texts (primarily journal
fiction and criticism) which deal with the prob-
lem of authorship examined in the contemporary
literary and socio-historical context. Emphasis
on non-Party authors. Babel, Eikhenbaum,
Mandelstam, Olesha, Tynianov, Zamiatin, and
Zoshchenko.
4 units, not given 1990-91

224. Reading in the Russian Novel—Intensive
study of Brothers Karamazov and its relation
to contemporary European and Russian philo-
sophical, literary, and social contexts. Readings
in Russian. Open to graduate and advanced un-
dergraduate students.
4 units, not given 1990-91
225A. Bulgakov—Close analysis of Mikhail Bulgakov's major prose works.  
3 units, not given 1990-91

3 units, not given 1990-91

227. Boris Pasternak and the Poetry of the Russian Avant Garde—Pasternak's work examined within a broad cultural context to identify and analyze characteristic features of the Russian avant garde poetics.  
4 units, not given 1990-91

228. Boris Pasternak's Safe Conduct (1929-1931)—Close analysis of the text. Theoretical and historical problems of the study in the autobiographical genre.  
4-5 units (Fleishman) not given 1990-91

229. Russian Versification—History and theory of Russian versification from the 17th to the 20th century.  
4 units, Aut (Fleishman) MWF 9

230A. Russian Formalism and Structuralism—The Russian Formalists' contribution to literary criticism and theory; relationship of Russian Formalism to critical movements in the West; the Prague School, and the Soviet Structuralists. Knowledge of Russian not required.  
4 units, not given 1990-91

230B. Russian Formalism and Structuralism in their Historical Background—Consideration of formalist and structuralist ideas in context of 19th- and 20th-century critical movements.  
4 units, not given 1990-91

270. Pushkin—Close reading of Pushkin's major poems and prose accompanied by detailed examination of his cultural milieu. Emphasis on essential changes in the understanding of literary concepts relevant to this period of Russian literature (poetic genres, the opposition between poetry and prose, Romanticism, etc.)  
4 units, Win (Fleishman) M 1:15-3:05

271. Solzhenitsyn—(Undergraduates register for 155.) Solzhenitsyn in the novel, short story, drama, and essay forms, and in the genre most characteristic of him: "literary investigation." Knowledge of Russian not required, but concentrators in Slavic are expected to do a major portion of the reading in Russian.  
4 units, not given 1990-91

4 units, not given 1990-91

277. Gogol—Close reading of Gogol's major prose and drama in context of literary and cultural trends in Russia and Western Europe in the 1930s and 40s. Readings in Russian. Open to advanced undergraduates with instructor's permission.  
4 units (Wachtel) not given 1990-91

278. Tolstoy—Tolstoy's creative evolution from his early and late short fiction (Childhood, The Sevastopol Tales, and The Kreutzer Sonata, etc.) and non-fiction, (Confession, and Anna Karenina), together with the appropriate critical texts. Readings in Russian; open to exempt undergraduates.  
4 units, not given 1990-91

279. Dostoevsky—The writer's shorter works in the context of European thought and literature.  
4 units, not given 1990-91

299. Individual Work—For graduate students in Slavic working on theses or engaged in special work. Prerequisite: written consent of instructor.  
1-12 units, any quarter (Brown, Fleishman, Freidin, Frank, Schupbach, Lifschitz, Mueller-Vollmer, Van Campen, Wachtel) by arrangement

300. Graduate Seminar: Theory of Narrative—Studies of narrative (fictional, historical, sacred) as verbal, structure, representation, rhetoric, and social institution. Readings: theoretical writings by Jakobson, Barthes, Bakhtin, Iser, Lukács, and others. Discussions analyze these readings and relate them to selected works in Russian and European literature. A seminar for graduate and advanced undergraduate students. Prerequisite: consent of instructor.  
4-5 units, not given 1990-91

300A. Graduate Seminar: Literature as Institutions—Literary production, dissemination, and reception in selected periods of Russian literature, from 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, not given 1990-91
300B. Graduate Seminar—The theme of utopianism in Russian literature from Dostoevsky through the late 1920s.
4 units, not given 1990-91

300C. Introduction to Archival Research in Russian Literature and History.
3 units, not given 1990-91

300D. Graduate Seminar: The Voices of History—Analysis of the web of interrelationships linking belletristic and historical genres in Russian culture of the 1820s, '30s, and '40s. The role that discussions of history had in the formation of a uniquely Russian cultural world view. Problems of genre and literary form in Karamzin, Pushkin, and Gogol.
4 units, not given 1990-91

300E. Graduate Seminar: Russian Theater—1898-1930—The golden age of Russian theater from foundation of the Moscow Art Theater through OBERIUTY. Theater as seen through theoretical writings (Stanislavsky, V. Ivanov, Meyerhold, Tairov) and performances (Balaganchik, Petrushka, Fobeda nad solntsem, Klop). Open to qualified undergraduates with instructor's permission.
4 units, Spr (Wachtel) W 3:15-5:05

375. Dostoevsky and French Literature—Dostoevsky's relations with French literature as a source of inspiration for his own work and as himself inspiring modern French writers. Notes from the Underground and Crime and Punishment are read with works by Diderot, Balzac, Gide, Camus, and Sartre.
5 units, not given 1990-91

SOCIOMETRY
Emeriti: (Professors) Alex Inkeles, Dudley Kirk
Chairman: Morris Zelditch, Jr.
Assistant Professors: Carol Conell, David B. Grusky, Jerald R. Herting, Leonard Hochberg (on leave Autumn), Szonja Szelenyi (on leave Winter and Spring)
Consulting Professor: George Bohrnstedt
Senior Lecturer: Ruth Cronkite
Consulting Associate Professor: Janet Johnston
Consulting Professor: James Baron, Jeffrey Pfeffer, Francisco Ramirez
Consulting Associate Professor: Arnold Eisen, JoAnne Martin
Consulting Assistant Professor: Larry Diamond, Clifford J. Nass
Visiting Professor: Victor Zeslavsky
Visiting Associate Professor: James Moore
Visiting Associate Professor: James Moore

Sociology is concerned with the full spectrum of social behavior (of individuals, small groups, large organizations, communities, institutions, and societies) and provides a strong intellectual background for students considering careers in the professions and in business. Students may pursue degrees in sociology at the bachelor's, master's (coterminal), or doctoral levels.

UNDERGRADUATE PROGRAMS
AREAS OF CONCENTRATION
Each area identifies a specialized arena of inquiry, a set of skills within sociology, and basic preparation for a variety of careers. A brief description of each area follows.

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 emphasize the effect of social processes on individual behavior and the analysis of group processes. Careers which relate to this study
area include therapy and counseling of individuals, couples and families, and group work.

Organizational Behavior—This area studies individual behavior within organizations and the behavior of organizations as collective actors and the factors which affect them. 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 making firms and public organizations; voluntary associations and total institutions such as prisons; and 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 process which shapes 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.

Comparative Social and Political Institutions—This field 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, institutional, and comparative perspectives are utilized. Foundation courses introduce students to these perspectives and to specific institutional areas. Careers related to this area include law and governmental service.

COURSE OFFERINGS

Most of the department courses can be categorized as primarily oriented to one of the three areas of concentration; a few courses are relevant to more than one area. Within each area of concentration, one or more foundation courses are identified which provide a general introduction to the area or some portion of it. Courses, classified by area, are as follows:

1. Social Psychology and Interpersonal Processes
   Foundation Courses: 5, 120, 121
2. Organizational Behavior
   Foundation Courses: 160
   Other Courses: 118, 127, 141, 143; 161-169; 260-269
3. Comparative Social and Political Institutions
   Foundation Courses: 141, 142, 143, 144, 145


BACHELOR OF ARTS

The department offers two programs leading to the A.B. degree in Sociology: the general sociology major and the specialized sociology major. Both are designed around a core curriculum, the intent of which is to ensure adequate coverage of basic sociological knowledge, but also to provide enough flexibility for tailoring the degree program to fit individual needs and interests. The programs and the requirements for each are described below.

CORE CURRICULUM AND GENERAL SOCILOGY MAJOR

All recipients of the A.B. degree in Sociology must complete a minimum of 60 units of coursework in the major. Related coursework from other departments may fulfill part of this requirement, but such work must be approved in advance by a departmental advisor and must not exceed 15 units. All degree candidates must fulfill the following core requirements:

1. 194, Departmental Seminar for Undergraduate Majors, offered each Autumn Quarter. It is recommended that students take it early in their program. It is also suggested for students who are considering a major in Sociology.
2. 180A and 180B, Introduction to Sociological Research, or its equivalent.
3. An introductory course in statistics, preferably Sociology 181, or equivalent (e.g., Statistics 60, Psychology 60).
4. 170, Classics of Modern Social Theory, or an equivalent course in social theory.
5. At least three foundation courses, one each from the three areas of concentration.

SPECIALIZED SOCILOGY 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. To complete the requirements for the A.B. degree in Sociology with a specialization in Comparative Social and Political Institutions, Organizational Behavior, or Social Psychology and Interpersonal Processes, the student must take a minimum of 25 units from courses listed under the proposed area of specialization.

HONORS PROGRAM

Each year several students participate in the departmental honors program, undertaking an intensive, individualized program of study. Each
honors student works closely with one or more faculty members on an independent research project. Most projects are student initiated but can be associated with ongoing faculty research.

Admission requires an average letter grade indicator (LGI) of "B" or better. A minimum LGI of "B" or better is required on the thesis for a student to be considered for honors, but does not guarantee an honors degree. If the grade is less than a "B," credit for the thesis counts toward the major in sociology.

Honors students may earn up to 15 units credit for work leading to completion of the required honors thesis, including honors seminars. Work on the project normally begins during Spring Quarter of the junior year (by enrolling in Sociology 194 for 2 units) and the remaining units are typically spread over two or three quarters during the senior year. The honors thesis may be submitted in the form of a scientific paper (similar to the format required for submission to a journal in the field) or that required of a Stanford master's thesis. Students interested in the honors program should talk with their academic advisor or the director of the undergraduate studies no later than the start of Spring Quarter of the junior year.

COTERMINAL MASTER'S PROGRAM

Stanford undergraduate students who wish additional training in sociology (whatever the undergraduate major), and who have a good academic record (ordinarily an average LGI of at least "B+" in their previous undergraduate work), may apply to the coterminal master's program as described in the "Degrees" section of this bulletin.

To apply for admission to the coterminal program, students should submit with the coterminal application the following: (1) a statement of purpose providing the rationale for the proposed program of study; (2) a proposed program that specifies at least 45 units of coursework relevant to the degree program and at least 36 units in Sociology; (3) a current undergraduate transcript; (4) two letters of recommendation from Stanford faculty familiar with the student's academic work.

All 45 course units to be counted toward the graduate degree should be at or above the 200 level; and at least 18 course units should be above the 200 level. Because the acquisition of research skills is an important component of graduate training in the social sciences, it is recommended coterminal students take one or more research methodology courses, e.g., Sociology 381. An LGI of "B-" or better must be secured in each course satisfying the 45-unit requirement.

Most coterminal students propose programs that concentrate on one of the three specialized areas of study offered by the department: Social Psychology and Interpersonal Relations; Organizational Behavior; or Comparative Social and Political Institutions. This approach helps to ensure program coherence. At the present time, however, such specializations are not formally recognized by the University, so that the degree obtained is an A.M. in Sociology.

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—Although it is desirable to have had undergraduate preparation in sociology, the department does consider for admission students without such preparation. Admissions forms may be obtained from the Office of Graduate Admissions and, once completed, should be returned to that office. Applicants must submit results on the General Test of the Graduate Record Examination. The GRE Subject Test in Sociology may also be taken but is not mandatory. Those wishing to apply for fellowships, scholarships, or assistantships should consult representatives of the financial awards office of their home institution to obtain application forms and information concerning application procedures.

MASTER OF ARTS

Ordinarily, the department does not admit students who are candidates solely for the A.M. 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 a letter grade indicator of "B" or better. All coursework should be at level 100 or above, 18 units should be above the 200 level, and at least 30 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 degree 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
MASTER OF ARTS IN TEACHING

This degree is offered jointly by the department and the School of Education. It is intended for candidates with a teaching credential or relevant teaching experience who wish further 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.

DOCTOR OF PHILOSOPHY

The department admits only those students who show potential for admission to Ph.D. candidacy. For the first three quarters in residence, all students have probationary status. At the end of this period, the entire faculty of the department reviews each student's progress toward the goal of a professional career of teaching and research in the field. A student may be (1) removed from probationary status, (2) continued in probationary status for an additional period, or (3) terminated from the program. In the fifth quarter in residence, a further decision is made on Ph.D. candidacy. 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.

A student admitted to Ph.D. candidacy must:

1. 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.

2. Complete a teaching apprenticeship, working for three quarters as a teaching assistant under the supervision of a faculty member.

3. Develop a thorough grounding in sociological theory and research methods. To accomplish this, five graduate courses are required: Sociology 370A, 370B, 382, 383, and 384. In addition, students entering with little background in statistics are required to take an elementary course in the first quarter after entering.

4. Select two fields in sociology as areas of special competence, and pass written examinations in these fields. Examples of fields are: small groups, socialization, family and kinship, sociology of education, comparative institutions, political sociology, and organizations. Theory or methods may be offered as a field only when the candidate has an exceptional grasp of material in the area.

5. Pass the University oral examination which ordinarily evaluates a dissertation prospectus, and, following this, complete a doctoral dissertation. For basic University requirements see the "Degrees" section of this bulletin.

Ph.D. MINOR

The department offers a minor in Sociology for doctoral students in the School of Education. Students must take at least 30 units of work in courses giving graduate credit. Work in theory and methods is encouraged. The specific program must be approved by a Department Advisor.

JOINT PROGRAM WITH THE SCHOOL OF LAW

The faculties of the School of Law 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 completes one full year of the law program, applying for admission to the Department of Sociology during the first year of law school. If admitted, the student must complete regular Sociology Department master's degree requirements. Applications for a joint program must be approved by the Research and Interdisciplinary Studies Committee of the School of Law and by the Sociology Department. Faculty advisors from both the department and the school 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 requires application to both the School of Law 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 School of Law or the Sociology Department. Normally, the student spends 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

Courses numbered 1-199 are open to all students without prerequisites, unless specifically indicated. Courses numbered 200-299 are open to advanced undergraduate and graduate students. Courses numbered 300 and above are normally offered to graduate students only.
OPEN TO ALL STUDENTS

INTRODUCTORY

1. Introduction to Sociology—Basic concepts of sociological analysis. Topics: how social systems and social organization emerge, are maintained, and change; how they differentiate, with consequences for inequality and stratification; and how the individual is related to society. These are studied from the simplest social interactions, through more complex organizations and communities, and to the structures and processes of whole societies and their basic institutions. (DR:5)
   5 units, Aut, Win (Staff) MWF 10
   section by arrangement

5. Status, Friendship, and Social Pressure: An Experiential Approach—The basic social processes that structure the individual’s experience in interpersonal situations. Processes include (1) group pressure on individual choices, (2) social control of deviants, (3) operation of status distinctions (sex and race), (4) formation of friendships, and (5) formation of intimate relationships (love relationships). Through structured exercises and simulation gaming, the student has the opportunity to experience these processes in section meetings. After these laboratory experiences, lectures examine the processes in terms of theoretical ideas, empirical research, and clinical strategy. Enrollment limited. (DR:4 or DR:5)
   5 units, Win (Berger) MWF 10 plus
   one 2-hour section M or T 2:15-4:05

SOCIAL ISSUES IN CONTEMPORARY SOCIETY

104. The Sociology of Gender—Social definitions of masculinity and femininity, and social inequalities based on gender-specific social roles. Topics: 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 (Staff) given 1991-92

105. Poverty and Public Policy in America—Why poverty persists in the U.S. and other modern industrialized societies. The role of public policies in preventing and mitigating poverty. Lectures, class discussions, and individual projects explore facts, myths, and theories.
   3-5 units (Tuma) given 1991-92

106. Deviance and Social Control—Sexual deviance, drug abuse, mental illness, crime in the streets; corporate and governmental abuses. The social foundations of the detections, labeling, and processing of people as “deviants.” The institutions and agencies mandated to keep “the public order,” how labeled persons are separated from the rest of society physically and symbolically, and the consequences for those individuals and for society.
   3-5 units, Win (Staff) MWF 9

107. Sociology of Mental Health—Interdisciplinary introduction to the concept of mental disorder and its social/historical context, types of mental disorders and their epidemiology, factors that shape psychiatrist diagnosis, models of the causes and treatment of mental disorders, current trends and issues in the organization and delivery of mental health services, current trends in evaluating treatment programs, and ethical issues in mental health practices.
   5 units, Win (Cronkite) TTh 10:30-12
   one section by arrangement

108. Peace Studies—(Same as Political Science 133, Psychology 142, VTSS 143.) Interdisciplinary, dealing with the challenges of pursuing peace in a world where the sources of conflict are many and regional/ethnic/religious antagonisms are rising. Creating and maintaining peace is analyzed from historical, social, psychological, and moral perspectives. The nature of peace and peaceful processes (e.g., historical and political perspectives, questions of harmony and aggression at different social levels, and feminist analyses). Peace at the operational level (e.g., social-psychological analyses, studies of bureaucracy, theories of structural violence, analyses of the defense economy and economic conversion, and the making of “enemies”). Peace-moral and normative considerations (e.g., pacifism and its critics, studies of moral disengagement and of concepts of responsibility). Hopeful developments and important successes.
   5 units, Spr (Dornbusch, Bernstein, Drekmeir, Moses, Ross, Bland)
   TTh 2:15-4:05

112. Gender and Education—(Same as Education 170.) Gender as a critical variable in educational institutions and labor markets. Interdisciplinary approach to 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 Institute for Research on Women and Gender Wednesday lecture series. The three primary disciplines are economics, history, and sociology, but psychology and law are also examined.
   4 units (E. Cohen, Strober) given 1991-92
117. Education and the Status of Women: Comparative Perspective—(Same as Education 197.) Theories and perspectives from the social sciences relevant to an understanding of the role of education in changing, modifying, or reproducing structures of gender differentiation and hierarchy. Cross-national research on the status of women and its uses to evaluate knowledge claims from varying perspectives.

4 units, Win (Ramirez) MWF 10

118. Groups, Teams, and Organizations—What makes groups productive? What is an effective group member? How does "team spirit" affect individual performance? How do organizations expand and constrain individuals? Provides experience with group and organizational phenomena through use of simulation games, structured exercises, and case studies. Lectures/reading provide tools for analyzing these experiences based on empirical research and theoretical ideas. Enrollment limited to 35.

5 units, (B. Cohen) given 1991-92

SOCIAL PSYCHOLOGY AND INTERPERSONAL BEHAVIOR

120. Interpersonal Relations—Power, exchange, coalition formation, status, conformity, and deviance. Important traditions of research have developed from basic theories of these processes. Emphasis is on understanding basic theories and drawing out their implications for change in a broad range of situations, families, work groups, and friendship groups. (DR:4 or DR:5)

5 units, (Johnston) MWF 8

section by arrangement

121. Social Psychology and Social Structure—Understanding the individual's relationship to social groups, from intimate two-person groups to society at large. Emphasis on socializing institutions, the family, ethnic groups in American society, gender difference, and international comparisons of social processes.

5 units, Win (Dornbusch) MWF 11

section by arrangement

127. Power in Interpersonal Relations—Concepts of power and influence, sources of power, dynamics of power-dependence relations, authority, and the legitimation of power. Topics: 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. Laboratory exercises alternate with lectures.

3-5 units, Spr (Staff) MWF 10

COMPARATIVE SOCIOLOGY: SOCIAL INSTITUTIONS AND SOCIAL CHANGE

130. American Society in Film and Literature—Plays, films, and novels are used to analyze some fundamental values, structures, and processes underlying American society. Emphasis is on processes of social control, including causes of conformity and deviance, and stratification, including inequalities in gender, ethnicity, race, and socioeconomic status. Film and literature are used only to study central features of American society. Readings: Ellison, Fitzgerald, James A. Miller, M. Norman, Updikey, and Steinbeck. Films: A Thousand Clowns, Officer and a Gentleman, Long Days' Journey Into Night, One Flew Over the Cuckoo's Nest, The Little Foxes, Adam's Rib, Streetcar Named Desire, and Harlan County, USA. Films on Wednesday nights. (DR:5)

3-5 units (Zelditch) given 1991-92

131. Science Fiction and the Sociological Imagination—The interplay of social knowledge and social change through science fiction. Alternative "future histories" by such authors as Frank Herbert, Isaac Asimov, and Ursula LeGuin, treating them as studies of ideology, behavior, social organization, and technological change. The social and political theories of Max Weber, Georg Simmel, Hannah Arendt, Thomas S. Kuhn, and C. Wright Mills provide formal concepts (charismatic vs. rational-legal authority, routinization of charisma, secrecy and secret societies, science as a vocation, the structure of scientific revolutions and nature of power, coercion, manipulation, and violence).

3-5 units (Hochberg) given 1991-92

135. Socialist Societies in Transition—Surveys visions of socialism from the Romantic tradition of William Morris, to the scientific theory of Karl Marx, and the unique doctrine of Mao Zedong. These are contrasted with the realities of "actually existing socialist societies" by the examination of empirical material on the problems of centrally managed economies, the extent and dynamics of social inequalities, dissent and opposition under socialism, and recent strategies for economic reform. Alternative views on the nature of these societies. Their overall prospects for social transformation. Emphasis on the socialist experiments in China, Cuba, Czechoslovakia, E. Germany, Hungary, Mozambique, Nicaragua, Poland, the Soviet Union, and Yugoslavia.

5 units (Szelenyi) given 1991-92

136. Seminar: The Political Sociology of American Security Policy—(Same as Political Science 145L.) By what internal social and political proc-
esses are the ends and means of national security policy determined? Various approaches (rational actor, organizational, neo-Marxist, and sociology of technology) explore goal-setting and the development of policy instruments in post-WWII American foreign and military policy. Issues: early Cold War strategy, nuclear weapons development, and thought and behavior of military organizations.

5 units, Spr (Eden) TTh 10-12

138. Gender and Society—Historical and contemporary patterns in gender stratification. Topics: the division of labor between men and women; the relationship between social class and gender; the dynamics of occupational sex-segregation; gender differences in social mobility, socialization, and educational attainment; racial and cross-national variations in gender inequality.

5 units (Szelenyi) given 1991-92

139. Introduction to Historical Sociology—Analysis of the relationship between historical events and sociological structures. Theoretical perspectives and comparative methods in recent literature by Michael Mann, Charles Tilly, Perry Anderson, and Immanuel Wallerstein. Themes: social and political revolution, capitalism and the rise of the West, development of the modern world-system, and the origins and structure of the modern state.

3-5 units (Hochberg) given 1991-92

140. Social Stratification and Inequality—Processes and institutions by which social rewards and resources are differentially distributed. The forms of inequality in comparative perspective: mechanisms by which individuals are allocated into unequal positions; structure of racial, gender, and ethnic stratification; evolution of stratification systems.

5 units (Grusky) given 1991-92

141. Politics and Society—Main themes of political sociology; origins and expansion of the modern state; linkages between state and society; impact of the modern world system on national policies; internal distribution of power and authority; and the structure of political group formation and individual participation in modern states. Emphasizes modern empirical literature. (DR:5)

5 units, Aut (Meyer) TTh 10-12

142. The Family—Family composition, organization, and processes. Historical and recent trends in Western societies examined and compared with current situations in developing countries. Topics: marriage and divorce, fertility, illegitimacy, value of children, family size, household composition, and sex roles.

5 units, Win (Herting) TTh 10-11:30

143. Education and Society—(Same as Education 220C.) 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, and the organizational structure of schooling.

5 units, Spr (Hannaway) TTh 8-9:50

144. Social Mobility—Functions and consequences of mobility between social classes; the role of education, social contacts, cultural capital, and "luck" in allocating individuals to class positions; social mobility of minorities and women; implications of social mobility for class structure and formation.

5 units (Grusky) given 1991-92

145. Race and Ethnic Relations—Racial and ethnic relations in contemporary perspective. The social behavioral implications of attributions of race and ethnicity in small group interactions, the world of work and the larger society. Topics: race and IQ, interracial dating and marriage, inequalities in employment and income, affirmative action and ethnic political mobilization. (DR:5)

3-5 units, Spr (Staff) MWF

146. The Social Foundations of Democracy—(Same as Political Science 116L.) Social, cultural, political, economic, and international factors favorable to the development and consolidation of democracy in historical and comparative perspective. Attention to worldwide development and re-emergence of democracy in the past decade. Case studies of individual country experiences with democracy.

5 units (Upset) given 1991-92

147. Sociology of Mass Schooling—(Same as Education 245X.) Introduction to issues regarding the rise, organization, and expansion of mass education throughout the world. Interdisciplinary readings with a comparative/historical and cross-national research focus. Evaluation of functionalist, conflict, incorporation, and other theories of mass education.

4 units, Aut (Ramirez) MWF 10

148. Social Theory and Religion—(Same as Religious Studies 148.)

5 units (Eisen) given 1991-92

149. Communication, Technology, and Society—(Same as Communication 169, VTSS 162.) Methods for analyzing and addressing the question: Does technology drive societal change or does society drive technological change? Ex-
amples focus on the relationship between information and information-processing technologies since 1850 and the self, on mass society, the information economy, and the self.

4 units, Aut (Nass) TTh 10-11:50

150. Urban Sociology—Over the last 200 years the scale of the ecological communities in which people are embedded has increased more rapidly than the psychological communities with which people identify themselves and the political communities within which they are governed. Explores all three kinds of communities and the impact on the ability of people to govern themselves, and of the disparity between the scales of the ecological, psychological, and political communities.

3-5 units, Win (Conell) MWF 1:15

151. Jews and Judaism in America—(Same as Religious Studies 153.) A particular Jewish community and the religious forms it has evolved, using historical, literary, sociological, and theological materials.

4 units (Eisen) given 1991-92


5 units, Spr (Arthur) MW 1:15-3:05

154. Urban Growth and Change—Cities and towns change in size, density, composition, and internal organization. Causes and consequences of these changes. The processes of change in a city as a whole and in subareas of a city, with emphasis on the U.S.

5 units, Aut (Tuma) TTh 1:15-2:45

155. Law and Society—Introduction to major issues in the sociology of law. Topics: law and social control; law and stratification; the legal profession; legal culture; law and politics; legal change. Legal materials from areas of criminal law, family law, and civil rights law is integrated with social science literature where appropriate.

3 units, Spr (Staff) TTh 1:15-2:05

157. Seminar: Social and Geographic Foundations of American Political Development—Historical overview of the geographic and social context of party conflict, voting behavior, institutional development, and public policy formation in the U.S. Various theories (sectionalism, the Annales School, world-system analysis, and sociogeography) are applied to the study of political events and processes. Students utilize a geographic information system for analyzing and displaying quantitative data via computer-generated maps.

3-5 units, Spr (Hochberg) MW 1:15-3:05

158. Social Movements and Social Protest—The underside of electoral politics, "the politics of disorder." How do new issues get placed on political agendas? What determines whether a given grievance leads to collective protest, and 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?

3-5 units, Spr (Conell) MWF 11

159. The Sociology of Revolution—The study of revolution, its causes, processes, and consequences. Readings organized around major paradigms in the social sciences. Some of the major cases of revolution and revolutionary movements and the major issues (the significance of ideology, violence, class conflict, political regimes, and geographic structures) which cut across the cases. Emphasis on cases and issues viewed in the context of the theoretical explanations of revolutionary crises.

3-5 units (Hochberg) given 1991-92

FORMAL ORGANIZATIONS


5 units, Aut (Scott) MWF 9 section by arrangement

163. Organizational Decision Making—(Same as Political Science 107, Business 371.) Decision making in complex organizations: universities, schools, hospitals, business firms, and public bureaucracies. Information, power, resources, organizational structure, and the environment. Alternate models of choice and their implications.

5 units, Aut (March) MF or TTh 8-9:50

164. Organizations: Principals and Emerging Ideas—(Same as Education 258X.) Analyzes basic ideas about the hows and why's of the ways organizations and the people in them function. Perspectives are drawn from psychology, soci-
ology, political science, and economics to address questions about what holds organizations together (and in place) and what influences how (and when) they change. Emphasizes commonalities, differences, and implications of various theoretical approaches and their applicability to different types of organizations.

4 units, Spr (Hannaway) MW 3:15-5:05

165. Organizational Leadership — (Same as Business 379, Political Science 108.) Problems of leadership in complex organizations: universities, schools, hospitals, business firms, armies, and public bureaucracies. Attention to the role of major executives.

5 units (March) given 1991-92

166. Organizations and Public Policy—(Same as Public Policy 102.) Concepts and methods for analyzing the influence of organizations on the setting and implementation of public policy. Varying conceptions of organizations as corporate actors and as social contexts. The several roles of organizations in relation to public policy: organizations as decision makers and problem solvers, as change agents, and as clients. Prerequisite: 160 or Industrial Engineering 100.

5 units, Win (Scott) MWF 9 section by arrangement

167. Women and Organizations—(Same as Business 378, Feminist Studies 135/235.) Examination of dilemmas faced by women in contemporary American organizations: complex formal organizations such as corporations, universities, and health and welfare institutions; and smaller, less formal professional firms and social and political groups. Focus is on tradition and change in the definition of women's roles, and on women's styles of management, leadership, decision-making, and communication. The importance of women's alliances, the dilemmas and characteristics of separate women's organizations, and the potential for revising organization theory based on observations of women's behaviors.

5 units, Spr (Staff) TTh 1-3

SOCIOLOGICAL THEORY

170. Classics of Modern Social Theory—The work of classical sociological theorists Karl Marx, Max Weber, and Emile Durkheim. Their contributions to the discipline through their ideas on: the transition from feudalism to capitalism, problems of modern social organization, and the nature of the emergent social relation. Material from George Lukacs, Robert K. Merton, and Talcott Parsons places these theories in a contemporary perspective. (DR:3)

5 units, Aut (Szelenyi) TTh 1:15-2:45

171. Theory and Method in Contemporary Sociology—How theory is used in contemporary sociology. How to analyze, evaluate, develop, and use theory. Analysis of varied examples of contemporary theoretically-oriented sociology from which are extracted models of theory and its relation to research design. Exercises identify sociological questions, propose theories that might answer them, and suggest research that might test the consequences of the theories.

5 units (Staff) given 1991-92

RESEARCH METHODS

180A. Introduction to Sociological Research—Provides the consumer of social research with standards to evaluate the findings of sociological studies, and to present a critical analysis of basic notions and theories used in sociological analysis. Required of all sociology majors. Associated laboratory, see 180B.

3 units, Aut (B. Cohen) MWF 11

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. Cohen) by arrangement

181. Introduction to Statistical Methods for Sociologists—Elements of statistical description and statistical inference, emphasizing the statistical methods of principal relevance to sociology. Discussion of contingency tables, and elementary correlation and regression. A special section develops computer skills. Students who receive credit for Psychology 60 or Statistics 60 cannot be given credit for Sociology 60.

5 units, Win (Staff) MTWThF 9

182. Gathering Evidence for Urban and Policy Research—Introduction to social-scientific methods for gathering evidence for urban, policy, and other social research. Topics: usage of government documents, interviewing, and social surveys (public opinion polls). Students apply these methods in group projects that focus on issues in nearby cities.

5 units, Aut (Tuma) TTh 3:15-5:05

INDIVIDUALIZED LEARNING EXPERIENCES, PRIMARILY FOR UNDERGRADUATE MAJORS

190. Undergraduate Individual Study.

1-5 units (Staff) by arrangement

191. Undergraduate Directed Research—An opportunity to work on a project of one's own choice under the close supervision of a faculty member. Prior arrangement required.

1-5 units (Staff) by arrangement
192. Undergraduate Research Apprenticeship—An opportunity to work in an apprentice-like relationship with specific faculty member(s) in an on-going research project. Prior arrangement required.

1-10 units (Staff) by arrangement

193. Undergraduate Teaching Apprenticeship.
1-5 units (Staff) by arrangement

194. Departmental Seminar for Undergraduate Majors—Introduces sociology as an academic discipline, career opportunities in the field, and current faculty research interests. Required of all sociology majors.
2 units, Aut (Staff) W 12

195. Honors Seminar—Required of all students planning an honors thesis. An opportunity to write and present portions of a thesis (e.g., prospectus and a research proposal) to fellow honors students who may assist you in the beginning of your project. Workshop format helps conceptualize, develop, and review thesis as it progresses. Organized to encourage the early development of a thesis and to enable the student to compete for awards from the Fund for Undergraduate Research.
2 units, Win (Staff) W 12

196. Senior Thesis—An opportunity to work intensively on an honors thesis project under faculty supervision (see description of honors program). Must be arranged early in the year of graduation, or before.
3-10 units (Staff) by arrangement

FOR ADVANCED UNDERGRADUATES AND GRADUATE STUDENTS

207. Sociology of Mental Health—Same as 107 with special work for graduate students.
5 units, Win (Cronkite) TTh 10:30-12

210. Problems in Sociology of Education—(Meets with 310; same as Education 210.) Introduction to sociological approaches to educational phenomena. Topics: 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. Readings and evaluating social sciences research. Short written assignments and individual feedback.
4 units, Win (E. Cohen) MW 3:15-5:05

220. Interpersonal Relations: Lectures and Seminars—Same as 120 plus seminar for graduate students.
5 units, Aut (Johnston) MWF 8 section by arrangement

221. Theories of Social Psychology—Major theoretical perspectives in interpersonal processes and social psychology. Basic principles and assumptions of each perspective; techniques of investigation and methodological issues. Perspectives: symbolic interaction, field theory and exchanges, and problems associated with perspectives, e.g., power and influence, development of the self or attribution. Open to advanced undergraduates.
5 units, Spr (Staff) MW 2:15-4:05

222. Social Processes and Pathological Outcomes—Seminar on abnormal family and group processes resulting in emotional disturbances and behavioral disorders. The development of disorders in personality (or the self) from a social psychological or sociological point of view, emphasizing searching for the mechanism by which pathological interpersonal interactions get translated into pathological self processes. Topics: the impact of experiences of neglect, abuse, molestation, violence, marital separation and divorce, war, and natural disasters on children and adults. Prerequisites: 120 or 220, and 121, or consent of instructor.
5 units, Spr (Johnston) T 7-10 p.m.

229. Status, Expectations, and Rewards—The effect of status characteristics, 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 performance and reward expectations can be changed. Theoretical and empirical research on status characteristics theory is 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, Win (Moore) Th 2:15-5:05

230. Seminar: Evaluation Research, Issues and Applications—The paradigms for evaluation research, the role of theory in formulating evaluations, and common issues in the design and execution of evaluations studies. Topics: general issues in program evaluation, development of assessment procedures, and examples of ongoing treatment and health services related evaluation projects. For advanced students, co-sponsored by the Department of Psychiatry and Veterans Administration Far West Health Services Research and Development Field Program. Prerequisite: consent of instructor.
2 units (Moos, Cronkite, Finney) given 1991-92

240. Seminar: Social Stratification—Major research issues in social stratification and inequality. Topics: concepts and theoretical
together. and symbiotic relations that tie organizations last. Relations between organizations and en-
determine when new organizations emerge, what forms they assume, and how long they
ket oriented organizations. The processes that
research on populations of market and non-mar-
for graduate students.

260. Formal Organizations: Lectures and Sem-
Principles for design and evaluations of group work for students and teamwork for teaching staff. Topics: social processes of influence, role differentiation, and evaluation. Methods of systemic evaluation and observation are included; students receive practical experience in using these methods.

4 units (E. Cohen) given 1991-92

261. Seminar: Organizational Ecology—Recent research on populations of market and non-market oriented organizations. The processes that determine when new organizations emerge, what forms they assume, and how long they last. Relations between organizations and environment, and the competitive, commensal, and symbiotic relations that tie organizations together.

5 units, Win (Connell) T 2:15-5:05

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. Relative power of subunits and individuals considered in terms of vertical power and authority differences and from the perspective of power differences that arise among subunits formerly on the same hierarchical level. Topics: the definition of power and politics, and whether power is a measurable and meaningful concept; the sources and determinants of 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 limited.

4 units, Aut (Pfeffer)

264. Managing the Organization's Workforce—(Same as Business 470.) All organizations face the following decisions: which activities to manage internally, and which to contract out; how to compensate those positions, and how to balance pressures for equal compensation with pressures to pay for performance; how to select individuals to fill positions; how to structure careers to ensure training and learning, and to motivate and retain excellent employees; how to adapt to pressures for flexibility and change. These are made in a business environment increasingly constrained by litigation and government regulation, and by unions and employee associations. How such decisions are made and how to make them more effectively. Topics: the structure of rewards, the externalization of work, the organization of work in other countries, the legal environment of the employment relationship, unions and their effects, and organizational hiring standards and internal labor market arrangements.

4 units, Win (Pfeffer)

265. International Perspectives on Organizations—(Same as Political Science 207M, Business 475.) Perspectives and research on organizations by foreign scholars and in non-American contexts. Emphasis on identifying a few key concepts from the foreign literature and contrasting the points of view, research results, and experiences with those based on research in the U.S. Prerequisites: Business 270, Sociology 160, or Industrial Engineering 100. Consent of instructor required.

5 units, Win (March) MTh 3:15-5:05
266. Seminar: The Employment Relationship—
(Same as Business 674.) Current theory and empirical research from social science disciplines bearing on the nature of the employment relationship. Topics vary each year, but include selection and screening mechanisms, career structures and other aspects of incentive systems, implicit and explicit contracts, authority and control systems, equity, and the role of institutions (including unions and the state) in shaping the employment practices of organization. Prerequisite: consent of instructor.
4 units, Win (Baron)

3, 5, or 8 units, Spr (Hochberg)

269A,B,C. Topics in Organizations—Research presentations and theoretical discussions addressing issues in current organizational research. Restricted to doctoral students.
1 unit, Aut, Win, Spr (Scott) by arrangement

282. Seminar: Topics in Comparative and Historical Sociology—The comparative and historical approaches to sociological analysis. Topics vary each year.
5 units, Spr (Conell) T 2:15-5:05

284. Demographic Methods—Population theory and data analysis. Static and dynamic models of population composition and growth. Methods for estimating population parameters from flawed data. Prerequisite: multivariate calculus, or consent of instructor.
5 units (Staff)

285. Political and Economic Organization of the World System—Seminar on current theory and research on the structures of the world polity, economy, and culture as they affect the organization and development of national societies. Dependency theories, world-economy theories, and world effects on the evolution, dominance, and modern forms of states and regimes. Prerequisite: previous work in comparative or political sociology.
5 units (Meyer) given 1991-92

268. Seminar of Institutional Analysis—Reading and research on the nature, origins, and effects of the modern institutional system. Emphasis on the state system.
5 units, Win (Meyer) T 1:15-4:05

PRIMARILY FOR GRADUATE STUDENTS

300A,B,C. Graduate Proseminar—Limited to first-year graduate students in Sociology.
2 units, Aut, Win, Spr (Staff) by arrangement

306. Sociology of Development and Education—
(Same as Education 306D.) Analysis of the relations between educational and societal developments from a comparative perspective. Readings on theoretical perspectives and empirical studies on structural and cultural sources of educational expansion and differentiation, and on cultural and structural consequences of educational institutionalization. Research topics: education and nation-building; education, mobility, and equality; education, international organizations, and world culture.
5 units, Spr (Ramirez) MW 1:15-3:05

307. Research Seminar in Higher Education—
(Same as Education 346X.) Overview of U.S. system of higher education and how it evolved. What are structural and cultural features of contemporary system? How did organizational structures and purposes get defined? How and why have they changed? Examines major topic areas (e.g., organization and governance, faculty, students, curriculum) and recurrent system-wide issues (e.g., stratification, decentralization, excellence and diversity).
4 units, Aut (Gumport) Th 3:15-6:05

310. Sociology of Education—(Same as Education 310.) For doctoral and master's students. Meets with 210. Emphasis on conceptualizing and analyzing applied sociological research in education. Short written assignments, individual feedback, and work with actual research data.
4 units, Win (E. Cohen) MW 3:15-5:05

320A,B,C. Seminar: Frontiers in Social Psychology—Recent developments in social/psychological research. Open to all graduate students and advanced undergraduates who have completed at least 15 units in Sociology. Required of trainees in the NIMH program on normal pathological interpersonal processes.
2 units, Aut, Win, Spr (Staff) M 12:15-1:30

321. Research Issues in Social Psychology—Selected current issues in sociological social psychology. Topics: effects of family process on status attainment; social structure and group productivity; operation and interrelation of status, affect and control as social processes; and effects of power and legitimacy on responses to inequity.
Prerequisite: 120 or 121, or permission of instructor.
5 units, Spr (Berger, Dornbusch, Zelditch) TTh 2:15-4:05

361. Seminar: Social Psychology of Organizations—(Same as Business 671.) The social psychological theories and research relevant to organizational behavior. Past topics: organizational culture, mythology, and the creation of knowledge structures such as script or schema; distributive injustice and its relationship to alienation, sabotage, violence, and theft organizational contexts. Prerequisites: enrollment in a Ph.D. program and consent of the instructor.
4 units, Win (Martin)

365. Seminar: Advanced Organization Theory—(Same as Business 676, Political Science 306.) Topics in organization theory for advanced students. Prerequisite: permission of instructor.
5 units (March) given 1991-92

367. Seminar: Organizational Analysis—(Same as Business 670, Political Science 307.) Doctoral-level introduction to research on organizations. Emphasizes recent organizational research in social science. Prerequisite: enrollment in a doctoral program.
5 units, Win (March) TTh 8-10

370A,B. Basic Problems in Sociological Theory—Two-quarter course on analysis and construction of theories and on basic strategies of sociological analysis. 370A introduces strategies of sociological analysis selected from among functionalism, historical materialism, human ecology, the theory of action, symbolic interactionism, social phenomenology, decision theory, and behaviorism, illustrated by one or more programs of theoretical research originating in the classical literature (e.g., Durkheim, Marx, Weber, et al) and still active in the contemporary literature (e.g., Homans, Merton, Parsons, et al). Also, some elementary methods required to intelligently read and analyze theory. 370B refines these methods and extends them to the construction of new theory. It includes a self-directed computer course in logic. Prerequisite: consent of the instructor.
5 units, Aut (Zelditch) MW 3:15-5:05
Win (B. Cohen) MW 2:15-4:05
section by arrangement

371A,B,C. Research Practicum: Cross-National Studies of Educational and Political Organizations—(Same as Education 387A,B,C) Analysis of quantitative and longitudinal data on national educational systems and political structures. Prerequisite: consent of instructor.
1-5 units, Aut, Win (Meyer, Ramirez) by arrangement
Spr (Ramirez) by arrangement

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 (B. 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 (B. Cohen) by arrangement

381. Sociological Methodology I: Introduction to Design and Analysis—Basic principles of research design and of descriptive, exploratory, and inferential statistics. Introduction to the computer as a research tool and to common data sets. Reviews basic math skills needed for advanced statistical training.
4-6 units, Aut (Herting) TTh 10-12
section W 10-12

382. Sociological Methodology II: The General Linear Model—The general linear model for discrete and continuous variables. Introduction to principles of estimation, model selection, specification error, assessment of fit. Prerequisite: 381 or equivalent.
4-6 units, Win (Grusky) TTh 10-12
section W 10-12

4-6 units, Aut (Grusky) MWF 1-3
Spr (Tuma) TTh 11-1
section W 11-1

4-6 units (Herting) given 1991-92

385. Seminar: Measurement in the Social Sciences—Principles and problems of measurement in the social sciences within the context of causal modeling. Methodological approaches, from
traditional factor analysis methods to recent developments in the causal modeling of error structures. Emphasis on the utility of multiple indicator approaches to social measurement.

5 units (Herting) given 1991-92

386. Seminar: Event History Analysis—Lectures/discussion on event history analysis and its application in social science research, plus hands-on experience with computer software for event history analysis. Exploratory and multivariate approaches. Topics: alternative approaches to time dependence and population heterogeneity. Estimation and testing. Parametric and semiparametric models. Prerequisite: 383 or equivalent.

5 units (Tuma) given 1991-92

388. Log-Linear Models—Analysis of categorical data with log-linear, log-multiplicative, latent class, latent trait, Markov, Rasch, and related models.

5 units (Grusky) given 1991-92

389A,B. Workshop in Research Design and Methods—Practicum in research design. Prerequisite: consent of instructors.

2-5 units, Win (Grusky) by arrangement Spr (Herting) by arrangement

GRADUATE INDIVIDUAL STUDY

390. Graduate Individual Study. (Staff) by arrangement

391. Graduate Directed Research. (Staff) by arrangement

392. Research Apprenticeship. (Staff) by arrangement

393. Teaching Apprenticeship. (Staff) by arrangement

394. Thesis. (Staff) by arrangement

The Center is an interdepartmental organization coordinating teaching and research in space science and astrophysics. Its members are drawn from the Departments of Applied Earth Sciences and Geology in the School of Earth Sciences; the Departments of Aeronautics and Astronautics, Electrical Engineering and Mechanical Engineering in the School of Engineering; and the Departments of Applied Physics, Chemistry, and Physics in the School of Humanities and Sciences.

Research now in progress covers a 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 Wilcox Solar Observatory and from national observatories; and theoretical research including computer modeling. 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 through the NASA-Ames-Stanford-University Joint Institute for Space Research, and with scientists at the Lockheed Palo Alto Research Laboratory through the Stanford-Lockheed Institute for Astrophysical and Space Research. For administrative purposes, the center comprises a number of smaller units with specialized research activities.

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 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.

Further information is available from either the director or deputy director.

COURSES

For descriptions, see the listing under Aeronautics and Astronautics, Applied Physics, Electrical Engineering, Geophysics, Mechanical Engineering, Physics, and also under the Astronomy Course Program.

AERONAUTICS AND ASTRONAUTICS

129. Life in Space.
212. Introductory Hypersonic Aerophysics.
227. Atmospheric and Space Physics.
279A. Space Mechanics.
279B. Advanced Space Mechanics.
279C. Optimal Space Trajectories.
286. Advanced Space Propulsion.

APPLIED PHYSICS

15. The Nature of the Universe.
50. Astronomy Laboratory and Observational Astronomy.
100. Introduction to Observational and Laboratory Astronomy.
160. Introduction to Stellar and Galactic Astrophysics.
161. Introduction to Extragalactic Astrophysics and Cosmology.
312,313. Basic Plasma Physics I and II.
360. Stellar Physics.
365. Extragalactic Astrophysics and Cosmology.

ASTRONOMY


ELECTRICAL ENGINEERING

106. Planetary Exploration.
249. Introduction to Space, Telecommunications, and Radioscience.
350. STAR Laboratory Seminar in Radioscience.
352. Electromagnetic Waves in the Ionosphere and Magnetosphere.
354. Introduction to Radio Wave Scattering.

ENGINEERING

235A,B. Space Systems Engineering.

GEOPHYSICS


MECHANICAL ENGINEERING

260. Geophysical Fluid Dynamics.

PHYSICS

15. Cosmic Horizons.
364. Gravitation.
SPANISH AND PORTUGUESE

Emeriti: (Professors) Fernando Alegria, Aurelio M. Espinosa, Jr., Bernard Gicovate, Juan B. Rael, Isabel Magaña Schevill; (Assistant Professor) Grace Knopp

Chairman: Jorge Ruffinelli
Professors: Mary Louise Pratt, Michael P. Predmore (on leave), Jorge Ruffinelli, Sylvia Wynter
Associate Professors: Wilfrido H. Corral (on leave Autumn), Tomás Ybarra-Frausto (on leave)
Assistant Professors: Francisco Caetano Lopes, Jr., Adrienne L. Martin
Associate Professor (Teaching): María-Paz Haro
Senior Lecturer: Karin Van den Dool
Lecturers: Irene Corso, Juergen Hahn, Pilar Soler
Visiting Professors: Francisco Caudet (Winter), Isabel Criado (Spring), María Herrera-Sobek (1990-91), Julio Ramos (Winter)

Director, Undergraduate Language Program: María-Paz Haro

The Department of Spanish and Portuguese accepts candidates for the degrees of Bachelor of Arts, Master of Arts in Spanish and Portuguese, and Doctor of Philosophy in Spanish and Portuguese.

Students interested in Iberian and American languages not offered in this department should contact the Special Language Program, Department of Linguistics.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Recognizing that students have different interests and reasons for pursuing a major in the Department of Spanish and Portuguese, the following major paths have been designed. Each has different objectives and requirements. Students should consider, in consultation 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 who enjoy reading literature and wish to acquire a knowledge of poetry, prose, and drama in the Hispanic world. Courses provide historical perspective and develop critical skills in approaching literature. Candidates complete a minimum of 50 units from courses in the department numbered 100 or higher.
Requirements: Spanish 140, Introduction to Methods of Literary Analysis; 170, Undergraduate Winter Colloquium; 201 and 202, Advanced Grammar and Composition; three courses in Peninsular literature; three courses in Latin American literature. Among the courses taken, two should be literature prior to 1750.

Recommended: Spanish 205, History of the Spanish Language; Chicano literature; linguistics; literary theory.

Literature and Society Emphasis—This path allows 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 40 units in the department from courses numbered 100 or higher, and 10 units in related fields with advisor approval.
Requirements: Spanish 140, Introduction to Methods of Literary Analysis; 170, Undergraduate Winter Colloquium; 201 and 202, Advanced Grammar and Composition; three courses in Peninsular Literature; three courses in Latin American literature.

Chicano Studies Emphasis—This path allows concentration in Chicano Studies. Professor Ybarra-Frausto serves as individual program advisor. Students acquire a broad knowledge of the roots of Chicano literature by taking courses designated Chicano Studies (CHST) and courses in, for instance, the Departments of Linguistics, Anthropology, or History. Candidates must complete a minimum of 50 units, including 10 units in Latin American and/or Peninsular literature from courses numbered 100 or higher in the department.
Requirements: Spanish 140, Introduction to Methods of Literary Analysis; 170, Undergraduate Winter Colloquium; 201 and 202, Advanced Grammar and Composition; three courses in Chicano literature; four courses in Latin American and/or Peninsular literature.

Language Emphasis—This path is for students whose primary interest is in the structure and use of Spanish. Students must complete a minimum of 50 units from courses in the department numbered 100 or higher.
Requirements: Spanish 140, Introduction to Methods of Literary Analysis; Spanish 170, Undergraduate Winter Colloquium; Spanish 201, 202, Advanced Grammar and Composition; Spanish 205, History of the Spanish Language; one course in introductory linguistics (in the Linguistics Department); two courses in Spanish linguistics.

Recommended: two literature courses in one area; Portuguese 109 (Portuguese for Speakers of Spanish.)
SUGGESTED SEQUENCE

A series of core courses designed to fulfill the requirements for all the major paths are offered each year. All majors must take Spanish 140 and 170. Courses numbered 150-151 (Peninsular literature) and 160-161 (Latin American literature) are introductory survey courses which satisfy the minimum literature requirements for all the paths. It is recommended that majors enroll initially in 150-151 or 160-161. It is also expected that they go on to take courses at the 200 level.

Courses numbered 130B, 131B, 132B are recommended for bilingual students and/or 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 Spanish 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 or English and Portuguese/Brazilian 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 50 units in Spanish and Portuguese from courses numbered 100 or 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 6 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 in the Stanford Program at the University of Salamanca. Students reside in residencias de estudiantes and attend university courses given and organized by the Director in Residence. Application forms may be obtained from Overseas Studies (room 126, Sweet Hall).

Two types of courses are offered: those under departmental listings in Overseas Studies and courses taught at the University of Salamanca. Special courses for Stanford students include:
- Overseas Studies 101A, Bases sociopolíticas de la evolución cultural española (5 units)
- Spanish 101B, Literatura Española Contemporánea (5 units)
- Overseas Studies 102A, Historia de España, s.XIX (4 units)
- Overseas Studies 102B, Historia de España, s.XX (4 units)
- Spanish 201, Advanced Grammar and Composition (3 units)
- Spanish 202, Advanced Grammar and Composition (3 units)

These courses are required for all students in the Salamanca program. Three are offered in Autumn Quarter and three in Winter Quarter.

Each Stanford student enrolls in two additional courses at the University of Salamanca from among those offered to Spanish students. The course list is available at the Overseas Studies office. Courses taught at the University of Salamanca include: Spanish Linguistics; History of Modern Philosophy; Anthropology; Pre-Columbian and Hispanic-American Art; Medieval History; etc.

The director of the Stanford Program in Salamanca, Prof. Isabel Criado, will be in residence at Stanford Spring Quarter. Students are invited to contact her for information on the program. For other information and course lists, consult Dr. Haro or the office of Overseas Studies.

BRAZIL

For information on programs in Brazil, consult Dr. Van den Dool. For credits in these and other programs abroad, consult your advisor.

INTENSIVE SUMMER PROGRAM

Stanford University offers first-year intensive language study in Spanish and Portuguese during the summer. For further information, contact the department or the Summer Session office.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, see 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 second- and third-year 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 in course numbers below 200 indicates bilingual courses.

HONORS PROGRAM

Spanish and Portuguese majors in the junior year, with a letter grade indicator of "B +" or better in all major courses, may apply to the honors program. Students should submit an
“Application for Honors Program” and a proposal outline by the end of Winter Quarter of the junior year. Each honors student must be accepted by a faculty member who serves as advisor and write an honors essay of 20 to 25 pages. Work on the essay normally begins in the Spring Quarter of the junior year and must be completed by the end of the third week of March of the senior year. Consult the undergraduate secretary or the major advisor for more information.

PROFICIENCY CERTIFICATION
Advanced students are encouraged to qualify by examination for the ACTFL Language Proficiency Notation which certifies foreign language competence. For further information, contact Dr. Haro.

GRADUATE PROGRAMS
MASTER OF ARTS IN SPANISH
This A.M. degree program is for students who do not intend to continue their studies through the Ph.D. degree. Students must complete a minimum of 45 units, 36 of which must be completed at Stanford.

Requirements: Spanish 201, 202, Advanced Grammar and Composition; Spanish 306, Introduction to Literary Theory or an equivalent course; two 200-or-above courses in Latin American literature and two 200-or-above courses in Peninsular literature; and reading knowledge of one foreign language other than Spanish (preferably Portuguese).

In addition, students may take approved courses in related fields such as linguistics, modern thought, classics, comparative literature, philosophy, history of art, and education. Students planning a career in language teaching may also take part in the University’s STEP 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.

DOCTOR OF PHILOSOPHY
The requirements of the Ph.D. are: (1) 90 units of graduate level coursework; units completed toward the A.M. degree can be counted for the Ph.D.; (2) Spanish 201 and 202, Advanced Grammar and Composition; 301, Methods of Teaching Spanish; and 306, Introduction to Literary Theory or an equivalent course must be included; (3) a reading knowledge of Portuguese and one other foreign language; (4) the qualifying paper, and the comprehensive and the University oral examinations, as described below; (5) teaching of at least three courses in the department; (6) completion of a dissertation. For basic residency and candidacy requirements, see the “Advanced Degrees” section in this bulletin. For further information, consult the department’s Graduate Student Handbook.

Newly admitted students are required to take a proficiency examination in Spanish during the first week of Autumn Quarter to determine the degree of previous preparation. The student is required to remedy deficiencies indicated by this examination before a teaching assignment is awarded.

In preparation for teaching, Ph.D. candidates must take Spanish 301, Methods of Teaching Spanish, in the Spring quarter of the first year.

In consultation with the advisor, students select one major field of study from the following: (1) Spanish Medieval Literature, (2) Spanish Literature of the Golden Age, (3) Modern Spanish Literature, (4) Luso-Brazilian Literature, (5) Spanish American Literature to Independence, (6) Spanish American Literature of the 19th and 20th Centuries, (7) Chicano Literature. In addition, candidates 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) Luso-Brazilian Literature, (6) Spanish American Literature of the Colonial Period, (7) Spanish American Literature from Independence, (8) Chicano Literature, (9) Literary Theory.

At least four courses must be taken in the major field of study. At least two courses must be taken in each secondary area. Students whose major field is in Spanish American, Luso-Brazilian or Chicano Literature must choose one secondary in Peninsular literature and vice versa. One secondary area of concentration may be taken outside the department in consultation with the advisor.

In addition to departmental course offerings, students should consult with their advisor and take relevant courses in other departments and programs, such as the Graduate Program in Humanities, Comparative Literature, Modern Thought and Literature, Feminist Studies, or History. It is also possible to complete a minor in another department with approval of the advisor. Normally, not more than 25 units are taken outside the department.

After the first year of study, the 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 term paper of approximately 20
pages by the first week of Autumn Quarter of the second year.

If approval of the qualifying paper is granted, the student should file a formal application for candidacy no later than the end of the second year, as prescribed by the University. Course requirements are usually completed by the end of the third year of study. Early in the fourth year, a written comprehensive examination on the major field and secondary areas is taken. The examination is based on a comprehensive list of readings, selected in consultation with the advisor, which integrates major and secondary topics in both Peninsular and Latin American Studies. At this time, students also hand in a long research paper to be evaluated by the faculty. For further details, consult the Graduate Student Handbook.

Immediately following the examination, students should find a topic requiring extensive original research and request that a member of the department serve as dissertation advisor. The advisor requests that the chairman approve a committee to supervise the dissertation. The committee may advise extra preparation within or outside the department, and time should be allowed for such work. The University oral examination usually takes place one or two quarters after passing the comprehensive examination. The oral examination covers plans for the dissertation based on a prospectus approved by the advisor (15-20 pages, written in English), and may be taken in English, Spanish, or Portuguese.

The dissertation must be submitted to the reading committee 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. Ph.D. dissertations must be completed and approved within five years from the date of admission to candidacy. Candidates taking more than five years are required to reinstate their candidacy.

Ph.D. MINOR

For a minor in Spanish or Portuguese, the student must complete 25 units, with a letter grade indicator of "B" or above, selected from courses numbered 200 or higher. Spanish 201 and 202 (or waiver by examination) are required.

Students who choose a minor in another department should consult with advisors in that department.

JOINT Ph.D. PROGRAMS

The Department of Spanish and Portuguese participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Spanish and Humanities. For a description of that program see the "Humanities Special Programs" section in this bulletin.

COURSES

OVERVIEW

1. First- and Second-Year Spanish (1-99)
2. Intermediate Courses (100-199)
   Culture and Bilingual (130-139)
   Literature (140-198)
   Individual Work (199)
3. Courses for Advanced Undergraduates and Graduates (200-299)
   Advanced Language, Linguistics, and Theory (200-210)
   Peninsular Literature (211-239)
   Medieval and Golden Age Literatures (211-220)
   Modern and Contemporary Literatures (221-230)
   Genre Survey Courses (231-235)
   Individual Authors (236-239)
   Latin American Literature (240-279)
   Periods (240-247)
   National and Regional Literatures (248-254)
   Genres and Literary Movements (255-271)
   Individual Authors (272-279)
   Chicano Literature (280-289)
   Special Topics (290-298)
   Individual Work (299)
4. Graduate Seminars (300-399)
   Linguistics, Methodology, and Literary Theory (300-313)
   Peninsular Literature (314-339)
   Latin American Literature (340-379)
   Chicano Literature (380-389)
   Special Topics (390-398)
   Individual Work (399)
   Dissertation Research (802)
5. Portuguese Program (1-399)
   Language (1-199)
   Portuguese Literature (211-239)
   Brazilian Literature (240-279)
   Individual Authors (280-289)
   Special Topics (290-298)
   Individual Work (299)
   Graduate Seminars (300-398)
   Individual Work (399)
   Dissertation Research (802)

All courses are taught in Spanish or Portuguese unless otherwise noted.

SPANISH LANGUAGE PROGRAM

Students registering for the first time in a first- or second-year course should take a placement test if they have studied Spanish before entering Stanford. Students who have passed
the AP exams with a 4 or 5 are exempted from the test but must register in third-year (100 or above) courses in order not to lose their AP credit. For courses 11B, 12B, and 13B, see the special section for bilingual students. Auditors are not permitted in language courses.

**INTRODUCTORY**

A letter grade indicator of "C" or better is required to enter the next higher course in the language sequence.

1. **First-Year Spanish (1st Quarter)**—A proficiency-oriented introduction emphasizing speaking and oral comprehension.
   - 5 units, Aut, Win, Spr (Staff) MTWThF plus language lab

2. **First-Year Spanish (2nd Quarter)**—As above, with additional development of reading and writing skills, and cultural readings. Prerequisite: 1 or equivalent.
   - 5 units, Aut, Win, Spr (Staff) MTWThF plus language lab

3. **First-Year Spanish (3rd Quarter)**—As above, with additional cultural and/or literary readings. Prerequisite: 2 or equivalent.
   - 5 units, Aut, Win, Spr (Staff) MTWThF plus language lab

5. **Intensive Beginning Spanish**—Daily work in language lab required. Proficiency-oriented instruction in comprehension, speaking, reading, and writing; also exposure to Hispanic cultures. Not equivalent to full year of Spanish study during the regular academic year. Enrollment limited to 15. No auditors.
   - 9 units, Sum (Haro) MTWThF

10/110. **Elementary Conversation**—(Graduate students register for 110.) Conversation practice supplementing 2 or 3. May also be taken when student intends to continue in first-year series but current course load does not permit. Prerequisite: 1 or equivalent. Satisfactory/No Credit only.
   - 2 units, Aut, Win, Spr (Staff) TTh

11. **Second-Year Spanish (1st Quarter)**—Intensive review of grammatical concepts; composition and conversation based primarily on cultural and literary readings. Prerequisite: 3 or placement test.
   - 4-5 units, Aut, Win, Spr (Staff) MTWThF

12. **Second-Year Spanish (2nd Quarter)**—Continuation of 11. Prerequisite: 11 or placement test.
   - 4-5 units, Aut, Win, Spr (Staff) MTWThF

13. **Second-Year Spanish (3rd Quarter)**—Application of grammatical concepts to composition, conversation, and oral presentation. Advanced readings. Prerequisite: 12 or placement test.
   - 4-5 units, Aut, Win, Spr (Staff) MTWThF

15/115. **Intermediate Conversation**—(Graduate students register for 115.) Recommended as complement to second year courses. Prerequisite: 3 or equivalent. Satisfactory/No Credit only.
   - 3 units, Aut, Win, Spr (Staff) MWF
   - Sum (Staff) MTWTh

100. **Advanced Conversation**—Prerequisite: 13 or equivalent. Satisfactory/No Credit only. (May be counted only once for the major.)
   - 3 units, Aut, Win, Spr (Staff) MWF

110. **Elementary Conversation for Graduate Students**—(See 10.)

115. **Intermediate Conversation for Graduate Students**—(See 15.)

**FOR BILINGUAL STUDENTS**

Designed to meet specific linguistic needs of the bilingual student. See also 130 sequence.

11B, 12B, 13B. **Second-Year Spanish for Bilingual Students**—Series for bilingual students of Hispanic background and others with equivalent language skills who wish to refine command of the language and to enlarge vocabulary. Short readings by and about Chicanos and other Hispanics in the U.S. Slides, tapes, videos, and films. (DR:2; entire sequence must be completed.)
   - 5 units, Aut, Win, Spr (Staff) MTWThF

162B. **Chicano Literature: Creative Writing for Bilingual Students**—(Same as English 162B.) Basic creative writing. Students are encouraged to draw from their bicultural, bilingual experience. Knowledge of Spanish and familiarity with barrio dialects essential. (Not open to graduate students or freshmen.)
   - 5 units, Spr (Islas)

**SPECIAL**

15, 2S, 3S. **First-Year Individualized Spanish**—Primarily for seniors who need to complete more or less than 5 units a quarter, or have demonstrably restrictive scheduling conflicts and must complete the language requirement for graduation. Students proceed at own pace, working with text and tapes. Instructor is available for consultation on a regular basis. Students who complete more than one course (5 units) of 1S/101S, 2S/102S, 3S/103S must attend 10/110, or pass a first-year oral proficiency examination. Enrollment limited. Consent of instructor required.
   - 3-15 units, Aut, Win, Spr (Hahn)

20. **Second-Year Intensive Spanish**—Proficiency-oriented accelerated course recommended for students with previous training (three to five
years of high school Spanish or the equivalent) whose progress would be best served by intensive study. Meets daily for two hours.
9 units, Win (Staff) MTWThF

50. Reading Spanish—Intensive course designed to fulfill the University requirement of a reading knowledge of Spanish. Students must earn a letter grade indicator of at least “B+.”
3 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

121M. Spanish for Medical Personnel—(Same as Health Research and Policy 280.) Geared to achieve a practical and rapid command of spoken Spanish. Topics: the human body, hospital procedures, diagnostics, food, and essential phrases for on-the-spot reference when dealing with Spanish-speaking patients.
3 units, Aut (Corso)

122M. Spanish for Medical Personnel—(Same as Health Research and Policy 281.) Continuation of 121M. Prerequisite: 121M or equivalent.
3 units, Win (Corso)

123M. Spanish for Medical Personnel—(Same as Health Research and Policy 282.) Continuation of 122M. Prerequisite: 122M or equivalent.
3 units, Spr (Corso)

125. Spanish for the Professions—Prepares for the proficiency exam which must be passed in order to obtain the official transcript notation certifying foreign language proficiency. Prerequisite: 13 or equivalent.
3-5 units, Win (Staff)

126L. Spanish for Lawyers—(Same as Law 396.) Provides a solid basis for communication in law-related interactions and develops the ability to read professional texts in Spanish.
3 units, Aut, Spr (Staff)

CULTURAL READINGS
For students who do not anticipate a literature major but want to continue beyond the second year.

Readings and topics for discussion and composition begin with a focus on Spain and expand to include socio-cultural and historical material from Latin America, and the Mexican-Chicano, Puertoriqueño and Cubano heritages. Aim is to develop critical perspective on issues affecting a bilingual-bicultural reality. Prerequisite: 13 or permission of instructor. For special courses in Chicano literature and history, see courses numbered 280-289.

130B, 131B, 132B. Cultural Readings—Art, current events, folklore, history, language, and literature of Spain (130B), Latin America (131B), and Mexico and the Hispanic Southwest (132B). Lectures supplemented by slides, movies, tapes, and occasional field trips. For non-majors, bilingual students, and others interested in the culture of Spanish speakers. Need not be taken in sequence.
130B. Spanish Cultural Readings—(DR:2)
3-5 units, Aut (Haro)

131B. Hispanic American Cultural Readings—(DR:2)
3-5 units, Spr (Staff)

132B. Mexican and Chicano Cultural Readings—(DR:2)
3-5 units, Win (Staff)

LITERATURE
These provide a broad perspective on Hispanic literature and an introduction to literary studies. Prerequisite: 13 or equivalent.

140. Introduction to Methods of Literary Analysis—For students with little or no background in literary analysis. Introduces basic terminology of literary theory and critical approaches to literature through textual analysis. Emphasis varies with instructor. Prerequisite: 13 or equivalent. (DR:2)
3-5 units, Spr (Corral)

150-151. Spanish Literature—Basic introduction to Spanish Peninsular literature. Sequence deals with major works from several periods and genres preparing for more specialized 200 level courses. Need not be taken in sequence. Content varies each year. Prerequisite: 13 or equivalent.

150. Spanish Literature I—The spirit of Spain in its early literature. Medieval and Golden Age masterpieces that establish and reflect Spain's unique identity (Christians, Jews, Moors) and create its traditions. Close reading of El libro de buen amor, Poema del Cid, La Celestina, Lazarillo de Tormes, El Burlador de Sevilla, Gacilaso, Cervantes, Gongora, Lope de Vega, Calderón. (DR:2)
3-5 units, Win (Martin)

151. Spanish Literature II—Representative works of Spanish literature from the 1830's to the 1930's: Larra, Espronceda, Becquer, Galdós, Unamuno, Valle-Inclán, Machado, and Lorca. Emphasis on a close reading of the texts in relation to the "problem of Spain" within the democratic tradition of Spanish liberalism. (DR:2)
3-5 units, Spr (Criado)

155. The Spanish Republic, the Civil War, and the Aftermath—Significance of the Civil War for
SPANISH AND PORTUGUESE

Spanish, European, and world history; the International Brigades. Effect of war on literary and cultural life of the country and the response of writers from Spain (Machado, Lorca, Alberti) and Latin America (Neruda, Guillén, Vallejo.) Literary protest during the Franco regime by such figures as Alonso, Aleixandre, Cela, Santos, and Goytisolo.

3-5 units (Predmore)

160-161. Spanish American Literature—Basic introduction, with major works from several periods and genres. Prepares for more specialized 200 level courses. Need not be taken in sequence. Content varies each year. Prerequisite: 13 or equivalent.

160. Spanish American Literature I—Major themes, writers, and cultural debates from the Colonial Period to independence. Novels, poems, essays, and periodicals from Latin America. (DR:2*)

3-5 units, Aut (Staff)

161. Spanish American Literature II—Continuation of 160, from independence to the present. Readings: "El matadero", Mara, Santa, Los de abajo, Cien años de soledad, El aleph, and Gringo viejo. (DR:2*)

3-5 units, Win (Herrera-Sobek)

165. Latin American Novel of the Sixties—Study of the most important works published in the 1960s, a period of artistic and social ferment which led to international recognition of the Latin American novel. Readings: Benedetti, García Marquez, Fuentes, Vargas Llosa, Martha Lynch.

3-5 units (Ruffinelli)

170. Undergraduate Colloquium: Mexican Immigration and the Corrido—(Same as Chicano Studies 170.) Traces Mexican immigration to the U.S. (1848-1990) through the lyrics of Mexican/Chicano corridos (ballads). Traditional historical sources and corrido texts help comprehend the Mexican immigrant experience.

3-5 units, Win (Herrera-Sobek)

199. Individual Work—Open only to majors in Spanish, or by consent of instructor.

1-12 units (Staff) by arrangement

FOR ADVANCED UNDERGRADUATES AND GRADUATES

ADVANCED LANGUAGE, LINGUISTICS, AND THEORY

201. Advanced Grammar—Problems of grammar at an advanced level.

3 units, Aut (Martín)


3 units, Win (Hero)

205. History of the Spanish Language—Historical development of Spanish from Vulgar Latin. Combined with close readings of Old Spanish poetic and prose texts.

3-5 units, alternate years, given 1991-92

209. Literature and the Institution of Literary Study—(Same as English 265B, French and Italian 106, German Studies 179D, Comparative Literature 100.) Overview of the emergence of the phenomenon of literature, of the institution of literary study in general, and of theoretical approaches to literature in particular. From ancient Greek rhetorical and poetical theory, tracks the changing shapes of ideas of literature and literary study from the Middle Ages through the present. Topics: the material culture of literary study and production (scribal vs. print vs. media cultures); the emergence of the concept of "national" literatures by the Romantic period, its institutionalization in the contemporary university and progressive decline (as in Stanford "Western Culture" debate and in the recurrent crises of literary theory from Russian formalism to deconstruction.

5 units, Win (Gumbrecht, Schnapp)

210. Theory of Literature and Society in Latin America—Analysis of themes and problems occurring in Latin American critical writings: acculturation and transculturation, eurocentrism or autonomy, historical periods and genres, literature nomenclature and the concept of America.

3-5 units, Spr (Ruffinelli)

PENINSULAR LITERATURE

211. Studies in Medieval Literature—Spanish literature between 1000 and 1500. Focus is on the major works and history of the period. Readings: Poema de Mio Cid, El libro de Buen Amor, and La Celestina.

3-5 units

212. La Celestina.

3-5 units

214. The Spanish Golden Age.

3-5 units

216. Don Quijote I—Don Quijote in relation to the principal literary traditions and cultural forces of the European Renaissance. In English.

3-5 units, Aut (Martín)

217. Don Quijote II—Continuation of 216.

3-5 units, Win (Martín)

222. Introduction to 19th-Century Spanish Literature—Representative literary figures of 19th-
century Spain: Larra, Espronceda, Zorilla, Bécquer, and Galdós. Major directions in modern lyric poetry and in the modern realist novel studied against the background of Napoleonic invasions, loss of overseas colonies, two Carlist civil wars, and frustrated attempts to establish the First Spanish Republic. Attention to close textual analysis.

3-5 units (Predmore)


3-5 units (Predmore)

227. Post-War Spanish Literature: Literature of Exile—A panoramic vision of Post-war Spain, from the perspective of “internal” and “external” exile, through the novels of Cela (La Colmena); Delibes (Cinco horas con Mario); Julio Llamazares (Luna de lobos); and Sender (Crónica del alba); the poetry of León Felipe, Cernuda, Emilio Prado, Luis Ruiz; short stories and theater.

3-5 units Win (Caudet)

228. Post-War Spanish Literature: Literature of Recovery—Evolution of Spanish narrative from 1940 to the present focusing on the relationship of the changing styles of narrative with socio-cultural change in contemporary Spain including Juan Marsé, Cela.

3-5 units, Spr (Criado)


3-5 units (Martin)

236. The Sonnet in Hispanic Literature—The structure of the sonnet and its history since San-tillana in the 15th century. The Golden Age in Spain and Spanish America and the innovations of the Modernista period and of the 20th century.

3-5 units, Spr (Gicovate)

LATIN AMERICAN LITERATURE

240. First Images of America in Colonial Prose—European and indigenous views of “America” on discovery and initial contact; “fiction/history”; the noble savage, the mestizo, the semiotics of quests, and utopianism/materialism.

3-5 units (Corral)

243. Taste, Wit, and What? in Spanish American Baroque—Three concepts/doctrines which guided Baroque poetics in Spanish America studied as phenomena that escaped traditional analysis. The social background and aesthetic theories underlying the Baroque prose and poetry of Sor Juana, Balbuena, Del Valle Caviedes, and Bolaños.

3-5 units, Win (Corral)


3-5 units (Corral)

248. The Caribbean-Americas: An Introduction to Their Literature, Thought, and Cultural Worlds—(Same as African and Afro-American Studies 248, English 262G.) Literature, thought, and popular cultures of the Caribbean Basin within the context of an overview of its multiple cultural and linguistic worlds.

3-5 units, Aut (Wynter)

249. Afro-Hispanic Cultural Worlds: An Introduction—(Same as African and Afro-American Studies 249.) Literature and thought of Black Latin American writers in the Spanish-speaking Americas and Brazil. Introduction to the popular syncretic cultures of these interesting but little known worlds. Readings in Spanish, Portuguese, and in English translations.

3-5 units (Wynter)

251. Modern Mexican Narrative—Examination of important texts making up the body of the modern Mexican narrative in context of the socio-historical transformations taking place after WWII. Readings: Yáñez, Rulfo, Fuentes, Pacheco, Poniatowska.

3-5 units

255. Methodology of Reading Poetry: Poesía de Amor—Latin American love poetry seems akin to the lyric but often appears in various other forms. Surveys the diversity of love poetry through the centuries and across national boundaries to determine the varied structural and cultural origins of this tradition. Readings: Sor Juana, Neruda, Vallejo, Vilarino.

3-5 units, Win (Ruffinelli)
257. Magic Realism and the Latin American Short Story.  
3-5 units

258. Contemporary Latin American Short Story—A variety of younger short story writers from Mexico, Central and South America.  
3-5 units (Ruffinelli)

259. The Short Story as Genre in Latin America—Los de Abajo and the avant garde short novels of the 1920s and '30s, the reception of works by Bombal, Onetti, Sábató, García Marquez, Pacheco, and other contemporary authors.  
3-5 units (Corral)

261. The Avant Garde Novel in Latin America—Survey of the neglected but increasingly important Avant Garde period of the 1920s and '30s. Readings: Owen, Novela como nube; Vela, El café de nadie; Palacio, El hombre muerto a punta piés; Adán, La casa de cartón; F. Hernández, El caballo perdido; Villarrutia, Dama de corazones; Torres Bodet, Margarita de Niebla.  
3-5 units (Ruffinelli) given 1991-92

263. The Origins of the New Latin American Novel—Several important works of the 1920s form the foundation of the contemporary novel and provide a powerful image of Latin America: the "novel of the Land" (Don Segundo Sombra, Doña Barbara, La Vorágine), and the "novel of the City" (Los siete locos, Ifigenia). Close readings survey the historical panorama of the 20th century.  
3-5 units, Aut (Ruffinelli)

264. A New Literary Genre: Testimony—Latin American literature and politics viewed in light of a new narrative genre in works of Rodolfo Walsh, Omar Cabezas, Elena Poniatowska, and others.  
3-5 units (Ruffinelli)

266. Latin American Theater: Theory and Practice—The development of Latin American theater from pre-Columbian times to the present. Emphasis on recent trends in socially-committed theater. Reading and interpretation of dramatic texts.  
3-5 units

279. The Narratives of García Márquez—Major works by the Columbian Nobel Prize winner, including Cien Años de Soledad.  
3-5 units (Alegria)

CHICANO STUDIES

280. Introduction to Chicano Literature—Selected works by major Chicano writers of the 20th century, including poetry, fiction, and drama. Questions of genre and textual interpretation emphasizing the socio-historical cultural context of Chicano literature.  
3-5 units, Win (Staff)

284. Chicana Writers—(Same as Chicano Studies 294.) Examines works of Chicana writers from various theoretical, critical approaches (feminist, semiotic, structural, anthropological, etc.) Authors: Villanueva, De Cervantes, Cisneros, Viramontes, Portillo-Trambley, Corpi, and Vigil.  
3-5 units, Spr (Herrera-Sobek)

289. Chicano Creative Writing Workshop—Pre-requisite: knowledge of Spanish.  
5 units

SPECIAL TOPICS

291. "Race", Discourse, and the Origin of the Americas: A New World View of 1492—(Same as African and Afro-American Studies 291.) Examines major texts related to the Event of 1492 and to the prelude voyage of the Portuguese around Cape Bojador to West Africa, which constitutes the formation of a new legitimating basis for structures of New World societies. Analysis of juridico-theological, historical, and literary texts, from the perspective of the Americas; attempts to decipher the politics of representation in the orthodox interpretation of Columbus' discovery and to deconstruct the strategies whereby a symbolic construct of "race" (in a Natural Law variant) would take primary place in the New World instead of the "gender" construct of previous human societies. In English.  
3-5 units, Spr (Wynter)

299. Individual Work—May be repeated for credit. Open to undergraduates or graduates majoring or minoring in Spanish.  
1-12 units, any quarter (Staff) by arrangement

GRADUATE SEMINARS

Open to undergraduates with consent of instructor.

301. Methods of Teaching Spanish—(Same as Education 292.) Analysis and discussion of second language theory on teaching and learning, classroom practices, and Spanish instructional materials.  
3-5 units, Spr (Haro)

306. Introduction to Literary Theory and Criticism—Discussion of major currents in contemporary criticism. Topics and readings vary each year. In English.  
4-5 units (Pratt)

309. Criticism and Colonialism—(Same as Modern Thought and Literature 361.) Examines critical approaches to literature and the study of
literature and culture in relation to colonialism, neocolonialism, and the postcolonial world. Topics: representations and hegemony, dynamics of transculturation, cultural dimensions of decolonization and resistance, psychoanalysis and colonial subjects, ideologies of masculinity and the feminine, the colonial discourse movement, nationalism and the first world/third world distinction, popular culture and syncretism. Readings from European, North American, Latin American, African, and Caribbean scholars. (In English.)
3-5 units, Aut (Pratt) T 2:15-5:05

310. Discourse and Ideology—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 concept of socially determined meaning, discursive practices in the French tradition, British empirical analyses, American sociolinguistics. In English.
4-5 units (Pratt)

320. Garcilaso de la Vega and St. John of the Cross—Study of the achievements of Garcilaso as the voice of the Renaissance in Spain and of the transposition of the new forms to the expression of mystic rapture in San Juan de la Cruz.
3-5 units (Gicovate)

3-5 units (Martin)

325. The Code of Honor/Limpieza de Sangre in Golden Age Theater—The dialectic relation between the literary motif of the code of honor and the social code of Limpieza de Sangre. Focuses mainly on drama: references to the role of honor and the social code in other genres.
3-5 units (Wynter)

332. 19th-Century Spanish Novel—Examines the Naturalist/Realist novel of the second half of the 19th century, against the historical and social background; works by Galdós (Tormenta, La de Bringas, and Misa), Pardo Bazán (Los pasos de Ulloa), Pereda ("La leva") and Clarín (La Regenta).
3-5 units, Win (Caudet)

336. Modern Spanish Poetry: Antonio Machado, Juan Ramón Jiménez, F. García Lorca—Major trends and developments in 20th-century poetry in the context of Restoration Spain (1871-1930), and against the background of the democratic tradition of Spanish liberalism. Emphasis on close stylistic analysis and such concepts as Generation of 1898, Modernism, Krausism, pure poetry, and symbolic system.
3-5 units, Spr (Predmore)

337. Ramón del Valle-Inclán—Evolution of the major works of Valle-Inclán from the Sonatas to Tirano Banderas, including the Comedias bárbaras and three of the "esperpentos" against the background of Restoration Spain. Emphasis on Valle as a major force in aesthetic innovation and social criticism.
3-5 units (Predmore)

3-5 units (Corral)

341. Writing and Re-Writing: Colonial Literature in Contemporary Narrative—Intertextual use of the chronicles of discovery. The Conquest examined in contemporary narrative as an aesthetic and ideological vehicle that questions historical knowledge and language as a means of expression. Notions of repetition, imitation, and dependency are studied in Columbus, Carpentier, Sarduy, Posse, and Saer.
3-5 units, Spr (Corral)

359. Rubén Darío and the Poetics of Modernismo—The modernista period and the revolutionary poetic forms of Darío respond to traditional and foreign sources. Darío's influence on the Generation of '98 and innovative Latin American writers foreshadows the avant garde movements.
3-5 units (Gicovate)

360. Research Seminar: Latin American Women Writers of the 19th Century—Workshop in primary research on women, literature, and culture. Assignments focus on a research paper and annotated bibliography.
5 units (Pratt)

5 units (Pratt)

362. Latin American Women Writers, 1945 to Present—Poetry and fiction by Latin American women writers since WWII. Topics: representations of marginality; women's inferiority and the critique of domesticity; proletarian novel and testimonio; relations to discourses of national and American sociolinguistics. In English.
5 units (Pratt)
tionality, race, and history; literature of project and survival; women’s responses to military authoritarianism and state terror. Works by Castellanos, Garro, Poniatowska, Lispector, Brunet, Menchu, Valenzuela, Marta Traba, Barros, Mercado, Alegria, Murillo, Belli, Peri-Rossi, Ferré, in conjunction with readings in history and social analysis. Prerequisite: read and understand Spanish, but not necessarily speak it.

5 units (Pratt) given 1991–92

365. The Latin American Novel.
3-5 units (Ruffinelli)

369. Language and Post-Modern Conditions in Narrative—Works by M. Fernández, F. Hernández, Borges, Monterroso, and V. Piñera studied in terms of concepts of language and writing, which historically and formally do not belong to movements summarized as avant garde or post-modern. Dependent post-modern literary representation in Spanish America is examined in background readings.

3-5 units (Corral)

370. The Writings of José Revueltas—Revueltas, the most important non-canonical Mexican writer since the post-war period, expressed in his novels, short stories, and essays a political concern for Mexico and for the international class struggle. Highlights of his political and literary profile in the context of contemporary Mexican history.

3-5 units (Ruffinelli)

379. Onda y Escritura en Mexico—Main lines in the development of literary production in Mexico since 1968. Examination of the aesthetic and textual practices of writers identified with “La Onda” (José Agustín, Gustavo Saenz, García Saldivia Parmenides), etc. Analysis of key works by the younger generation of writers (Luis Zapata, Armand Ramírez, Cristina Pacheco) in this socio-historical context.

3-5 units

384. Methods of Research in Latin American Literature, Popular Culture, and Chicano Studies—Same as Chicano Studies 384.) Introduction to bibliographic sources and archival research, oral history techniques, and field work methodologies in Latin American, popular culture, and Chicano Studies research. Individualized project is developed using strategies and techniques discussed.

3-5 units, Aut (Herrera-Sobek)

390. Humor in Hispanic Literature—Manifestations of humor in Peninsula literature from medieval times to the present. Comic poetry is discussed; emphasis is on prose. Primary texts analyzed in the light of theoretical works (Bakhtin, Foucault, Bergson, Cole, Levin) to establish a poetics of Hispanic humor.

3-5 units (Martin)

391. Humor in Latin American Literature—Satire and other comic forms of literature as a political force for reform in 19th- and 20th-century Latin American writings.

3-5 units (Ruffinelli)

392. The Body on the Stage: Theater in France, Spain, and Italy from 1600 to 1650—(Same as French 339A, Comparative Literature 339A.) The first half of the 17th century in Paris and Madrid marks the moment for the emergence of nationally specific forms of dramatic writing and theatrical institutions. Under the influence of the Italian tradition of commedia dell’arte, the Italian artistic culture of body-performance was “domesticated” in highly divergent ways on the French and the Spanish stages. Theater in France, Spain, and Italy between 1600 and 1650 is seen as a historical key-paradigm for the branching of European Culture into separate “national traditions,” and for the theoretical problem of a phenomenology of “the body on the stage.” In English.

3-5 units, Aut (Gumbrecht)

394. Research Seminar on the Baroque—(Same as Italian 462.) Baroque poetics studied within the broad setting of the social and cultural history of the 17th century. Topics: counter-reformation cultural politics; the growing impact of academies on the arts; the evolution of rhetorics of wit (Gracian, Pelligrini, Tesauro); and Baroque conceptions of aesthetic awe and monstrosity (Longinus.) Authors and texts may include: Marino’s L’Adone; Góngora’s Soledades, Quevedo’s Buscón, a play by Lope de Vega, and selected poems of John Donne. In English.

5 units, Win (Schnapp)


3-5 units, Win (Ramos)

399. Individual Work—Exclusively for graduate students in Spanish engaged in special work.

1-12 units, any quarter (Staff) by arrangement
PORTUGUESE LANGUAGE PROGRAM

INTRODUCTORY

1. First-Year Portuguese (1st Quarter)—Proficiency-oriented introductory course emphasizing speaking and oral comprehension.
   5 units, Aut (Van den Dool) MTWThF plus language lab

1A. Accelerated First-Year Portuguese (1st Quarter)—Accelerated proficiency-oriented course recommended for students with background in a Romance language. Equivalent to the first half of the regular first-year sequence.
   5 units, Win (Van den Dool) MTWThF plus language lab

2. First-Year Portuguese (2nd Quarter)—Continuation of 1, with additional development of reading and writing skills. Prerequisite: 1 or equivalent.
   5 units, Win (Van den Dool) MTWThF plus language lab

2A. Accelerated First-Year Portuguese (2nd Quarter)—Continuation of 1A. Equivalent to the second half of the regular first-year sequence.
   5 units, Spr (Van den Dool) MTWThF plus language lab

3. First-Year Portuguese (3rd Quarter)—Continuation of 2, with additional cultural and/or literary readings. Prerequisite: 2 or equivalent.
   5 units, Spr (Van den Dool) MTWThF plus language lab

5. Intensive Beginning Portuguese—Proficiency-oriented course in listening, comprehension, speaking, reading and writing, with presentation of cultural aspects. Special activities such as a "Portuguese table" and movies throughout the quarter. Enrollment limited to 15. Equivalent to one year of Portuguese study. No auditors.
   9 units, Sum (Van den Dool) MTWThF plus language lab

10/110. Elementary Conversation—(Graduate students register for 110.) Conversation practice as a supplement to 2 and 3. Prerequisite: 2 or equivalent. Satisfactory/No Credit only.
   2 units, Win, Spr (Staff) TTh

11. Second-Year Portuguese (1st Quarter)—Emphasis on reading, discussion, and composition. Grammar review included. Prerequisite: 11 or equivalent.
   4-5 units, Aut (Van den Dool) MTWThF

12. Second-Year Portuguese (2nd Quarter)—Continuation of 11. Prerequisite: 11 or equivalent.
   4-5 units, Win (Van den Dool) MTWThF

13. Second-Year Portuguese (3rd Quarter)—Continuation of 12. Prerequisite: 12 or equivalent.
   4-5 units, Spr (Van den Dool) MTWThF

15/115. Intermediate Conversation—(Graduate students register for 115.) Recommended as a complement to 11 and 12. Prerequisite: 3 or equivalent. Satisfactory/No Credit only.
   3 units, Aut, Win (Staff) MWF

99. Individual Work—Cannot be taken as a substitute for any of the regularly scheduled language courses.
   1-12 units (Van den Dool) by arrangement

100. Advanced Portuguese Conversation—Satisfactory/No Credit only. May be counted only once for the major. Prerequisite: 12 or equivalent.
   3 units, Spr (Van den Dool) MWF

109. Portuguese for Speakers of Spanish—Accelerated one-quarter course for beginners with advanced knowledge of Spanish. Designed to give reading competence in Portuguese for research and courses in Luso-Brazilian studies. Includes aural comprehension and some practice in speaking (if taken for 5 units).
   3 units, Aut, Spr (Van den Dool) MWF
   5 units, Aut, Spr (Van den Dool) MTWThF

110. Elementary Conversation for Graduate Students—(See 10.)

115. Intermediate Conversation for Graduate Students—(See 15.)

CULTURAL READINGS

130. Brazilian Cultural Readings and Composition—Readings/discussion on aspects of Brazilian life and culture. Focus varies depending on student interest.
   3 units, Win (Van den Dool) MWF

199. Individual Work—Consent of instructor required. Prerequisite: 13 or equivalent.
   1-12 units (Staff) by arrangement

ADVANCED UNDERGRADUATE AND GRADUATE LITERATURE

   3-5 units

240A. Brazilian Literature I: Origins to Independence—Principle literary movements of Brazilian literature from the 16th-19th centuries: "absence" of Brazilian cultures, chronicles of the Portuguese conquest and resistance, Colonial Baroque, Independence Movement, Romanticism and Realism. The definition of genres and of Brazilian cultural identity within a dependent context.
   3-5 units, Win (Lopes)
240B. Brazilian Literature II: Naturalism to the Present—Continuation of 240A, from the late 19th century, emphasizing narrative and poetry: modernism and postmodernism. Essays and autobiographical writings place the literary works in socio-historical perspective.
3-5 units, Spr (Lopes)

290. Brazilian Cinema—Introduction to major issues in the study of Brazilian film culture. The relationships of film, society, class, artistic production and social change; and the exploitation of women by male directors.
3-5 units, Aut (Lopes)

294. Luso-Brazilian Women in a Postmodern Context—The position of women in the culture of Brazil and Portugal through issues of social class and ethnicity. Female creativity, the relationship of female artists to the male tradition, woman's exploitation of women, and the attitude of the middle-class toward popular feminism and social change. (In English.)
3-5 units, Spr (Lopes)

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

399. Individual Work—Exclusively for graduate students in Portuguese engaged in special work.
1-12 units, by arrangement

STATISTICS

Emeriti: Theodore W. Anderson, Rosedith Sitgreaves, Herbert Solomon, Charles Stein
Chairman: Jerome H. Friedman
Associate Professor: Iain Johnstone
Assistant Professors: Anindita Adhikari, Amir Dembo, Thomas DiCiccio, Michael A. Martin, Art B. Owen, Joseph P. Romano, Anne G. Sheehy (on leave)
Courtesy Professors: Byron W. Brown (Biostatistics), Helena Kraemer, Richard A. Olshen (Biostatistics), David P. Rogosa (Biostatistics), Patrick Suppes
Visiting Professor: Persi Diaconis

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 and courtesy faculty appointments: Applied Earth Sciences (Switzer), Economics (Anderson), Education (Olkin, Rogosa, Suppes), Electrical Engineering (Cover), Health Research and Policy (Brown, Efron, Johnstone, Moses, Olshen), Mathematics (Dembo), Operations Research (Lieberman), Stanford Linear Accelerator (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, 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.

The Department of Statistics is well equipped for statistical applications and research in computational statistics. Computer facilities include: SUN 3/280 file server networked to 14 SUN 3/50 desktop workstations, a MIPS 120-5 for computationally intensive tasks, and a VAX 11/780 for general research and teaching use. The Mathematical Sciences Library serves the department jointly with the Mathematics and Computer Science Departments.

The department has always drawn 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 42 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 normally fulfills the following requirements for the Master of Science degree:

1. Statistics 116, 200, 217, 218. Courses previously taken may be waived, in which case they must be replaced by other approved courses.
2. Math. 103 or 113 and Computer Science 106A. Substitution 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, 209, 227.
4. Additional units to complete the requirements chosen from offerings in the Statistics Department or from authorized courses in other departments. At least half of the units taken for the M.S. degree must be from offerings in the Statistics Department.

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 (LGI) is required for all statistics courses which are taken for an M.S. degree. All statistics courses required for the M.S. degree in Data Analysis and Statistical Computing must be taken for letter grades.

The program normally takes one calendar year to complete.

DOCTOR OF PHILOSOPHY

The department looks for motivated students who want to prepare for research careers in statistics or probability, either applied or theoretical. Advanced undergraduate or master's level work in mathematics and statistics provides a good background for the doctoral program. Quantitatively oriented students with degrees in other scientific fields are also considered for admission. The program normally takes four years.

Program Summary—Statistics 300A, B, C, 305, 306A, B, and 310A, B, C (first year core program); pass two of three parts of the qualifying examination (beginning of second year); breadth requirement (second or third year); University oral examination (end of third year or beginning of fourth year); dissertation (fourth year).

First Year Core Courses—Statistics 300 systematically surveys the ideas of estimation and of hypothesis testing for parametric and nonparametric models involving small and large samples. 305 is concerned with linear regression and the analysis of variance. 306 surveys a large number of modeling techniques, related to but going beyond the linear models of 305. 310 is a
measure-theoretic probability theory, beginning with the basic concepts of analysis.

Qualifying Examinations—These are intended to test the student's level of knowledge when the first year program, common to all students, has been completed. There are separate examinations in the three core subjects of statistical methods, mathematical statistics, and probability theory, and all are given at the beginning of the Autumn Quarter of the student's second year. Students may take two or three of these examinations and are expected to show acceptable performance in two examinations.

Breadth Requirement—In order to appreciate scientific problems, students are required to take 9 units of coursework at a graduate or advanced undergraduate level in some other department. These units must be in courses higher than 200. Students with a graduate degree in a scientific area that is not essentially mathematics or statistics are exempted from this requirement.

University Oral Examination—The University oral examination is taken on the recommendation of the student's research advisor after the thesis problem has been well defined and some research progress has been made. Usually, this happens early in the student's fourth year. The oral examination consists of a 40 minute presentation on the thesis topic, followed by two question periods. The first relates directly to the student's presentation and the second is intended to explore the student's familiarity with broader statistical topics related to the thesis research.

Financial Support—Students accepted to the Ph.D. program are offered financial support. All tuition expenses are paid and there is a fixed monthly stipend determined to be sufficient to pay living expenses. Financial support is continued for four years, departmental resources permitting, for students in good standing. The resources for student financial support derive from funds made available for student teaching assistantships and research assistantships. Students receive both a teaching and research assignment each quarter which, together, do not exceed 20 hours. Students are strongly encouraged to apply for outside scholarships, fellowships, and other forms of financial support.

Ph.D. MINOR

The Statistics Department will devise individual Ph.D. minor programs, but the department urges all graduate students in other fields who wish to have a subspecialty in statistics to study for an M.S. degree instead. The unit requirement for an M.S. degree is 40-42 units, depending on the degree of difficulty of the courses, whereas the number of units required for a minor averages around 30. This difference of 10-12 units can be made up by the student by including in the M.S. program courses from his or her own field which are related to statistics or applications of statistics.

COURSES

INTRODUCTORY

Introductory courses for general students with an interest in the problems of descriptive statistics and statistical inferences are: Statistics 40, 60, 61, 70. These courses have no mathematical prerequisites. 40 and 60 are approved for the Mathematical Science distribution requirement for undergraduates. 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. 70 is designed for students interested in biological and medical applications of statistics.

110, 116, 200, 217-218 are introductory but have a calculus prerequisite. 110 covers the most important techniques used in the analysis of experimental data in engineering and science. 116 provides a general introduction to the theory of probability. It may be followed by 200, which deals with statistical theory, or by 217 and 218, which deal with stochastic processes. The sequence 116, 200 is a basic one-year course in mathematical statistics; the sequence 116, 217, 218 is a basic one-year course in probability theory.

40. Chance and Strategy—(Graduate students enroll in 140.) Precalculus for nonmathematical students in probability theory and game theory. Permutations and combinations, conditional probability, expectation, two-person games, risk and minimax theory, simple gambling, etc. (DR:6)

3 units, Aut (DiCiccio) MWF 11

60. Introduction to Statistical Methods I—(Graduate students enroll in 160.) A nonmathematical study of statistical methods. Emphasis on statistical techniques. Organization of data, averages, variability, and association. Statistical inference, test of hypotheses, estimation, and confidence intervals. Computer statistical packages are used. Students cannot receive credit for both Statistics 60 and Psychology 60. (DR:6)

5 units, Aut (Rogosa) MTWThF 1:15
Win (Bell) MTWThF 1:15
Spr (Martin) MTWThF 1:15
Sum (Staff) MTWThF 1:15

61. Introduction to Statistical Methods II—(Graduate students enroll in 161.) Chi-square tests, analysis of variance, regression, correlation, nonparametrics, sample surveys, elementary
design of experiments. Prerequisite: 60 or consent of instructor.

5 units, Win (Martin) MWF 1:15


3 units, Win (Brown)

110. Statistical Methods in Engineering and the Physical Sciences—Introduction to applied statistics for engineers and physical scientists. Topics: descriptive statistics, point and interval estimation, tests of hypotheses, nonparametric methods, curve fitting by least squares, analysis of variance, elementary experimental design. Prerequisites: 116 or equivalent, and one year of calculus. (DR:6)

4 units, Aut (Adhikari) MTWF 10
Spr (Bell) MTWF 10
Sum (Staff) MTWThF 2:15


3 or 4 units, Aut (Adhikari) MTWF 8:30-9:45
Sum (Staff) MTWThF 9

117. Introduction to Statistical Methods I—(See 60.) For graduate students.

5 units, Win (Rogosa) MTWThF 1:15
Win (Bell) MTWThF 1:15
Spr (Martin) MTWThF 1:15
Sum (Staff) MTWThF 1:15

118. Introduction to Statistical Methods II—(See 61.) For graduate students.

5 units, Win (Martin) MWF 1:15

199. Independent Study—For undergraduates. (Staff) by arrangement


4 units, Win (Lai) MTWF 11
Spr (DiCiccio) MTWF 11

CONTINUATION

Courses in this category have been designed for particular use in applications. Generally, they have introductory statistics or probability as prerequisites.


3 units, Win (Martin) MWF 11

201B. Data Analysis II—Classification and discriminant analysis. Dimensionality reduction. Principal components, factor analysis, multidimensional scaling. Cluster analysis. Treatment of missing values. Analysis of categorical data. Topics are discussed from the point of view of their application. Emphasis is conceptual rather than theoretical understanding. Prerequisite: 201A or equivalent.

3 units, Spr (Martin) MWF 3:15

201B. Data Analysis II—Classification and discriminant analysis. Dimensionality reduction. Principal components, factor analysis, multidimensional scaling. Cluster analysis. Treatment of missing values. Analysis of categorical data. Topics are discussed from the point of view of their application. Emphasis is conceptual rather than theoretical understanding. Prerequisite: 201A or equivalent.

3 units, Spr (Martin) MWF 3:15

203. Introduction to Regression Models and the Analysis of Variance—The most widely used statistical techniques; interpretation of observational data and empirical model building. Topics: simple and multiple linear regression, nonlinear regression, analysis of residuals and model selection, design of one-way and two-way
factorial experiments, fixed effects and random effects models. Prerequisite: 200 or 201A.
3 units, Spr (Johns) MWF 1:15

204. Sampling from Finite Populations—The theory of sampling from finite populations. Simple random sampling, stratified sampling, cluster sampling, efficiency of various designs, nonresponse models; emphasis on applications. Prerequisite: a basic course in statistics (61, 110, or 200).
3 units, alternate years, given 1991-92

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. Prerequisite: 200 or concurrent registration in 200.
3 units, alternate years, given 1991-92

206. Applied Multivariate Analysis—Introduction to statistical analysis of several quantitative measurements on each observational unit. Emphasis on concepts, methods, computation, interpretation. Examples from economics, education, geology, psychology. Topics: multiple regression, multivariate analysis of variance, principal components, factor analysis, canonical correlations. Prerequisites: 200 or 201A. Concurrent registration in 200 is permitted.
3 units, Win (Olkin) MWF 9

207. Introduction to Time Analysis—Time series models used in economics, engineering, physics, geology, etc. Trend fitting, autoregressive schemes, moving average models, periodograms, second order stationary processes, spectral analysis. Prerequisites: 116 and a basic course in statistics (200 or 201A).
3 units, Win (Johns) MWF 2:15

209. Quantitative Methods and Their Application to Public Policy—(Same as Public Policy 105.) Applications of statistical methods, rather than methodology per se. Topics: risk assessment in the evaluation of biohazards and medical techniques and technologies; comparisons of information-gathering techniques (surveys, experiments, or simulation studies); methods of expressing and evaluating uncertainty; and the interpretation of quantitative techniques of data analysis (regression). Prerequisites: 60 and 61.
5 units, Spr (Moses) MW 8-10

3 units, Aut (DiCiccio) MWF 2:15
Win (Lai) MWF 10

218. Introduction to Stochastic Processes—Renewal theory, point processes emphasizing the Poisson process. Also, Wiener and Gaussian processes and second order processes. Prerequisite: 217.
3 units, Win (DiCiccio)/MWF 2:15
Spr (Romano) MWF 10

3 units, Win (Johnstone) TTh 11-12:15

3 units, Spr (Lieberman)
Sum (Staff)

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: working knowledge of FORTRAN or PASCAL; 217 or the equivalent.
3 units, Spr (Glynn)
Sum (Staff)

PRIMARILY FOR DOCTORAL STUDENTS

Sequences 300A, B, C, 305, 306A,B, and 310A,B,C comprise the fundamental sequence which serves as a general introduction to and prerequisite for further work. Subsequent courses delve more deeply into special topics.

240. Linear Programming—(Enroll in Operations Research 240.) Linear programming em-
phasizing 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: Math. 113.

3 units, Aut (Cottle)


3 units, Aut (Eaves)

260A, B, C. Workshop in Biostatistics—Applications of statistical techniques to current problems in medical science. Primarily for doctoral students in statistics. Enrollment for more than 2 units of credit involves extra reading or consulting and requires permission of the instructor.

260A. 1-5 units, Aut (Brown, Efron, Johnstone, Moses, Olshen) Th 1:15-3:05

260B. 1-5 units, Win (Brown, Efron, Johnstone, Moses, Olshen) Th 1:15-3:05

260C. 1-5 units, Spr (Brown, Efron, Johnstone, Moses, Olshen) Th 1:15-3:05


3 units, alternate years, given 1991-92

300A, B, C. Theory of Statistics—Elementary finite sample theory of point estimation: statistical models; sufficiency; applications to exponential families, group families, and nonparametric families; minimum risk unbiased estimation; minimum risk equivariant estimation; Cramér-Rao inequality. Elementary decision theory: loss and risk functions, Bayes estimation; minimax estimation; shrinkage estimators. Large sample estimation theory: asymptotic efficiency; maximum likelihood estimation; delta method; asymptotic distribution of quantiles and trimmed means; differentiability of statistical functionals; robustness and influence. Hypothesis testing and confidence intervals: Neyman-Pearson theory; uniformly most powerful tests and uniformly most accurate confidence intervals for distributions with monotone likelihood ratio; systematic use of sufficiency and conditioning to eliminate nuisance parameters in exponential families; use of invariance to eliminate nuisance parameters in group families; asymptotic theory of likelihood ratio test; Pitman asymptotic efficiency; rank, permutation and randomization tests; jackknife, bootstrap and sample reuse methods. Density estimation: kernel density estimation; bias versus variance tradeoff; choice of bandwidth and kernel. Time series: first and second order autoregressive processes; conditions for stationarity; use of maximum likelihood in time series with asymptotic theory. Other possible topics: sequential analysis; optimal experimental design; empirical processes with applications to statistics; Edgeworth expansions with applications to statistics.

300A. 3 units, Aut (Romano) MW 9

300B. 3 units, Win (Romano) MW 9

300C. 3 units, Spr (Romano) MW 9

305. Introduction to Statistical Modeling—Descriptive statistics. Effects of correlation, nonnormality, and heteroscedasticity on one and two sample t tests. Linear models: simple linear regression, correlation, one-way ANOVA, multiple comparisons, the general linear model, testing nested models, regression diagnostics, weighted least squares, blocking random effects, two-way ANOVA, mixed effects, calibration, prediction, confidence bands, lack of fit and pure error sums of squares, contrasts, Gaussian-Markov theorem, polynomial regression, orthogonal series regression, transformations, dummy variables, model selection, partial correlation, modeling heteroscedasticity. Emphasis on problem sets involving substantial computations and realistic data. Prerequisites: 200, Computer Science 106A, Math. 113, or consent of instructor.

3 units, Aut (Owen) MW 11

306A, B. Methods for Applied Statistics—Survey of applied statistical methods, including computational methods. Topics: nonlinear least squares (including robust regression), generalized linear models, time series (autocorrelation, autoregression, periodogram, spectrum), survey sampling (finite populations, stratification, clustering, ratio estimation), nonparametric regression (kernels, splines, projection pursuit, CART, MARS), survival analysis (Kaplan-Meier, Mantel-Haenszel, Cox model), design (factorial experiments, response surfaces), random number generation, numerical linear algebra, numerical optimization, sample reuse (bootstrap,
 Statistics 665

3 units, Aut (Lat) by arrangement
Win, Spr (Siegmund) by arrangement

3 units, Aut, Win, Spr (Johnson) by arrangement

3 units, Aut (Olkin) MWF 2:15-3:30

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, alternate years, given 1991-92

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 1991-92

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, alternate years, given 1991-92

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: 236A, B, C.
3 units, alternate years, given 1991-92

336. 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.
3 units, alternate years, given 1991-92

3 units, alternate years, given 1990-91


3 units, Win (Johnstone) TTh 9:30-10:45

348. Statistics of Experimentation—Methods for the design and analysis of experiments. Examples from biological and industrial experiments. Review of least squares theory. One way layouts, factorial designs, blocking, fractional factorials, Latin squares, analysis of covariance, split plots, response surfaces, Taguchi's methods (robust design, noise factors, orthogonal arrays, linear graphs, achieving additivity), computer experiments.

3 units, Spr (Owen) MWF 1:15

352. Spatial Statistics—Summary statistics, probability models, smoothing and interpolation, classification, sampling design, applications to remote sensing and environmental monitoring.

3 units, alternate years, given 1990-91


3 units, alternate years, given 1990-91


3 units, Spr (Iglehart)


3 units, alternate years, given 1991-92

374. Large Deviations—(Same as Math. 234.) Combinatorial estimates and the method of types. Large deviation probabilities for partial sums and for empirical distributions, Crãmer's and Sanov's theorems, and their Markov extensions. Applications in statistics, information theory and statistical mechanics. Prerequisite: 310 or Math. 230A.

3 units, Aut (Dembo) TTh 9:30-10:45


3 units, Win (Glynn)

equi-partition theorem. Prerequisite: 116, Electrical Engineering 275, or equivalent.

3 units, Aut (Gill) TTh 11-12:15

390. Consulting Workshop—Provides skills required of practicing statistical consultants and exposure to wide range of statistical applications. Students participate as consultants in the department’s drop-in consulting service, analyze client’s data, and prepare formal written reports. Seminar provides supervised experience in short term consulting. Prerequisites: coursework in applied statistics or data analysis, and consent of the instructor.

3 units, Aut, Win (Moses) by arrangement Spr (Staff) by arrangement

399. Research—Research work as distinguished from independent study of nonresearch character listed in 199 and 299.

(Staff) by arrangement

PROGRAM IN STRUCTURED LIBERAL EDUCATION

Emeritus: (Professor) John Goheen (Philosophy)
Director and Professor: Mark Mancall (History)
Lecturers: George Cattermole, Suzanne Greenberg, John Rider, Mollie Schwartz Rosenhan, Ligh Sealy, Amy Sims
Coordinator: Suzanne Greenberg

The Program In Structured Liberal Education (SLE) is designed specifically for freshmen interested in an 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; to develop the student’s ability to ask effective questions of texts, teachers, the culture, and themselves; and to develop 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 provides “ready-to-serve” answers to the questions being dealt with; rather, SLE encourages a sense of intellectual challenge, student initiative, and originality.

APPLICATION

Freshmen should apply during the summer preceding the academic year in which they will enroll.

SLE is designed as a three-quarter sequence, and 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, Florence Moore Hall, Stanford University, Stanford, California 94305.

COURSES

SLE is a demanding program which consumes approximately 60 percent of the average academic workload first-year students usually carry. Autumn Quarter concentrates on ancient Greece, Israel, and India. Winter Quarter examines the religious, ideological, and aesthetic transformations that occurred in Europe, Asia, and the New World as a result of the Middle Ages, Renaissance, Scientific Revolution, and Enlightenment. Spring Quarter focuses on the social, political, and artistic forces that shape the modern world. Completion of the SLE Program satisfies the Cultures, Ideas, and Values Requirement (DR:1), the Literature and Fine Arts Requirement (DR:2), the Philosophical, Social, and Religious Thought Requirement (DR:3), and the Writing Requirement.

91. 9 units, Aut (Staff) TWTh 3:15-5, TW 6:30-8 p.m., and Th 6-8 p.m.
92. 9 units, Win (Staff) TWTh 3:15-5, TW 6:30-8 p.m., and Th 6-8 p.m.
93. 9 units, Spr (Staff) TWTh 3:15-5, TW 6:30-8 p.m., and Th 6-8 p.m.)

PROGRAM IN SYMBOLIC SYSTEMS

Director: Jim Greeno (Education)
Program Faculty: Joan Bresnan (Linguistics), Herbert H. Clark (Psychology, on leave), John Etchemendy (Philosophy), Solomon Feferman (Mathematics and Philosophy) Martin Kay (Linguistics), Jean-Claude Latombe (Computer Science), Ellen Markman (Psychology), John McCarthy (Computer Science), Nils Nilsson (Computer Science, on leave), Helen Nissenbaum (Assistant Director), John Perry (Philosophy), Stanley Peters (Linguistics), Stuart Reges (Computer Science), David Rumelhart (Psychology), Ivan Sag (Linguistics), Peter Sells (Linguistics), Yoav Shoham (Computer Science), Barbara Tversky (Psychology), Terry Winograd (Computer Science), Tom Wasaw (Linguistics and Philosophy)

Consulting Faculty: Phil Cohen (Linguistics), Joe Halpern (Computer Science), Per-Kristian Halvorsen (Linguistics), Pat Hayes (Computer Science), Bernardo Huberman (Physics),
Computer systems, robots, and people are all examples of symbolic systems, agents that use language to represent the world around them so as to communicate and generally act intelligently. The notions of symbol, representation, information, and action are at the heart of the study of symbolic systems. This common core of notions arises in a variety of fields including artificial intelligence, computer science, cognitive psychology, linguistics, philosophy, and symbolic logic. In recent years, though, a new discipline has begun to emerge from research collaborations across these traditional disciplines, addressing questions such as: In what ways are computers and computer languages like humans and their languages? What would it take to build a computer that thinks, or that could understand and communicate in a human language?

The Symbolic Systems Program offers an opportunity to focus on these issues. Majors must take courses in the Departments of Computer Science, Linguistics, Philosophy, and Psychology, as well as courses designed specifically for the program. The goal is to prepare students with the vocabulary, theoretical background, and technical skills to understand and participate in contemporary interdisciplinary research into questions about language, information, and intelligence—both human and machine. The curriculum offers traditional humanistic approaches to these questions as well as a training in, and familiarity with, contemporary developments in the science and technology of computation.

A degree in Symbolic Systems prepares students for advanced training in the interdisciplinary study of language and information, or for post-graduate study in any of the contributing disciplines. It is also excellent preparation for employment in the industrial sector immediately after graduation.

**UNDERGRADUATE PROGRAM**

**BACHELOR OF SCIENCE**

The program leads to a B.S. in Symbolic Systems. The curriculum is aimed at providing students with a core of concepts and techniques from computer science, linguistics, logic, philosophy, and cognitive psychology, drawing on faculty and courses from these and other departments.

Symbolic Systems majors must complete a core of required courses plus a concentration consisting of five additional courses. All major courses are to be taken for letter grades unless an approved course is offered Satisfactory/No Credit only. The core requirements are:

1. **Cognition**
   a) Psychology 106, Introduction to Cognitive Psychology.

2. **Computation and Artificial Intelligence**
   b) Computer Science 109A,B, Introduction to Computer Science
   c) Computer Science 221, Introduction to Artificial Intelligence.

3. **Foundations**
   a) Philosophy 80, Mind, Matter, and Meaning.
   b) Philosophy 186, Philosophy of Mind or Philosophy 180, Philosophy of Language.

4. **Language**
   a) Linguistics 120, Introduction to Syntax.
   b) Linguistics 130, Introduction to Semantics and Pragmatics. Linguistics 230A is for those with a strong interest in natural language. They may also take Linguistics 220A, Syntactic Theory, with consent of instructor, instead of Linguistics 120.

5. **Logic**
   a) Symbolic Systems 159, Basic Concepts in Mathematical Logic (same as Philosophy 159).
   b) Symbolic Systems 160A, First Order Logic (same as Philosophy 160A).
   c) Philosophy 160B, Computability and Logic or Computer Science 154, Introduction to Automata and Complexity Theory or Computer Science 254, Automata, Languages and Computability.

6. **Mathematics**—One course on a mathematical topic other than calculus. Examples: Math. 103, 109, 120, 162; Statistics 16, 110, 115; Computer Science 260; Philosophy 160B. Other courses may be substituted for the suggested ones with the approval of the Assistant Director.

7. **Senior Seminar**—Symbolic Systems 201.

Students may select concentrations from the list below or design others in consultation with their advisors.

- Applied Logic
- Artificial Intelligence
- Cognition
- Computation
- Education and Learning
- Natural Language
- Philosophical Foundations
The program offers only an undergraduate degree. An honors option is available, which requires the student to complete an honors project under supervision of an advisor.

**COURSES**

**CORE**

80. Mind, Matter, and Meaning—(Enroll in Philosophy 80.) A writing focus course.
3 units, Aut, Spr (Dretske, Zalta)

105. Introduction to Cognitive Psychology—(Enroll in Psychology 106.) (DR:4)
4 units, Win (Tversky)

106B. Programming Abstractions—(Enroll in Computer Science 106B.)
5 units, Aut, Win, Spr (Staff)

109A, B. Introduction to Computer Science—(Enroll in Computer Science 109A, B.)
109A. 4 units, Aut (Ullman)
109B. 4 units, Win (Ullman)

120. Introduction to Syntax—(Enroll in Linguistics 120.). (DR:4)
4 units, Aut (Sells)

130. Introduction to Semantics and Pragmatics—(Enroll in Linguistics 130.). (DR:4)
4 units, Win (Peters)

154. Introduction to Automata and Complexity Theory—(Enroll in Computer Science 154.)
4 units, Win (Pratt)

159. Basic Concepts in Mathematical Logic—(Same as Philosophy 159, Linguistics 135.)
4 units, Aut (Etchemendy) MWF 9 plus section

160A. First Order Logic—(Same as Philosophy 160A.)
4 units, Win (Etchemendy) MWF 9

160B. Computability and Logic—(Enroll in Philosophy 160B.)
4 units, Spr (Van Benthem)

180. Philosophy of Language—(Enroll in Philosophy 180.) (DR:4)
4 units, Win (Moravcsik)

186. Philosophy of Mind—(Enroll in Philosophy 186.)
4 units, Spr (Dretske)

201. Senior Seminar.
3 units, Win (Nissenbaum)

220A. Syntactic Theory—(Enroll in Linguistics 220A.)
4 units, Aut (Wasow)

221. Introduction to Artificial Intelligence—(Enroll in Computer Science 221.)
3 units, Aut, Spr (Staff)

230A. Semantics and Pragmatics—(Enroll in Linguistics 230A.)
4 units, Win (Sag)

254. Automata, Languages, and Computability—(Enroll in Computer Science 254.)
4 units, Aut (Floyd)

**SYMBOLIC SYSTEMS**

20. Problems of Intelligence, Information, and Learning—(Same as Education 120X.) Introduction to studies of intelligent reasoning, knowledge, understanding, representation, and meaning. Results of computational, linguistic, philosophical, and psychological research discussed and compared. Relevance of the material to instruction and learning. (DR:4)
4 units, Aut (Greeno) MWF 9:15

100. Computers, Ethics, and Social Responsibility—(Same as Computer Science 201, VTSS 215.) Analysis of ethical and social issues related to the development and use of computer technology. Introduction to relevant background in ethical theory, and social, political, and legal considerations. Analysis of scenarios in a number of specific problem areas: privacy, reliability, and risks of complex systems, and the responsibility of professionals for the applications and consequences of their work. Small group discussion emphasizing developing analytical skills. Primarily for majors entering computer-related fields. Prerequisite: Computer Science 106B or equivalent.
3-4 units, Spr (Nissenbaum, Winograd)

121. Intermediate Syntax—(Same as Linguistics 121.) Drawing upon data from a variety of languages, examines morphological and syntactic properties of case marking, word order, verb agreement, passives, anti-passives, raising, reflexives, causatives, and relative clauses. Similarities and differences among languages are given a typological and theoretical treatment.
4 units, Spr (Gerdtz)

138. Lexicon and Dictionary—(Same as Linguistics 138.) The similarities and differences of approaches to lexical description as they reflect different notions of "the dictionary." Topics: roots and practice of traditional lexicography, the role of the lexicon in linguistic description, and explicit lexical information that is required
for the development of adequate natural-language systems as used in machine translation.

4 units, Spr (Nunberg, Zaenen)

150A. Computational Linguistics I—(Same as Linguistics 139.) Introduction to computing for linguists, emphasizing good programming style. Data and functional abstraction, procedural and declarative formulations, deterministic and non-deterministic algorithms, computational complexity, and fundamental processes in the lexicon, phonology, morphology, and syntax. The programming language used is Lisp.

4 units, Aut (Kay)

150B. Computational Linguistics II—(Same as Linguistics 227, Computer Science 275.) Computational methods in linguistics (phonology, morphology, syntax, semantics, etc.) and applications (translation, expert systems, question answering, etc.). Individually, or in small groups, students complete a programming project involving a substantial amount of linguistic theory. The programming language used is either Lisp or Prolog. Prerequisites: 120, Computer Science 21 or 22 (depending on the language used).

4 units, Spr (Kay)

159. Basic Concepts in Mathematical Logic—
(Same as Philosophy 159, Linguistics 135.) Introduction to basic concepts and techniques used in mathematical logic: sets, functions, structures, formalization, proof, mathematical induction, enumerability, and effectiveness. (DR:6)

4 units, Aut (Kay)

160A. First Order Logic—(Same as Philosophy 160A.) The syntax and semantics of sentential and first-order logic. Introduction to the basic concepts of model theory. Godel's Compactness Theorem and its consequences (the Loenheim-Skolem Theorem and the Compactness Theorem) are discussed and applied. Prerequisite: 159 or consent of instructor.

4 units, Win (Etxhemendy) MWF 9 plus section

162. Theoretical Methods in Cognitive Science and Cognitive Psychology—(Same as Psychology 162.) Introduction to model building methods in cognitive science and cognitive psychology focusing on computer simulation methods and models. Students study current models and get hands-on experience exploring several examples. Individual modeling projects.

3 units, Aut (Rumelhart) TTh 9-10:15

190. Senior Honors Tutorial.

1-5 units, any quarter (Staff) by arrangement

191. Honors Seminar—Senior year.

2 units, any quarter (Staff) by arrangement

195. Microcomputer Programming Project—
Students develop software illustrating concepts from symbolic systems. Project ideas that produce software useful in departmental courses are generated by faculty or by students. Projects of up to 9 units are under faculty direction. Prerequisites: Computer Science 106X or equivalent, and approval of basic proposal for software by instructor with the advice of department staff. Recommended: familiarity with Macintosh, IBM-PC or other microcomputer, or Computer Science 193.

3-5 units, any quarter (Staff) by arrangement

196. Independent Study—Independent work under the supervision of a faculty member.

1-15 units, any quarter (Staff)

201. Senior Seminar—Core seminar for department majors. Integrates themes from core coursework. Studies contemporary cross-disciplinary research in areas such as learning, computation, formal systems. Class sessions led by department faculty who represent central sub-areas of the program.

3 units, Win (Nissenbaum)

229A,B. Mathematical Linguistics—(Same as Linguistics 229A,B.) Mathematical results about syntactic and semantic systems having empirical application to linguistic theory and its linguistic theory applications. Prerequisite: Linguistics 135 or Philosophy 159, or consent of instructor.

3 units, Win, Spr (Peters, King)

231. Semantics and Logic of Natural Language—
(Same as Linguistics 231.) Treats a substantial fragment of English: presentation and justification of a detailed syntactic analysis within situational semantics, presentation of detailed rules assigning meanings to the expressions in the fragment, development of the logic of the fragment under the given syntactic analysis, presenting rules of inference.

4 units, Aut (Peters)

294. Philosophy of Computation—(Same as Philosophy 395A.) Critical examination of the conceptual foundations of computation. Initial focus on: formal symbol manipulation; digital state machines; recursive function theory; and information processing. Other, non-standard views considered. Readings: Dretske, Goodman, Harel, Haugeland, Newell, Simon, Smith, Turing, and others.

3 units, Win, (Smith) Th 1:15-2:30 alternate years, not given 1991-92
295. Psychology of Program Solving and Reasoning—(Same as Education 295X, Psychology 261.) Introduction to results and methods of research on cognitive processes of solving problems and reasoning. Focus is on accomplishments and limitations of research conducted since 1970.

3 units, Spr (Greeno) MW 3:15-4:40 alternate years, not given 1991-92

296. Philosophy of Cognitive Science—(Same as Philosophy 395B.) Foundational analysis of modern cognitive science, emphasizing the role of computation. Topics: traditional symbol manipulation (Fodor, Haugeland, Newell, Pylyshyn, Simon); full-scale critiques (Dreyfus, Searle, Taylor, Winograd); the role of connectionism (Cussins, Fodor, Smolensky); and anti-representationalism (Brooks, Chapman, Dretske, Rosenschein). Prerequisite: 294.

3 units (Smith) alternate years, given 1991-92

356. Reasoning About Knowledge—(Enroll in Computer Science 356.) The crucial role of knowledge in distributed systems, cryptography, and artificial intelligence. Examines formalizing reasoning about knowledge and the extent to which knowledge is applicable to the areas above. Issues: common knowledge, probabilistic knowledge, applying knowledge to analyzing distributed systems, attainable states of knowledge, and modeling resource-bound reasoning. Prerequisites: mathematical maturity and acquaintance with propositional logic.

1-3 units, Win (Halpern) alternate years, given 1991-92

PROGRAM ON URBAN STUDIES

Director: Leonard Ortolano (Professor of Civil Engineering)
Chair: Sylvia Yanagisako (Associate Professor of Anthropology)
The Committee on Urban Studies: Albert Camarillo (Associate Professor of History), Steven Gorelick (Associate Professor of Applied Earth Sciences), Irwin Remson (Professor of Applied Earth Sciences), Nancy Tuma (Professor of Sociology), Paul Turner (Professor of Art)
Lecturers: Ed Everett, Gerald Gast, Susan Goltsman, Daniel Iacofano, David Neuman, George Sipel, Frederic Stout

Urban Studies brings together students, faculty, and outside specialists who are concerned with the people and problems of cities. The program stresses two basic themes: developing a critical understanding of how cities evolve and shape urban life, and developing the practical and analytical tools which can help improve the quality of life. Urban Studies enables undergraduates to examine urban problems through a number of disciplinary lenses and to address these problems in a practical way.

The Urban Studies major examines the city within the broader context of a liberal arts education. It treats urbanism as an interdisciplinary field and encourages students to inquire critically into both the nature of the urban environment and techniques used to modify that environment.

The major prepares students for a variety of careers and advanced academic pursuits. Graduates from the Program on Urban Studies have established careers in urban planning, city management, policy analysis, real estate development, architecture, environmental planning, and urban design. Many have obtained graduate degrees in urban planning, architecture, or urban design from major universities across the country including UC-Berkeley, Harvard, and MIT. A substantial number have opted to take degrees in business, law, or public policy.

UNDERGRADUATE PROGRAMS

All students majoring in Urban Studies must complete the Urban Studies core. Those who wish to specialize in either urban planning or architecture and urban design may complete their majors by meeting the appropriate Option Requirements. Students who wish to concentrate in a different area (e.g., health care) must complete the Urban Studies core and design the remaining units with an academic advisor who is a member of the Academic Council.

In all cases, a total of 60 units (not counting prerequisites) is required for the major. Courses used to satisfy requirements for the major must be taken for a letter grade.

Students considering the major in Urban Studies should visit the program office (126 Encina Commons) to meet with the Program Director.

URBAN STUDIES CORE

Urban Studies majors should take 110, Introduction to Urban Studies, before the end of the Autumn Quarter of their junior year. This is a prerequisite to the following core courses: Art 290, Utopia and Reality in Modern Urban Planning; Urban Studies 130, Urban Politics; and 131, Managing Local Government.

110. Introduction to Urban Studies, and
120. Utopia and Reality in Modern Urban Planning.
130. The Politics of Development or
140. Emergence of the American Modern City or
141. Race and Ethnicity in American Urban Society or
145. Race and Ethnicity in the American Experience or
147. London: The Birth of the Modern Metropolis, 1500-1700
150. Urban Sociology or
151. Urban Growth and Change or
160. Urban Problems in Anthropological Perspective or
170. Introduction to Urban Design or
171. Urban Design Studio.
180. Current Issues in Urban Planning or
181. Environmental Planning.

URBAN PLANNING OPTION
The courses required for the Urban Planning option introduce the techniques and approaches of city and regional planners. A course applying economics to the solution of urban problems provides a key element to this option. In addition, students are required to study the methods of land use planning and techniques to control the use of land. Because urban planners rely heavily on statistics and computers in doing their analyses, the major requires an introduction to each of these subjects. The Urban Planning option provides excellent preparation for graduate programs in urban and regional planning and in public policy analysis.

See departmental listings for course information.

PREREQUISITE COURSES

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics 1. Elementary Economics</td>
<td>5</td>
</tr>
<tr>
<td>Economics 51. Economic Analysis I</td>
<td>5</td>
</tr>
</tbody>
</table>

REQUIRED COURSES TO COMPLETE THE MAJOR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Earth Sciences 130.</td>
<td>5</td>
</tr>
<tr>
<td>Environmental Earth Sciences</td>
<td>5</td>
</tr>
<tr>
<td>Applied Earth Sciences 132.</td>
<td>5</td>
</tr>
<tr>
<td>Environmental Earth Sciences</td>
<td>5</td>
</tr>
<tr>
<td>Computer Science 103A. Introduction to Computers</td>
<td>5</td>
</tr>
<tr>
<td>Applied Microeconomics—select one of the following: Economics 145, 150, 154, 155.</td>
<td></td>
</tr>
<tr>
<td>Statistics—select one of the following: Statistics 60, 110; Psychology 60 or 153.</td>
<td></td>
</tr>
</tbody>
</table>

Students should take Urban Studies 180 or 181 before taking Applied Earth Sciences 132.

RESTRICTED ELECTIVES
Any 100-level courses selected from the Urban Studies core, from any offered by the Program on Urban Studies, or from those listed below to bring the total to 60 units (not including Economics 1 and Economics 51).

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Earth Sciences II</td>
<td>5</td>
</tr>
</tbody>
</table>

ARCHITECTURE AND URBAN DESIGN OPTION
Viewed together with the Urban Studies core, the courses required for the Architecture and Urban Design option allow the student to explore design in the context of architectural and urban history and in response to human needs, social concerns, and cultural values. The required courses focus on drawing and design skills and on history of architecture. Two of the design courses are sequenced (Art 60 and 160). This option provides strong preparation for graduate study in architecture and urban design. Students who are considering professional study in architecture are advised to take, in addition to the required courses, a year of calculus and introductory courses in physics.

See departmental listings for course information.

PREREQUISITE COURSES

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art 40. Basic Drawing.</td>
<td>3</td>
</tr>
<tr>
<td>Art 60. Basic Design.</td>
<td>3</td>
</tr>
</tbody>
</table>

REQUIRED COURSES TO COMPLETE THE MAJOR

<table>
<thead>
<tr>
<th>Course No. and Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art 140. Drawing I.</td>
<td>3</td>
</tr>
<tr>
<td>Art 160K or 160L. Design I—Intermediate Design</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Engineering 101. Visual Thinking</td>
<td>3</td>
</tr>
</tbody>
</table>

At least two courses on the history of architecture (or architecture and art) offered by the Department of Art (100 level or above).

RESTRICTED ELECTIVES
Any 100-level courses selected from the Urban Studies core, from any offered by the program on Urban Studies, from any 100-level course offered by the Art Department in drawing, painting, sculpture, printmaking, or design, or from those listed below to bring the total to 60 units (not including Art 40 and Art 60).
Course No. and Subject | Units
--- | ---
Civil Engineering 180. Elementary | 4
Structural Analysis | 4
Engineering 11. Mechanics of Materials | 4

RECOMMENDED ADDITIONAL STUDY

Architecture schools typically require applicants to submit a portfolio of work in the visual arts or design as part of the admissions process. In addition, many graduate schools of architecture require calculus and physics as conditions for admission. Therefore, potential applicants to architecture schools are strongly advised to take:

Course No. and Subject | Units
--- | ---
Engineering 10. Applied Mechanics: Statics | 3
Math. 19. Calculus and Analytic Geometry | 3
Math. 20. Calculus and Analytic Geometry | 3
Math. 21. Calculus and Analytic Geometry | 3
Physics 21. Mechanics and Heat | 4

Students seeking exposure to orthographic projection, sectioning, and other aspects of technical drawing should take Mechanical Engineering 103D, Engineering Drawing. The Civil Engineering Department offers 126, Introduction to Computer Aided Drafting Using AutoCAD, in the Spring Quarter. Note also that courses in drafting are available at local community colleges including West Valley College and Foothill College.

SELF-DESIGNED OPTION

Students who wish to concentrate on an area other than Urban Planning or Architecture and Urban Design must complete the Urban Studies core and design the remaining units (to bring the total to 60 units) with an academic advisor who is a member of the Academic Council. The self-designed portion of the major should concentrate on a particular area of analysis such as health care or urban public policy. It should include only courses at the 100 level, and must be approved by a subcommittee of the Committee on Urban Studies. Proposals for the self-designed portion of the major should include a course list and a description of how the courses meet the student's educational objectives. Proposals must be submitted for approval by the Urban Studies Committee by the end of the second quarter of the student's junior year. Applications received after that deadline are not considered.

HONORS PROGRAM

The honors program offers qualified students an opportunity to conduct independent research and to write a thesis of superior quality summarizing the results. The program grants honors at graduation to those students who have successfully completed a thesis of honors quality, attained a 3.5 letter grade indicator in their major, and successfully completed all the course requirements for their major. Honors students must register for a minimum of 10 units and a maximum of 15 units spread over their senior year. The completed honors thesis must be submitted to the program office by the last week in May before graduation. Students may obtain details regarding application, admission, and honors procedures from the Office of the Program on Urban Studies, 126 Encina Commons.

COTERMINAL PROGRAMS

Undergraduates in Urban Studies may enter coterterminal master's degree programs in a number of departments in the University. In recent years, Urban Studies majors have developed coterterminal programs within the Departments of Anthropology and Sociology, and the School of Education. Information and applications for the coterterminal degree programs are available at the Undergraduate Advising Office. Students should discuss the coterterminal program with the Program Director during their junior year.

COURSES

Further descriptions and details of current courses offered by lecturers are available prior to each quarter from the program offices and are listed in each quarter's Time Schedule.

40. Introductory Seminar: Social Change in Industrializing America—A Case Study of Chicago—(Enroll in History 67S.) Chicago offers a vivid context for an examination of the social and cultural transformations of American society between 1870 and 1920. Topics: immigration and assimilation; creation and experiences of a new industrial workforce; machine politics; architecture and city planning; social reform; and race relations. Readings from fiction, photographs, memoirs, municipal records, and social criticism.

5 units, Win (Sawislak) Th 1:15-3:05

110. Introduction to Urban Studies—Interdisciplinary introduction to the study of cities and urban civilization. Covers history of urbanization through Lewis Mumford's The City in History and examines various disciplinary methodologists comprising the unified field of urban studies (sociology, economics, politics, architecture, urban design and urban public policy formation).

4 units, Aut (Stout) MW 3:15-4:05
115. Seminar: Utopia and Reality in Modern Urban Planning—(Enroll in Art 280.) Primarily for upper-level undergraduate Urban Studies majors. Examines utopian urbanist thinkers (Ebenezer Howard, Le Corbusier, Frank Lloyd Wright, and others) who have established the conceptual groundwork of contemporary urban planning practice. Student participation and research-oriented term paper required.

4 units, Win (Stout, Turner) W 3:15-4:05

120. Urban Economic Analysis—(Enroll in Economics 148.) The economy of cities. Location and land use, urban transportation, housing, and local taxation and provision of public services. Emphasis on theory: some discussion of public policy. Students write a field essay which entails applying urban economic theory to some aspect of the San Francisco urban theme. Prerequisite: 51.

5 units, Aut (Arnott) MTWThF 9

130. The Politics of Development—The reality of community development: the tug and pull that cities experience, interests of developers, and roles played by various publics. The politics of development: values, votes, revenues, conflicts, deals, mistrusts, negotiations, and compromise. Why are developers, environmentalists, and cities antagonists? What affect does this have on cities and the Bay Area in general?

4 units, Spr (Everett, Sipel)

131. Managing Local Government—Urban administration using the urban executive as a focal point. Topics: the mission and structure of government; policymaking processes in urban government; respective roles of legislators and administrators; and role and function of the city manager. The manager's role in dealing with contemporary urban problems: productivity, declining resources, housing, and transportation and growth management. Prerequisite: 110 (for Urban Studies majors only).

4 units (Sipel)

alternate years, given 1991-92

132. Politics and Public Policy—(Enroll in Political Science 101P, Public Policy 101.) The domestic policy-making process, emphasizing how elected officials, bureaucrats, and interest groups shape governmental policies in various areas including tax policy, environmental policy, and social-welfare policy, given their goals and available tactics. How public policies are formulated and implemented. Results of this process using equity and efficiency criteria. Prerequisite: Political Science 10.

5 units, Spr (Brady)

133. Preparation for Internship Learning—(Enroll in Public Policy 179.) Provides knowledge and skills necessary for effective learning through an internship. Focus is on identifying and negotiating internship assignments which yield effective service and substantive learning appropriate to students academic interests. Introduction to the theory and practice of self-directed "field" learning (e.g., clarifying goals and objectives, critical reflection on experience, problem solving, assessing experiential learning, understanding the interplay between experience and analysis in field research. Students are assisted in identifying and preparing for an internship of their choice and, if appropriate, connected with faculty who serve as sponsors of internship-related directed study.

2 units, Win (Stanton) M 3:15-5:05

140. Undergraduate Seminar: The Emergence of the Modern American City—(Enroll in History 257S.) The social, political, economic, and spatial contours of American urban life between 1840 and 1900. Topics: structure of national "urban system"; urban politics; social mobility as an urban phenomenon; the popular image of the city; experiences of ethnic and racial minorities; efforts of urban reformers.

5 units, Aut (Sawislak)

141. Race and Ethnicity in American Cities: History and Public Policy—(Enroll in History 162A.) Compares urban histories of the nation's two largest minority groups, and the predominant themes which characterize the history of Chicanos, Puerto Ricans, and Blacks in American cities from 1870-1980. Topics: formation and development of ghettos and barrios, urban occupational structure and stratification, racial attitudes and institutional responses to the presence of racial minorities, ethnic community and political organizations, and family structure and the role of women in the household.

4 units (Camarillo) not given 1990-91

143. Undergraduate Colloquium: Race and Ethnicity in American Cities: History and Public Policy—(Enroll in History 262A.)

5 units (Camarillo) not given 1990-91

144. Undergraduate Colloquium: Topics in the History of the American West—(Enroll in History 253A.) Thematic study of the American West since 1850, emphasizing the social and cultural history of region. Topics: Indian-Anglo relations; labor systems of a resource-intensive economy; impact of federal policies; efforts to control the region's environment; the experience of westward migration; ideology of the frontier in American culture.

5 units, Win (Sawislak)
145. Race and Ethnicity in the American Experience—(Enroll in History 164.) 5 units, Win (Camarillo, Frederickson)

147. London: The Birth of the Modern Metropolis 1550-1700—Between 1580 and 1680, London's population doubled every 20 years and outgrew its medieval walls on the north bank of the Thames. The medieval merchant and artisanal city acquired its present day industrial East End and an upperclass West End. Why and how did London grow so rapidly, despite repeated attempts by the Crown to limit new building and a mortality rate that frequently eclipsed the birth rate? How was it able to retain its medieval guild-dominated governing structure in a period of rapid urban expansion, and what were the relations between the mayor and alderman and the monarchy? How did the city provide clean water, clean air, sanitation, and workable transport? How did the city provide for new urban poor? What new forms of culture emerged in the post-medieval metropolis? 5 units (Seaver) given 1991-92

149. Poverty and Homelessness in America—(Enroll in History 251F.) 5 units, Win (Camarilla)

150. Urban Sociology—(Enroll in Sociology 150.) Over the last 200 years the scale of the ecological communities in which people are embedded has increased more rapidly than the psychological communities with which people identify themselves, and the political communities within which they are governed. Explores all three kinds of communities and the impact of the disparity between the scales on the ability of people to govern themselves. 3-5 units, Win (Conell) MWF 1:15

151. Urban Growth and Change—(Enroll in Sociology 154.) Cities and towns change in size, density, composition, and internal organization. Causes and consequences of these changes. The processes of change in a city as a whole and in subareas of a city, with emphasis on the U.S. 5 units, Aut (Tuma) TTh 1:15-2:45

152. Poverty and Public Policy—(Enroll in Sociology 105.) Why poverty persists in the U.S. and other modern industrialized societies. The role of public policies in preventing and mitigating poverty. Lectures, class discussions, and individual projects explore facts, myths, and theories. 3-5 units (Tuma) alternate years, given 1991-92

153. Organizations and Public Policy—(Enroll in Sociology 166.) Concepts and methods for analyzing the influence of organizations on the setting and implementation of public policy. Varying conceptions of organizations as corporate actors and as social contexts. Roles of organizations in relation to public policy as decision makers and problem solvers, as change agents, and as clients. Prerequisite: Industrial Engineering 100, Sociology 160. 5 units, Win (Scott) MWF 10

154. Gathering Evidence for Urban and Policy Research—(Enroll in Sociology 182.) Introduction to social-scientific methods for gathering evidence for urban, policy, and other social research. Topics: usage of government documents, interviewing, and social surveys (public opinion polls). Students apply these methods in group projects that focus on issues in nearby cities. 5 units, Aut (Tuma) TTh 3:15-5:05

155. Urban Problems in Anthropological Perspective—(Enroll in Anthropology 146.) Issues from current urban problems examined from the cross-cultural perspective of anthropology. Topics: rural-urban migration; changing family and kinship patterns; urban ethnic communities and inter-ethnic relations; urbanization and women; urban poverty and stratification; and crime. 5 units, Spr (Staff)

156. Women in Cities: A Cross-Cultural Perspective—(Enroll in Anthropology 145, Feminist Studies 142.) Women's experiences in cities throughout the world and the determinants of 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 evaluated in light of research on women in Latin American, Asian, and African cities. Topics: women and urban migration, changing forms of the sexual division of labor, changing family and kinship structures, prostitution, and the political activism. 5 units (Yanagisako) alternate years, given 1991-92

157. Inter- and Intra-Ethnic Variation in Urban Vernacular English—(Enroll in Linguistics 153.) Surveys the literature on ethnic vernaculars in urban settings, concentrating on modern sociolinguistic studies of black and white vernaculars in the U.S. and in British cities. Recent research findings that urban black and white vernaculars are diverging are compared with new research in the local (E. Palo Alto) community. Students innovate local research on their own. Implications for linguistics, the social sciences, and urban policy, especially in teaching and tutoring working-class, inner-city youth. (DR:4 or DR:5) 4 units (Rickford) alternate years, given 1991-92
170. Introduction to Urban Design—Urban design in theory and contemporary practice. Theoretical overview of urban form and experience. Neighborhood conservation, downtown revitalization, preservation, and metropolitan growth are examined through comparative studies of urban design processes and issues in North America and abroad. Student projects and workshops focus on case study urban design problems in San Francisco and the Bay Region. 5 units, Win (Gast) T 10-12 and 7-9 p.m. plus two required Sat. workshops

171. Urban Design Studio—(Undergraduates enroll in Art 168B; graduates enroll in Urban Studies 271.) 10-week comprehensive urban design project taken from a current problem in San Francisco. Systematic introduction to the urban design process and problem-solving methods. Graphic, diagrammatic, and other tools of analysis and communication are used. Prerequisite: 170. Enrollment limited to 14. 5 units, Spr (Gast) TTh 7-10 p.m. plus one required Sat. workshop

172. Environmental Psychology in Urban Design—Seminar emphasizing critical reading and discussion of environment/behavior literature; and a workshop training students in environmental research procedures. Major theories and methods of environmental psychology and their application to the fields of architecture, urban planning, and design. Topics: 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, Aut (Goltsman, Iacofano)

173. Architecture: Process and Practice—(Enroll in Civil Engineering 223.) Overall view of the process and practice of architecture. Taught by five practicing architects and one contractor, and coordinated and supported by the Center for Integrated Facility Engineering (CIFE). Each stage of the architectural life cycle is presented by one of the outside faculty including Beaux-Arts, Bauhaus, industrial design, Post-Modernism. Relation of design to art, technology, politics, and culture. Readings from principle theorists and practitioners including William Morris, Walter Gropius, LeCorbusier. Analyses of notable success and failures in modern design. 4-5 units (Adams, Katz) not given 1990-91

174. Architectural Design Process—Lecture/studio. Introduction to basics of the design process through building-type case studies and studio sessions, applying principles affecting site interactions with building program components. Visits and discussions with architects/landscape architects responsible. Student work is developed as a conceptual massing model, and simplified site and building related graphics. Result: demystification of the initial phase of the design process and providing a better understanding of the architect's role. Enrollment limited to 15. 5 units, Win (Neuman) MTh 7-10 p.m. plus one required Sat. workshop

175. Technology and Aesthetics—(Enroll in VTSS 115.) The aesthetic dimension of technology in the modern world and in history. The role of subjective factors in technological and scientific problem-solving and in the response of users and observers to technological phenomena. Analysis of such concepts as beauty, elegance, quality, appropriateness, and function as they apply to specific works of technology and science. Technology as art and art as technology. Improving the ability to analyze the "fit" of technological products to individual needs and cultural values. Case studies of personal computers, buildings, machines, weapons, structures, and networks. 4-5 units (Adams, Katz) not given 1990-91


180. Current Issues in Urban Planning—Focuses on current issues and professional challenges in the field of urban planning and policy development. Through presentations, seminar discussions, and project assignments, students examine growth management, relationship of land use and transportation, environmental mediation and conflict management, and affordable housing. Also, emerging trends in urban general plans with respect to child care services, parks and recreational service, and hazardous waste management. Enrollment limited to 25. 3 units (Iacofano) given 1991-92

181. Environmental Planning—(Enroll in Civil Engineering 171, VTSS 183.) Alternative strategies for air and water quality management; environmental impact assessment requirements; interactions between land use, physical
infrastructure, and environmental quality; forecasting and evaluation of environmental effects; survey of techniques for assessing visual, biological, noise, air quality, and water quality impacts. Recommended: one year of college mathematics and Civil Engineering 170.

4 units, Win (Ortolano) TTh 1:15-2:30

182. Policy Making and Problem Solving at the Local and Regional Level—(Enroll in Public Policy 182.) Public policy issues, processes and organizations at the local and regional level. Focus: public context of community problem-solving and local policy formulation, implementation and analysis. Case study investigation of public issues in the local community (e.g., homelessness, toxic waste disposal, child care, land use planning). Opportunity to learn from local policy makers and community leaders.

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

186. Management of Geologic Hazards—(Enroll in Applied Earth Sciences 184.) The application of earth science to the identification and management of geologic hazards within the modern regulatory framework. Emphasis on developing geologic techniques to recognize natural geologic hazards and select mitigation measures to manage risk. Topics: geologic problems associated with earthquakes, landslides, floods, stream and erosion, land subsidence, underground water, environmental abuses, and planning, and engineering design alternatives. Necessary geologic fundamentals are introduced. Prerequisite: Geology 1 or consent of instructor. (DR:8)

3 units, Aut (Cotton) TTh 1:15-2:30

190. Seminar on Planning and Design Professions—Informal luncheon seminar on vocational possibilities in urban planning, urban design, and architecture. Bay Area professionals lecture and respond to questions concerning the nature of their day-to-day work, impressions of the field in general, and academic background recommended for that career. One session devoted to graduate school admissions and the degree relevant to these fields.

1 unit, Win (Staff) T 12-2

191. Public Service Practicum in Urban Studies—Students organize a volunteer public service internship. Examples: work at a homeless shelter, participation on a panel to mediate community conflict, or work as a counselor at a battered woman’s shelter. After the volunteer work is completed, students prepare a 3-5 page statement on the nature of the practicum and its relevance to the major in Urban Studies. Open to Urban Studies majors. Recommended: 133.

1-2 units (Ortolano) by arrangement

192. Internship in Urban Studies—Students organize an internship in an office of a government agency or a private firm directly relevant to the Urban Studies major. Program of reading supplements their internship. Paper summarizes internship experience and related readings. Open to Urban Studies majors. Prerequisite: 133.

2-4 units (Ortolano) by arrangement

193. Special Projects.

2-5 units (Staff) by arrangement

197. Directed Reading.

2-5 units (Staff) by arrangement


3-8 units (Staff) by arrangement

SPECIAL PROGRAMS

PROGRAM FOR INDIVIDUALLY DESIGNED MAJORS

This program is intended for currently registered undergraduates 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. While the Individually Designed Major program is not an honors program, the governing committee encourages each participating student to consider an honors project as a culminating experience of the major. Any student in good academic standing is free to participate. Information about proposal procedures, and the procedure for an honors project, is available at the Undergraduate Advising Center, Sweet Hall, first floor.

In designing a major, the student consults with at least three Academic Council faculty members from at least two separate departments or programs of the University; one of the faculty members is 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 does not consider proposals (or changes in previously
approved proposals) without the approval of the faculty advisory group.

THE "COMMITTEE IN CHARGE"

The program is administered by the Dean's Advisory Committee on Individually Designed Majors and the Undergraduate Advising 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 a student's faculty advisory group.

THE PROPOSAL

Detailed written procedures and advice about the preparation of the proposal are available from the Undergraduate Advising Center, (Sweet Hall, first floor; telephone 415-723-2426), where a UAC director is available to discuss your proposal with you.

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 the selected faculty advisory group; 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 all three advisors giving separate appraisals of the academic viability of the proposed major.

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 specific requirements. The criteria for approval of proposals submitted include:

1. Each major shall consist of at least 60 units, all in courses at or above the 100 level (or their equivalent);
2. A maximum of 15 units of the 60 may be taken on a Satisfactory/No Credit basis.
3. A maximum of 5 units of the 60 may be taken in individual study or directed reading.
4. The proposed major must constitute a coherent academic program which fulfills the student's objectives and achieves a clear academic goal.
5. The proposed major must be comparable in quality and in academic rigor to degrees obtained by students in other degree-granting programs offered at Stanford.
6. The proposed major must achieve both breadth and depth within the academic discipline(s), involve interdisciplinary study, and be compatible with a liberal arts education.
7. The proposed major must not duplicate, or be achievable through, a major already offered by another degree-granting program or department.
8. Students must present evidence that demonstrates their ability to do independent work.
9. Students proposing individually designed majors must have at least three full quarters of undergraduate work remaining at Stanford after the date on which the proposal is approved by the committee.
10. All three advisors must be on Academic Council. No more than two advisors may be from the same department.

These specific requirements are in addition to the general guidelines discussed under "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.

INNOVATIVE ACADEMIC COURSES (IAC)

Director: Margo Horn

IAC introduces alternative topics and methods into the standard University curriculum and, through SWOPSI, links students' academic experience to social and political activism. IAC encourages faculty and students to introduce experimental courses and develop alternative approaches to learning. These courses do not fulfill any Distribution Requirements, but do count as units toward graduation. IAC courses are selected and approved by the program's Accreditation Committee. They include three
types of offerings: Freshman-Sophomore Seminars, SWOPSI (Stanford Workshops on Political and Social Issues), and Undergraduate Special courses (UGS).

REGISTRATION
Registration for all IAC courses occurs on regular class sign-up days at the Registrar’s Office or locations designated by that office. All Freshman-Sophomore Seminars, SWOPSI workshops, and UGS courses are listed in the IAC Program Catalog, available each quarter during class list sign-ups through the residences, at the Registrar’s office, and at the IAC office, 124 Sweet Hall.

GRADES
IAC courses are graded in accordance with regular University procedure, with the Satisfactory/No credit option available on the instructor’s approval.

COURSE PROPOSALS
A proposal for a UGS or SWOPSI course may be initiated by a student, staff member, faculty member, or a member of the community. The LAG staff is available to help in the development of proposals, and those interested in teaching in IAC are urged to consult with them. The proposed instructor should submit, for review by the IAC Accreditation Committee, a proposal using forms available at the program office, 124 Sweet Hall, including:
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 a statement of the qualifications of these individuals. Instructors who are not members of the Academic Council must obtain a sponsor statement from a council member indicating support for the course and the qualifications of the proposed instructor(s). The sponsor is responsible to the IAC Accreditation Committee 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.

Proposals are generally due by the fifth week of the quarter preceding the one in which the proposed course is to be offered. Contact IAC for exact timetables.

FRESHMAN-SOPHOMORE SEMINAR PROGRAMS
Freshman-Sophomore Seminars bring together small groups of students early in the undergraduate years to investigate a well-defined issue under the guidance of a faculty member, usually a professor in one of the University’s graduate departments or professional schools. The seminars introduce students to research and scholarship that rarely finds its way into introductory courses.

ADMISSION PROCEDURES
Enrollment is limited to freshmen and sophomores. Seminar offerings are announced each Autumn Quarter in Approaching the Sophomore Year, as well as in the IAC Program Catalog (see above). Students sign up for seminars on class-list sign-up days.
Inquiries may be directed to the IAC office, Sweet Hall.

SWOPSI (STANFORD WORKSHOPS ON POLITICAL AND SOCIAL ISSUES)
SWOPSI was initiated by students in 1969 to harness the research capabilities of Stanford in searching 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 for credit approximately nine workshops each quarter. SWOPSI classes are small; enrollments of 8 to 15 students per instructor allow for personal contact between students and instructors and for a high level of student involvement.

Workshops combine academic analysis with direct exposure to the issue. Some conduct community-based research and publish the research findings and policy recommendations. For example, a 1977 workshop developed a solid waste recycling plan for the campus which grew into the ASSU Recycling Center. In other workshops, students have published periodicals, painted murals, worked on a rape crisis hotline, and developed dorm outreach programs on racism. All workshops seek to acquaint the community-at-large with the issue under study; workshop findings form the basis of publications, public forums, or concrete legal, political, or
UNDERGRADUATE RESEARCH OPPORTUNITIES (URO)

Director: Laura S. Selznick

The Undergraduate Research Opportunities Program (URO) seeks to combine two of Stanford's greatest strengths: the eminence of its research faculty and excellence in undergraduate education. URO encourages students to work independently on projects with faculty and thus to participate directly in Stanford's research community.

There are two principal formats in which the collaboration is established. Faculty members may list ongoing research projects in which undergraduates can become involved. Undergraduates may design their own individual projects and pursue them under the sponsorship of an individual faculty member. The URO staff directs students to departments with established research programs, advertises opportunities submitted by individual faculty, and helps to develop resources.

Faculty who have participated in this program since 1974 have found enthusiastic and energetic assistants, made better progress in research, and freed up time for more specialized work. Students have appreciated the direct contact with faculty, immersion in a topic of mutual interest, and the unique learning opportunity that research provides.

LISTING RESEARCH

Faculty members with ongoing research programs are encouraged to identify a piece of their project appropriate to undergraduate competencies and to list it through URO. (Purely menial or mechanical projects are not appropriate.) The researcher should state clearly the nature of the position, requisite background and qualification, and the expected time commitment. Determination of credit appropriate to each project is left to the researcher and the student. The formula generally used is three hours of intellectual work per week per academic unit. (On the average, students have received 3 units of credit per quarter in exchange for a commitment of 10 hours per week.)

RESOURCE FILES

Students can obtain free computer accounts to access two data bases designed to facilitate undergraduate research projects. The Odyssey and Faculty Interests files are available through Folio, the computer processor which includes Socrates, the on-line library catalog. Odyssey lists openings for student research assistance on faculty research projects (as well as public service opportunities from the Haas Center for Public Service and internships from the Career Planning and Placement Center). The Faculty Interests file contains information about the research interests of individual Stanford faculty across the University. Students can use faculty interest information in identifying potential sponsors for projects of their own design or in seeking advice about a particular discipline.

FUNDING AVAILABLE

The Fund for Undergraduates' Research is administered by URO and is available exclusively to Stanford undergraduates. The deadlines for major grants (up to $2,500) for 1990-91 are Friday, April 5 for projects in social sciences, natural sciences and engineering and Friday, April 26 for projects in humanities and creative arts.

Small grants ($500 maximum) are awarded each quarter. The deadlines for 1990-91 are November 2, February 8, and April 26.

Major grants differ from small grants in the scope of the project proposed rather than the level of reimbursement requested. Major and small grants are restricted to supplies and expenses associated with research. Major grants are awarded once a year, during Spring Quarter, to as many as 40 students whose projects reflect the highest level of creativity and independence and the greatest promise for exciting results.

The faculty sponsor of each winning major grant project receives an unrestricted professional expense grant of $500. Major grants for students on financial aid may sometimes include funds to replace summer earning expectations. Summer earnings can occasionally be replaced for small grant winners with a high level of financial need.

The Chappell-Lougee Scholars program is a special opportunity for sophomores in the humanities and social sciences to be involved in research under faculty mentorship. Faculty may nominate students or students may nominate themselves. Financial need is considered as well as the academic goals of the proposed project. Applications and nominations are due to the URO office by Monday, November 5, 1990. The URO office has information on applications and criteria.
The University offers 13-week “stretch quarters” (mid-September to mid-December or late March to the end of June) in residence at the Stanford facility in Washington, D.C. The program enables highly-qualified undergraduates to work and study in the nation’s capital. In addition to providing students with an understanding of public policymaking and encouraging them to consider a career in public service, the program offers an opportunity to take advantage of the city’s unique cultural resources.

Central in the student’s educational experience is an internship. Students serve as interns at such institutions and agencies as the Senate, the House of Representatives, the Office of Management and Budget, the Securities and Exchange Commission, the Smithsonian Institution, the National Gallery, and the Departments of Commerce, Education, Health and Human Services, Justice, and State.

In addition to the internship, students must also complete an academic course of study consisting of small tutorials taught by policy experts (5 units), and weekly policy seminars taught by Stanford faculty members (5 units). Students also usually write a major paper related to their internship for 3-5 units of credit.

The program is designed for students in their junior year or the first part of their senior year. Applications must be completed two quarters in advance. For Autumn Quarter, apply early Winter Quarter of the previous year. For Spring Quarter, apply early Autumn Quarter.

Students interested in the program may obtain a brochure at Owen House, or call for information, (415) 723-0992.

**COURSES**

**Seminar: Economics of Regulation**—(Enroll in Economics 159.) The changing federal policies toward microeconomics interventions. Topics: recent efforts to reform regulatory policies and institutions and to deregulate various sectors; legal, political, and economic theories that prevailed prior to the reform movement and the basis for their political and economic legitimacy; and who gains and who loses from the reforms and whether the reforms are likely to stick. Explores hypotheses proposed by scholars in the context of specific regulatory institutions and issues.

* 5 units, Aut, Spr (Owen) M 4-6, 7:30-8:30

**Seminar: Politics and Policy for Children, Youth, and Families**—(Enroll in Political Science 188K, Public Policy 188.) Analyzes the political conflicts and public policymaking system for children and families including concepts such as bargaining, coalitions, and political symbols. Emphasis on federal strategies for improving schools and children’s outcomes.

* 5 units, Aut (Kirst) T 4-6, 7:30-8:30

**198. Tutorial**—Individual and small-group discussions, conducted by tutors in areas such as health, environmental, and foreign policy.

* 5 units, Aut, Spr (Danelski) by arrangement
Emeriti: (Professors) Jack H. Friedenthal, J. Myron Jacobson, J. Keith Mann, John H. Merryman, Howard Williams

Dean: Paul A. Brest

Associate Deans: Ellen Borgersen, Frank Brucato, Sally M. Dickson, John Gilliland


Associate Professors: Janet M. Cooper (on leave 1990-91), Henry T. Greely, Joseph A. Grundfest, Bill Ong Hing, Barton H. Thompson

Assistant Professors: Barbara H. Fried, Deborah M. Weiss, James Q. Whitman

Lecturers: Bernhard E. Bergesen, Roger Borovoy, Barbara A. Caulfield, Jorge del Calvo, Mary C. Dunlap, Randee G. Fenner, Gary J. Friedman, James Fuller, Lynn Hart, Ivan Humphreys, Marc Jones, Glen Kohl, Csilla Kollonay, Linda J. Krieger, David Lowin, Judith C. Miles, Brian D. Smith, Lisa M. Pearson, Dennis P. Riordan, Daryl Rutkin, Kenneth Taymor


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 the full curriculum, see the School of Law Bulletin.) The school is on a two-term academic calendar. Autumn Term classes begin on September 6, 1990. Spring Term classes begin on January 22, 1991, and the term ends on May 25, 1991.

COURSES

GRADUATE

The following courses are open to qualified graduate students of other departments of the University upon consent of the instructor:

229. Law and Social Science—Viewing social science as an analytical tool, examines its role in the American legal process. Focus is on the relevance of social science theory and empirical findings for such legal issues as deterrence; pornography; desegregation; fair employment; jury selection and dynamics; child custody; and the nature of expertise. A separate emphasis is placed on social science method, and its implications for legal analysis.

3 term units (Rosenhan)

236. Art and the Law—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; 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.

3 term units (Merryman, Elsen)

244. Issues in Child Custody—(Same as Psychology 351.) How policy regarding child custody ought to be developed. How behavioral sciences information can be utilized in the development of legal policies regarding child custody decisions. Identifies research projects that provide new data relevant to policymakers.
Seminar limited to 20 graduate and law students. Consent of instructor required.

2 term units or 3 quarter units not given 1990-91

329. Psychopathology and Mental Health Law—(Same as Psychology 353.) The literature on severe psychopathology focusing on diagnosis, nature, and effects of treatment, predictions of dangerousness to self and others, and assessment of grave disability and competence. Effects of diagnostic stereotyping, current modes of treatment, and our technical ability to predict social behavior are assessed for their legal implications. Also, law and practice in commitment and conservatorship, issues and case law in right to treatment, patients' rights, informed consent, assessment of malpractice and psychosurgery.

3 term units (Rosenhan) not given 1990-91

337. Public Policy Towards Abused and Neglected Children—(Same as Education 379X.) Standards that are, and should be, used in defining child abuse and neglect and evaluating means of state intervention to protect such children. Role of various professionals, doctors, lawyers, mental health experts, police, and social workers in dealing with the problems of child abuse and neglect. Types of research currently being done and identification of new research directions. Seminar limited to 20 graduate and law students and meets for 15 weeks under the school's semester system. Consent of instructor required.

3 term units or 5 quarter units not given 1990-91

345. Psychology and the Law Proseminar—(Same as Psychology 225.) Current Stanford research on psychosocial issues designed to acquaint faculty and students in the Psychology/Law program with each other's current research and with contemporary issues in the field. Topics may include the role of social science experts in legal decision making, eyewitness identification, jury behavior, psychological assumptions in evidence law, the insanity defense, and others, depending upon the interests of the participants. Prerequisites: law student or graduate standing in psychology or postdoctoral fellow, and consent of instructor.

2 term units or 3 quarter units (Rosenhan)

440. Fatherhood, Law, and Construction of Family Relationships—(Same as Psychology 290.) Psycholegal studies in family law help examine how legal reform affects family functioning in intended and unintended ways. Revisions in sociolegal policies derive from changes in normative family roles and relationships (e.g., gender and parenting roles), and help create these changes by institutionalizing intended modes of family functioning. Because families are complex social systems, legal reforms which influence aspects of family process may have unanticipated consequences for other aspects of family life. Emphasis on fatherhood and its sociolegal construction.

not given 1990-91

NONPROFESSIONAL

The following courses are open to juniors, seniors, and graduate students in other departments, and may be counted toward the A.B. degree but not toward professional degrees in law.

104. Psychology and Law—(Same as Psychology 125.) The joiners between cognitive, social, and personality psychology and the law. Topics: role of memory and perception in eyewitness testimony; insanity defense and associated issues of prediction; educational and job discrimination; and the psychology of juries.

not given 1990-91

106. Introduction to American Law—(Same as American Studies 179, Political Science 182F.) Introduction to American law for undergraduates, dealing with the structure of the American legal system, including the courts; American legal culture; the legal profession and its social role; the scope and reach of the legal system; the background and impact of legal regulation; the relationship between the American legal system and American society in general. (DR:S)

3 units, Spr (Friedman)
SCHOOL OF MEDICINE

Vice President for Medical Affairs and Dean: David Korn
Senior Associate Dean for Education and Student Affairs: Charlotte D. Jacobs

The School of Medicine offers courses of study leading to the B.S., M.S., Ph.D., and M.D. degrees.

UNDERGRADUATE PROGRAMS

At the undergraduate level, a number of the school's courses are open to any registered Stanford student who has fulfilled the prerequisites, subject to the usual limits of course enrollment and faculty approval. Undergraduates may also elect to major in Microbiology and Immunology, as described in that department's section. Details on admission into undergraduate programs are described in the "Degrees" section of this bulletin.

GRADUATE PROGRAMS

M.S. AND Ph.D. PROGRAMS

Some departments offer programs leading to the M.S. degree, and most offer programs leading to the Ph.D. degree. In addition, there are several interdisciplinary programs, described in the "Dean of Graduate Studies" section of this bulletin, which include a number of faculty from throughout the School of Medicine. Except for the Departments of Biochemistry and Cell Biology, applications and information for all graduate programs may be obtained through the Office of Graduate Admissions, Building 590, Room 208, Stanford University, Stanford, California 94305-3052.

In 1989 a new program, Combined Admissions Mode (CAM), was created to allow a small, select group of students to enter graduate study in the biomedical and biological sciences without committing to a particular department or program. See below for details on CAM.

M.D. PROGRAMS

The 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, Stanford had designed its medical curriculum with a twofold 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 length of the curriculum may vary as the individual's needs dictate. Students develop study plans that take into consideration their academic background, particular strengths, and career objectives.

All medical students must complete a formal curriculum in the basic medical sciences and have formal clinical experience in medicine, surgery, pediatrics, gynecology-obstetrics, and psychiatry. The minimal requirement for the M.D. degree is satisfactory completion of 13 quarters of academic work. Additional quarters may be taken at a nominal fee. The time students spend in medical school is a function of their background and their degree of involvement in research and outside coursework.

There is a wide variety of opportunity for students who wish to study subject areas in the preclinical and clinical disciplines in depth. Students with strong interests in careers in medical research are urged to investigate opportunities available under the auspices of the Medical Scientist Training Program (MSTP). This program provides an opportunity for a limited number of students to pursue an individualized program of research and coursework leading to both the M.D. and Ph.D. degrees. The estimated time for completion of the program is six years. Students interested in participating in the MSTP are asked to provide supplemental information relevant to their research background and are considered for entry into the MSTP at the time of their application to the School of Medicine.

The admissions process recognizes that minorities and women are under-represented in the medical profession, and especially in academic medicine; and the school has a strong commitment to identify, recruit, and educate such students.

Provided an applicant to the 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. Coursework 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 records.

Further details on the M.D. degree, including admission requirements, are in the Stanford University School of Medicine bulletin. For ap-
students who enter a given program, as such. Rather, it serves as an entryway to choose from the myriad opportunities available to CAM students, therefore, to experience different areas of research before accepting a student, but no formal re-review of a student's credentials is made. The requirements for completion of the Ph.D. may vary between programs but, in all cases, there is a strong emphasis on successful research experience, commitment to biomedical research, and GRE scores (including the subject test in either biology, molecular biology, or chemistry) which should be taken in October of the application year, at the latest, for the results to be received by the application deadline. See the Stanford University Guide to Graduate Admission for additional details.

Once admitted to the program, students are given between six and nine months to experience different areas of research before choosing a specific program or department in which to complete the Ph.D. All Ph.D.-granting departments and programs in the School of Medicine participate in CAM including: the Departments of Biochemistry, Cell Biology, Developmental Biology, Genetics, Microbiology and Immunology, Molecular and Cellular Physiology, and Pharmacology, as well as interdepartmental programs in Biophysics, Cancer Biology, Immunology, Medical Information Sciences, and Neurosciences. Additionally, faculty with relevant interests in the Departments of Biological Sciences and Chemistry may also serve as preceptors for CAM students. The opportunities available to CAM students, therefore, span virtually all areas of modern research in the life sciences. CAM is not a Ph.D.-granting program, as such. Rather, it serves as an entryway into the 14 programs listed above. It has been designed to enable students to experience a small slice of research activities at Stanford and then to choose from the myriad opportunities. Students are able to complete their degrees in the same time as students who enter a given Ph.D. program directly.
completion of research constituting an original and significant contribution to the field.

CAM students are supported by the CAM program for the first year. Subject to satisfactory student progress, support covers tuition and a living stipend based on the median level for all participating programs. Support in subsequent years is provided by the faculty member or program in which the student pursues the Ph.D. CAM applicants are strongly urged to make early application for outside awards such as those available from the National Science Foundation and Howard Hughes Medical Institute, both of which have November 1991 application deadlines.

Entry to the CAM program is likely to be highly competitive as only about twelve students are admitted each year. CAM represents a unique opportunity to choose from and to experience the diversity of research at Stanford, with the ultimate goal of pursuing the Ph.D. degree in a department or program which is of manageable and comfortable size.

**BIOCHEMISTRY**

*Emeritus: (Professor) Arthur Kornberg*

*Chairman: Robert L. Baldwin*


*Associate Professor: Douglas L. Brutlag*

*Assistant Professors: Patrick O. Brown, Robert S. Fuller, Mark A. Krasnow, Suzanne R. Pfeffer*

The Department of Biochemistry is part of the graduate division of the University and a department of the School of Medicine. Departmental offices and laboratories are located in the Beckman Center for Molecular and Genetic Medicine at 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. Biochemistry 202 is designed for medical students and can be taken in lieu of 201. Students who elect to enroll in either of the above courses should have a good background in general and organic chemistry, and in cell biology, equivalent to the core series offered by the Department of Biological Sciences.

Advanced courses in more specialized areas are offered 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 replication and recombination, the biochemistry of bacterial and animal viruses, the molecular basis of morphogenesis, and the structure and function of both eukaryotic and prokaryotic chromosomes.

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, protein and nucleic acid purification, synthesis 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, yeast, and Drosophila.

**GRADUATE PROGRAM**

**DOCTOR OF PHILOSOPHY**

The Department of Biochemistry offers a Ph.D. program which begins in the Autumn Quarter of each year. The program of study is designed to prepare students 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 complete 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 student curricular and research programs. All Ph.D. students are expected to participate actively in the departmental seminar program and journal club, and students are encouraged 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.

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.
The Departments of Cell Biology and Biochemistry have a joint admissions program. Prospective students may apply to either department. Students who are admitted have the option of gaining research experience through laboratory rotations in both departments. The eventual choice of a research advisor determines the department from which the Ph.D. degree is earned. 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, and analytical, organic, inorganic, and physical chemistry. The department is especially interested in those applicants who have research experience in biology or chemistry. Students must submit an application, including transcripts and letters of recommendation, by January 1.

Applications are available from the department beginning September 1. Applicants are notified by April 1 of decisions on their applications. Stanford University requires scores from the Graduate Record Examination (verbal, quantitative, and analytical), and in addition applicants must submit scores from the GRE Subject Test in either biology or chemistry. Students are strongly encouraged to take the October GRE exam.

All applicants are urged to compete for non-Stanford fellowships or scholarships, and American citizens should complete an application for a National Science Foundation and a Howard Hughes Medical Institute Predoctoral Traineeship. Students are provided with financial support to cover normal living expenses. In addition, Stanford tuition costs are paid by the department.

All applicants for admission to the department are 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; 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—Structure and function of biochemical molecules, enzyme kinetics and mechanisms, bioenergetics, pathways of intermediary metabolism and their control, and membrane structure and function. Lectures on special topics. Prerequisites: organic chemistry, cell biology.

5 units, Win (Fuller, Kaiser, Kornberg, Lehman, Pfeffer) MTWThF 11

201. Advanced Molecular Biology—Lectures on rapidly developing frontiers in polynucleotide metabolism and its control, chromosome structure and function, transcription and translation, hormone action, and virus biochemistry. Prerequisites: 200 and an understanding of basic molecular biology.

5 units, Spr (Baldwin, Berg, Brown, Brutlag, Davis, Fuller, Hogness, Krasnow, Lehman) MTWThF 11

202. Genes and Genomes—Structure and function of genetic DNA and RNA molecules, methodologies for molecular genetic analysis, maintenance of genomes, regulated gene expression and comparative genetic strategies in development of yeast, Drosophila, nematodes and mice genes and genomes. Three lectures and one optional discussion period per week. Enrollment limited to medical students or by consent of instructors. Prerequisite: 200 or equivalent.

4 units, Spr (Berg, Krasnow, Lehman)

210. Advanced Topics in Membrane Biochemistry—Structure, function and biosynthesis of cellular membranes and organelles. Based on current literature, with extensive student participation. Prerequisites: 200, 201, or equivalents, and consent of instructor.

4 units (Pfeffer) not given 1990-91

211. Development in Microorganisms—(Same as Developmental Biology 211) Studies cell differentiation and multicellular development. They are attractive subjects for molecular studies of the regulation of development because they can be manipulated easily by genetic and biochemical techniques, can be handled in large numbers, and because their genomes are relatively small. Topics: morphogenesis of virus particles, asymmetric cell division in Caulobacter, spore formation in Bacillus, heterocyst differentiation in Anaibaena, cell-cell communication in Vibrio and Saccharomyces, and multicellular development in Myxococcus and Dictyostelium. Lectures, discussions, readings in current literature.

3 units, Spr (Kaiser, Shapiro)
212. **Cellular and Molecular Biology of Yeast**—The application of sophisticated methods of molecular and genetic analysis for studying the unicellular eukaryote, *Saccharomyces cerevisiae* (baker’s yeast), as a model system for basic problems in eukaryotic, cellular, and molecular biology. Topics: differentiation of cell type, regulation of the cell cycle, replication, recombination and segregation of the genome, regulation of gene expression, biogenesis and function of the cytoskeleton, organelle biogenesis, protein transport and secretion, and membrane receptors and signal transduction. Lectures and a preview of pertinent literature with extensive student participation. Prerequisites: 200 and 201 (or equivalent), and consent of the instructors.

3 units, (Davis, Fuller) not given 1990-91

213. **Developmental and Molecular Genetics of Drosophila**—Molecular and genetic analyses of the *Drosophila melanogaster* genome and how that genome controls the development of *Drosophila*. Prerequisites: 200 and 201, and Biology 166 and 167 (or equivalent).

3 units, Spr (Hogness, Krasnow) by arrangement

214. **Physical Biochemistry**—Physical chemistry of proteins, nucleic acids, and their complexes. Topics vary and have included molecular mechanisms of protein folding and protein-nucleic acid recognition. Current papers in the literature discussed. Prerequisites: 200 and 201 (or equivalent), and a first-year course in physical chemistry.

3 units (Baldwin) by arrangement

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) by arrangement

218. **Computer Applications in Molecular Biology**—(Same as Medical Information Sciences 231.) Reviews/evaluates current computer methods used in molecular biology including access to various biological sequence and structure databases and analyses of the data. Topics: GenBank and other DNA databanks, protein sequence and structure databases, restriction maps, restriction enzyme sequence alignment and database search, multiple sequence alignment, phylogenies, pattern finding, pattern matching, secondary structure prediction and physical mapping of DNA. Theoretical and practical component. Algorithm is analyzed for its strengths and weaknesses and compared with other algorithms. Future directions in algorithm improvement. Enrollment limited to 40; consent of instructor.

3 units, Aut (Brutlag)

221. **The Teaching of Biochemistry**—To be taken by all teaching assistants in 200, 201, or 217. Emphasizes practical experience in teaching on a one-to-one basis, and problem set design and analysis. Familiarization with current lecture and text material expected, along with evaluations of class papers and examinations. Prerequisite: enrollment in the Biochemistry Ph.D. program.

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

294. **DNA Repair, Recombination, and Replication**—Enzymes and molecular mechanisms and how some physiological aspects of DNA transactions may be explained at the molecular level. Prerequisites: 200 and 201.

2 units (Kornberg, Lehman) not given 1990-91

299. **Research.**

1-15 units, any quarter (Staff) by arrangement

399. **Research and Special Advanced Work**—Prerequisite: consent of instructor. Register by section numbers by arrangement with faculty.

1-18 units, any quarter

---

**CELL BIOLOGY**

Chairman: Roger D. Kornberg

Professors: Roger D. Kornberg, Michael Levitt, David B. McKay, James A. Spudich, Lubert Stryer

Associate Professor: Peter Parham

Senior Lecturer: Patricia Cross

The department offers opportunities for coursework and research in cell biology. Courses fall in two categories: (1) a series of one-quarter courses that treat special topics of current interest in cell biology at an advanced level; and (2) Structure of Cells and Tissues, a one-quarter course tailored to the needs of medical students that includes both lectures on structure-function relationships of mammalian cells and tissues, and a laboratory on medical histology.

The emphasis of research in the department is on understanding fundamental cellular processes in terms of the structure and function of organelles and molecular assemblies. Techniques used include standard methods of biochemistry, genetic engineering, and cell culture, as well as image processing and three-dimensional reconstruction from electron micrographs, x-ray and electron diffraction, fluorescence mi-
microscopy, nanosecond fluorescence spectroscopy, and microinjection of cells and nuclei. The department owns and operates a computing center equipped with the most advanced time-sharing and color graphics systems for data analysis and molecular modeling.

The graduate program in Cell Biology leads to the Ph.D. degree. The department also participates in the Medical Scientists Training Program in which individuals are candidates for both the Ph.D. and M.D. degrees.

The graduate program is intended to prepare students for careers as independent investigators in cell and molecular biology. The principal requirement of a Ph.D. degree is the completion of research constituting an original and significant contribution to the advancement of knowledge. In addition, students are required to enroll in the series of special topics courses taught by the faculty of the department. Finally, students gain teaching experience by assisting in the one-quarter courses offered by all faculty in the department.

Applicants to the program should have a bachelor’s degree and should have completed at least a year of coursework in mathematics, physics, organic chemistry, physical chemistry, and biology. Application forms must be received by the department before January 1 for notification by April 15. Application to the National Science Foundation for fellowship support is also encouraged. Remission of fees and a personal stipend are available to graduate students in the department. Prospective applicants should write to the Department of Cell Biology for further information.

Current topics of research in the department lie in the areas of gene expression and molecular genetic analysis of protein structure, cell motility, signal transduction, and cell-cell interaction. Coursework and laboratory instruction in the Department of Cell Biology conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.

COURSES

211. Structure of Cells and Tissues—The structural organization of tissues in relation to their function. Topics: light and electron microscopy, epithelia, muscle, connective tissue, bone and cartilage, blood, cardiovascular system, lymphoid tissue, nervous tissue, skin, endocrine, exocrine, gastrointestinal, respiratory, urinary, female and male genital systems, and the ear and eye. Three lectures, two laboratories, and one review session per week.

222. Signal Transduction Mechanisms—Molecular mechanisms of transduction of sensory and hormonal stimuli by prokaryotes and eukaryotes. Topics: bacterial chemotaxis and phototaxis; vision in invertebrates and vertebrates; olfaction; and hormonal actions mediated by G-proteins e.g., adenylate cyclase and the phosphoinositide cascade; molecular evolution of transducing proteins. The structure and interplay of receptors, enzymes, and ion channels mediating these processes. Experimental approaches include gene cloning and site-specific mutagenesis, isolation and reconstitution of functional transducing assemblies, and patch clamping and other electrophysiological methods. Recurring motifs of excitation and adaptation, and transduction and their evolution are emphasized.

3 units (Stryer) not given 1990-91

225. Molecular Motors and the Cytoskeleton—(Same as Developmental Biology 225.) The molecular basis of energy transduction that leads to movements generated by microfilament-based and microtubule-based motors. Molecular motors include forms of myosin, dynein, and kinesin. Structure of the molecular motors and their accessory proteins. Regulation of the function of motile assemblies. Functions of molecular motors in cells. Spatial and temporal controls on the formation of motile assemblies in cells. Experimental approaches: genetic analysis, DNA cloning and expression, reconstitution of functional assemblies from purified proteins, x-ray diffraction, three-dimensional reconstruction of electron microscope images, spectroscopic methods, and high-resolution light microscopy. Focuses on how a complex cellular process is analyzed at the molecular level by a multifaceted approach using biochemical, biophysical, and genetic techniques. Prerequisites: knowledge of basic biochemistry and cell biology.

3 units (Spudich) not given 1990-91

228. Protein and Nucleic Acid Structure, Dynamics, and Engineering—The availability of three-dimensional atomic structures of proteins and nucleic acids allows interpretation of biological processes based on the physical and chemical properties of these molecules. Crystallographic studies: structural themes exemplified by local chain conformation, secondary structure, domains, families of folds, protein folding and thermodynamic stability. How these structures move is considered by combining results of experiment with theoretical molecular dynamics simulations. Enzyme catalysis is described in these terms. How these structures can be changed to engineer novel molecules from the experimental and predictive aspects; use of interactive computer graphics programs
to illustrate problems. Systems include protein-nucleic acid complexes and antibody-antigen interactions. Prerequisite: knowledge of basic biochemistry and cell biology.

3 units, Win (Levitt)

229. The Eukaryote Chromosome—Principles of chromosome structure and function. Topics: structure, dynamics, and topological forms of DNA; units and hierarchies of DNA coiling in chromosomes; centromeres, telomeres, and the basis of chromosome maintenance and sorting in mitosis; the mechanism of gene activation, with regard to enhancer, promoter, and terminator sequences; basis of sequence-specific protein-DNA interaction; organization and assembly of the cell nucleus. Prerequisite: knowledge of basic biochemistry and cell biology.

3 units, Aut (Kornberg) TTh

232. Macromolecular Structure: Diffraction Methods and Diffraction Results—General methods and accomplishments of x-ray crystallography and solution scattering. Methodology topics: small-angle scattering, fiber diffraction, and x-ray crystallography at a level that makes current literature in the field understandable to the non-practitioner. Protein folding patterns, enzymology, receptor-effector systems, proteins of the immune system, and membrane proteins. Prerequisite: knowledge of basic biochemistry.

3 units, (McKay) not given 1990-91

233. Antigen Presentation: Critique and Commentary—(Same as Immunology 211.) For experienced graduate students. Current research in antigen presentation to T lymphocytes focusing on genetics and function of the major histocompatibility complex. Critical review of journal articles, the synthesis of knowledge in related fields and on the directions for future research. Student preparation of written critiques and reviews and their oral presentation. Enrollment limited to 9. Prerequisite: basic knowledge of immunology.

3 units, Spr (Parham)

260. Supervised Study—Research or advanced tutorial for undergraduates.
1-18 units, any quarter (Staff)

299. Directed Reading.
1-18 units, any quarter (Staff)

399. Individual Research.
1-18 units, any quarter (Staff)
in Teaching Activities as stated in the back of this catalog.

**COURSES**

210. Developmental Biology—Goal: to discover unifying themes in how organismic complexity is generated during embryonic and post-embryonic development. The roles of genetic hierarchies, induction events, cell lineage, maternal inheritance, cell-cell communication, and hormonal control in developmental processes in well-studied organisms (mammals, insects, and nematodes). Aquaints graduate students and advanced undergraduates with important current developmental biology. Small groups of students and faculty discuss current papers in depth, augmenting lectures. Team taught by department faculty. Undergraduate prerequisite: consent of instructor. Recommended: familiarity with basic techniques and experimental rationales of molecular biology, biochemistry, and genetics.

5 units, Win (Scott) MWF 9-11

211. Microbial Developmental Biology—(Same as Biochemistry 211.) Microorganisms exhibit fundamental processes of development: cell differentiation, morphogenesis and multicellular development. Spatial and temporal control of gene expression is studied in these organisms because of the ease with which genetic and biochemical techniques can be applied to them, because they can be handled in large numbers, and because their genomes are small enough to be saturated with mutations. Topics: regulation of cell differentiation, morphogenesis, asymmetric cell divisions and cell-cell interactions in both prokaryotic and eukaryotic microbes.

2 units, Spr (Kaiser, Shapiro) TTh 10-11 given every 3rd year

215. Frontiers in Developmental Biology—Seminar series presents the latest advances in understanding the genetic control of development. Distinguished scientists present research at a seminar every other week and review future directions for research. Background material is presented by reviewing relevant scientific papers. Topics: developmental genetics in *Drosophila* and *C. elegans*, early development in the mouse, muscle development, neural development, microbial and fungal development, and the function of the immune system.

1 unit, Aut, Win, Spr (Shapiro)
T 5-6, W 4-6

225. Molecular Motor Proteins and the Cytoskeleton—(Same as Cell Biology 225.) The molecular basis of energy transduction that leads to movements generated by microfilament-based and microtubule-based motors. Molecular motors include forms of myosin, dynein, and kinesin. Structure of the molecular motors and their accessory proteins. Regulation of the function of motile assemblies. Functions of molecular motors in cells. Spatial and temporal controls on the formation of motile assemblies in cells. Experimental approaches: genetic analysis, DNA cloning and expression, reconstitution of functional assemblies from purified proteins, x-ray diffraction, three-dimensional reconstruction of electron microscope images, spectroscopic methods, and high-resolution light microscopy. Focuses on how a complex cellular process is analyzed at the molecular level by a multifaceted approach using biochemical, biophysical, and genetic techniques. Prerequisites: knowledge of basic biochemistry and cell biology.

3 units (Spudich) given every 3rd year, not given 1990-91

399. Research—Must register by section numbers.

1-18 units, any quarter (Staff) by arrangement

---

**DIAGNOSTIC RADIOLOGY AND NUCLEAR MEDICINE**

Emeriti: (Professors) Norman Blank, Henry H. Jones, Frederic N. Silverman

Chairman: Gary M. Glazer


Associate Professors: Dieter R. Enzmann, Robert J. Herfkens, Barton Lane, Norbert J. Pelc, F. Graham Sommer, Stuart W. Young, Gerhard Wittich

Assistant Professors: Ann C. Bjorkengren, Robert L. De La Paz, John Drace, Elvira V. Lang, Sheila Moore, Matilde Nino-Murica, George Segall, Ralph L. Smathers

Associate Professor (Research): Tien-Wen Weidmann

Professors of Radiology (Clinical): William H. Marshall, Jr., Bruce R. Parker

Associate Professor of Radiology (Clinical): Barton Lane

Acting Professor: R. Brooke Jeffrey, Jr.

Acting Assistant Professors: Colleen Bergin, Kiran Jain, Michael Marks
Although the Department of Diagnostic Radiology and Nuclear Medicine 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 advisees for study and research. Undergraduate students may also arrange individual research projects under the supervision of the department's faculty.

This discipline focuses on the use of radiation, ultrasound, and magnetic resonance as diagnostic, therapeutic, and research tools. The fundamental and applied research within the department reflects this broad spectrum as it relates to anatomy, pathology, physiology, and interventional procedures. Original research and development of new clinical applications in medical imaging is supported within the Radiological Sciences Laboratory.

Courses open to undergraduate and postgraduate students are listed below.

**COURSES**

101. Selected Readings in Radiology Research.
   Aut, Win, Spr (Staff) by arrangement

208. Experimental Nuclear Medicine—Computer applications in medicine, particularly use of radioisotopes as tracers. Recommended: some knowledge of physiology and calculus.
   Spr (Goris) by arrangement

299. Research.
   any quarter (Staff) by arrangement

**GENETICS**

Chairman: David Botstein
Associate Professors: Michele P. Calos, Huntington F. Willard
Professor (Research): Leonore A. Hezenberg

**GRADUATE PROGRAMS**

The Department of Genetics offers programs of study and broadly based research training in genetics and related fields of molecular, cellular, and developmental biology leading to the Ph.D. degree. In addition, a limited number of M.D. candidates can combine research training in the department with their medical studies.

The training program is designed as preparation for a career in biomedical research and teaching. It provides students with the conceptual and experimental tools required by modern geneticists to approach biomedical problems of fundamental or clinical importance. Former trainees currently hold positions at leading universities and research institutions around the world and in a variety of private industries.

Although the program provides formal coursework as well as informal seminars and lectures, the emphasis is on laboratory research involving close interaction between each student and his or her faculty advisor. At the same time, the program is designed to prepare the student for a career as an independent scientist. The principal subject areas for research training include molecular and cellular genetics, developmental genetics, biochemical genetics, population genetics, medical genetics, and immunogenetics. There are also opportunities for the application of advanced instrumentation and extensive computer capabilities to certain specialized research problems, including cell detection and sorting, and aspects of human biochemical and population genetics. Interdisciplinary programs can be arranged with the faculty of other departments in the Medical Center in clinical genetics, pharmacogenetics, prenatal diagnosis, development, and immunology.

Ordinarily, students select areas of research specialization after they have explored the various scientific opportunities available in the department by rotation through the laboratories of some of the faculty. Study for the Ph.D. involves four to five years of graduate work, most of which is spent on the students' dissertation research. 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. Commonly, a formal dissertation proposal is submitted by the student following a qualifying examination given in the second year of study. Student progress is followed by a faculty preceptor and an advisory committee.

A grant from the U.S. National Institute of Health provides major support for the graduate training program in the department. Students who are U.S. citizens or permanent residents are eligible to receive support from this source. Other student support can be provided by departmental funds and research grants awarded to individual faculty. Information about individual fellowship support can be obtained from the Fellowship Office, National Research Council, 2101 Constitution Avenue N.W., Washington, D.C. 20418, and prospective students are encouraged to apply for such support.

For basic University requirements for the Ph.D. degree, see the "Degrees" section of this bulletin.
COURSES

For further information on the availability of courses, consult the quarterly Time Schedule, or inquire at the department office. Additional courses in or related to genetics are included in the listings of the Departments of Biological Sciences, Biochemistry, Cell Biology, and Microbiology and Immunology.

201. Human Genetics—Theoretical and experimental basis for modern genetics emphasizing examples from humans where appropriate. Lectures/reading in all aspects of genetics, including molecular, chromosomal, cellular, developmental, population, and medical genetics emphasizing the latter. Prerequisites: knowledge of biochemistry and basic genetics.

201.4 units, Spr (Botstein, Calos, Cavalli-Sforza, Cohen, Francke, Canean, Herzenberg, Willard) MWF 9 Th 10


3 units (Cavalli-Sforza) alternate years, not given 1991-92

209. Genetics of Vision and Vision Disorders—Background information about the developmental biology of the eye, the physiology of vision, and the biology of vision disorders that have a genetic basis. Examples of genetically-related research problems involving study of vision and/or vision disorders.

1 unit, Spr (Cohen)

249. Advanced Genetics—For graduate, medical, and advanced undergraduate students with good knowledge of biochemistry, biology, and genetics. Topics: genetic regulation and biochemistry of DNA replication in pro-and eukaryotes; gene rearrangements and novel mode of expressions in certain organisms; advances in genetics and biochemistry of cell division; applications of modern technology to problems of third and developing countries.

3 units, Aut (Ganesan) alternate years, not given 1991-92

260. Supervised Study—Prerequisite: consent of instructor.

any quarter (Staff) by arrangement

HEALTH RESEARCH AND POLICY

Emeriti: (Professors) Rodney R. Beard, John P. Bunker
Chairman: Byron Wm. Brown, Jr.
Director of Master’s Program: Mark A. Hlatky
Associate Professors: Mark A. Hlatky, Iain M. Johnstone
Senior Lecturer: Ernie Young (Chaplaincy Service)
Lecturers: Irene S. Corso (Spanish and Portuguese), Carole R. Price (Stanford University Hospital), Marilyn Winkleby (Medicine)
Participating Faculty: Kenneth D. Bloem (Stanford University Hospital), Alain C. Enthoven (Graduate School of Business), Stephen P. Fortmann (Medicine), James F. Fries (Medicine), Alan M. Garber (Medicine), Peter Gregory (Medicine), Halsted R. Holman (Medicine), David Hopkins (Stanford University Hospital), Rudolf H. Moos (Psychiatry), W. Richard Scott (Sociology), Edward H. Shortliffe (Computer Science and Medicine), Amos Tversky (Psychology)

The Department of Health Research and Policy has three divisions:

1. Biostatistics deals with scientific methodology in the medical sciences, emphasizing the use of statistical techniques.

2. Epidemiology provides training and experience in the application of epidemiologic methods to the study of diseases of unknown etiology. It is concerned also with problems of health and disease in human populations in all parts of the world and with efforts toward improving levels of health.

3. Health Services Research is concerned with many aspects of health policy analysis in the public and private sectors.
The department, and each division, offers courses in its areas of specialization. These are listed in the current Stanford University School of Medicine bulletin.

Coursework and instruction in the Department of Health Research and Policy conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this bulletin.

**MASTER OF SCIENCE PROGRAM**

The master's degree program in Health Services Research (M.S. in H.S.R.) 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.

Medical students who intend to pursue careers involving administration may wish to consider coursework in the Graduate School of Business.

Applications are 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.

2. Graduate students in 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.


Students already admitted to a degree program who wish to be admitted to the M.S. in H.S.R. program must submit a Graduate Program Authorization Petition, available from the Department of Health Research and Policy in the School of Medicine.

To receive the degree of M.S. in H.S.R., 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 H.S.R. degree. The remaining 9 units may be double-counted to meet other degree requirements.

For additional information, address inquiries to the Program Administrator, Department of Health Research and Policy, School of Medicine, Stanford University, Stanford, California 94305.

**COURSES**

220. Social Controversy and Policy Analysis in Medicine—(Same as Human Biology 40.) Goals: to understand the role and limits of health care and prevention in achieving and maintaining health; develop a working knowledge of the organization, financing, and regulation of health care in the U.S.; plan and carry out analyses of problems in health policy, and assess the validity of analyses carried out by others; and to understand the logical basis of clinical decision-making (especially under uncertainty), and the resulting implications for policy.

4 units, Spr (Staff) MWF 11

256. Economics of Health and Medical Care—(Same as Economics 156/256; graduate students enroll in 256.) Empirical, institutional, and theoretical analysis of problems of health and medical care. Topics: measurement, valuation, and determinants of health; physicians, hospitals, and the drug industry; financing and organization of medical care; public policy issues. Open to graduate students and undergraduates (juniors, seniors) with training in microeconomics and some background in statistics or mathematics. Prerequisite: Economics 51 or permission of instructor.

5 units, Spr (Fuchs)

270. International Health—Discussion on world distribution of selected diseases and health problems; international organizations and control programs; environmental, social, and economic factors in relation to health, particularly in developing countries; and comparative health care systems in poor and wealthy countries. Also, preparation for work and experience abroad. Prerequisite: consent of instructor.

2-4 units, Spr (Basch) Th 1:15-3:05

279. Management of Hospitals and Other Health Care Institutions—Administrative aspects of health care institutions. Organizational elements of hospitals, administration, financial issues and problems, hospital departmental relationships, quality of patient care, principal external pressures (governmental and nongov-
ernmental), consumerism, and community influence.

3 units, Win (Gibson) Th 3:15-6:05

283. Core Seminar—Presentation of thesis research in progress. Open to H.S.R. masters candidates only.
1 unit, Aut, Win, Spr (Hlatky)
alternate M 4:15-5:30

284. Research Seminar—Invited guests present current research. Credit available to H.S.R. masters candidates only.
1 unit, Aut, Win, Spr (Hlatky)
alternate M 3:30-5:30

391. Political Economy of Health Care—(Same as Business 431.) The financial and public policy context in which the health care system operates, and the issues in public policy controlling it in the public expenditure. Issues: financing and organization for delivery of health care in the U.S., 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. Not open to undergraduates.
4 units, Aut (Enthoven) MF 8-10

392. Cost-Benefit Analysis in Health Care—(Same as Business 432.) How do you do cost-benefit analysis when the “output” is difficult or impossible to measure? Study and discussion of the main literature on the principles of cost-benefit analysis applied to health care. A critical review of actual studies. Emphasis on insights into the art of practical application. Not open to undergraduates.
4 units, Spr (Enthoven) MF 8-10

Participating Faculty by Department:
Opportunities for research are not limited to the specific faculty and departments listed.

Anesthesia: David M. Gaba (Assistant Professor), Allen K. Ream (Associate Professor)

Biochemistry: Douglas L. Bruttlag (Associate Professor)

Business, School of: Alain C. Enthoven (Professor)

Computer Science: Thomas O. Binford (Professor), Edward A. Feigenbaum (Professor), Michael L. Genesereth (Associate Professor), Mark A. Musen (Assistant Professor), Edward H. Shortliffe (Professor)

Economics: Victor R. Fuchs (Professor)

Education, School of: Lee S. Shulman (Professor), Richard E. Snow (Professor)

Electrical Engineering: Albert Macovski (Professor), Gio Wiederhold (Professor)

Engineering-Economic Systems: Samuel Holtzman (Consulting Assistant Professor), Ronald A. Howard (Professor), Ross D. Shachter (Assistant Professor), Edison Tse (Associate Professor)

Genetics: Stanley N. Cohen (Professor)

Health Research and Policy: Byron W. Brown Jr. (Professor), John P. Bunker (Professor), Alan M. Garber (Assistant Professor), Mark A. Hlatky (Associate Professor)

Medicine: Terrance Blaschke (Associate Professor), Robert W. Carlson (Assistant Professor), Gregory F. Cooper (Senior Research Associate), Lawrence M. Fagan (Senior Research Associate), James F. Fries (Associate Professor), Alan M. Garber (Assistant Professor), Mark A. Musen (Assistant Professor), Richard L. Popp (Professor), Edward H. Shortliffe (Professor)

Obstetrics and Gynecology: Emmet J. Lamb (Professor)

Pathology: Howard H. Sussman (Professor)

Psychology: Amos N. Tversky (Professor)

Radiology: Dieter Enzmann (Associate Professor), Gary M. Glazer (Professor), Leslie M. Zatz (Professor)

Statistics and Biostatistics: Byron W. Brown Jr. (Professor)

Surgery: Michael Eliastam (Associate Professor), Adam Seiver (Clinical Instructor)

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 (medical informatics).

Stanford University’s extensive computing facilities are described in the “Computer Science” section in this bulletin. In addition, the
Medical Information Sciences Program has a network of Macintosh, PS/2, NeXT and SUN workstations. These machines are available for coursework and research projects by trainees in the program.

GRADUATE PROGRAMS

The Medical Information Sciences Program is interdepartmental and offers instruction and research opportunities leading to M.S. and Ph. D. degrees in Medical Information Sciences (M.I.S.). All students are required to complete the core curriculum requirements outlined below. Students who fail to maintain a 3.0 letter grade indicator in a category of the core curriculum are expected to pass a comprehensive exam in that area before the graduate degree is 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 master’s degrees are intended as terminal professional degrees.

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 justified in writing and approved by the student’s M.I.S. advisor and the chairman of the M.I.S. Committee. It should be noted, however, that the program is intended to provide flexibility and to complement other opportunities in applied medical research that exist at Stanford (e.g., the Program on Engineering in Biology and Medicines and the Graduate Division Special Programs). Although most students are 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 University.

CORE CURRICULUM

All students are expected to participate regularly in the M.I.S. Journal Club (201) and Colloquia (200). In addition, all students are expected to fulfill requirements in the following 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 are Clinical Diagnosis (M.I.S. 202) and Introduction to Clinical Environments (M.I.S. 205)

2. Computer Science (11 units): The student is expected to acquire a knowledge of the use of computers, computer organization, programming, and symbolic systems. It is assumed that students have had prior computing experience at least equivalent to Computer Science (C.S.) 109A, B. All students are required to take a minimum of 11 units of courses in the Computer Science Department. If similar courses have not been taken previously, these units must be C.S. 110, 161, and 221. With the exception of C.S. 110, all other courses applied to the degree requirements must be numbered 137 or higher.

3. Decision Making (10-12 units): Students are expected to learn basic probability theory, Bayesian statistics, decision analysis techniques, and experimental design techniques. It is assumed that students have taken a prior course in statistics at least equivalent to Statistics 60. Required courses are Psychology 252 (Statistical Analysis of Data); Statistics 116 (Theory of Probability) or Engineering-Economic Systems (E.E.S.) 221 (Probabilistic Analysis); and E.E.S. 231 (Decision Analysis).

4. Medical Computer Science (9 units): All students are expected to acquire a general knowledge of the state-of-the-art and future frontiers for medical computer science. Required courses are M.I.S. 210 (Computer Applications in Medicine), 21A (Computer-Assisted Medical Decision Making), and 21B (Project Course).

5. Health Policy/Social Issues (5-7 units): Candidates are expected to be familiar with key issues regarding public health policy, financing, ethics, and legal topics. Students are expected to take Health Research and Policy (H.R.P.) 200 (Health and Society). A second course may be selected from among H.R.P. 220/Human Biology 40 (Social Controversy and Policy Analysis in Medicine), Symbolic Systems 100 (Computers and Ethics), H.R.P. 392 (Cost-Benefit Analysis in Health Care), or any other advanced course in Health Policy/Social Issues proposed by the student and approved by the MIS advisor.

Note that the core curriculum generally entails a minimum of 42 units of coursework but can require substantially more or less depending upon the courses selected and the previous training of the student. The varying backgrounds of students are well recognized and no one is required to take courses in an area in which he or she has already been adequately trained; under such circumstances, students are permitted to skip courses or substitute more ad-
advanced work. Students design appropriate programs for their interests with the assistance and approval of their MIS advisor.

MASTER OF SCIENCE

This degree is designed for individuals who wish to undertake in-depth study of medical informatics. The University's basic requirements for the master's degree are discussed in the "Degrees" section in this bulletin. Normally a student spends two years in the program and will implement and document a substantial project during the second year. The first year involves acquiring the fundamental concepts and tools through coursework and research project involvement. Graduates of this program are prepared to contribute creatively to basic or applied projects in medical information science.

PROGRAM REQUIREMENTS

Programs of at least 54 units that meet the following guidelines are normally approved:
1. Completion of the core curriculum.
2. A minimum of 9 additional units composed of courses in Computer Science numbered 137 or higher, courses in Engineering-Economic Systems or Operations Research or Statistics numbered greater than 200, or one of Psychology 256 or 260.
3. Electives: Additional courses to bring total to 54 or more units.

MASTER OF SCIENCE (SPECIAL PROGRAM)

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 are 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 are permitted to complete the program in no less than four quarters. Students in this program are 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 effectively in collaborative research projects.

DOCTOR OF PHILOSOPHY

Individuals wishing to prepare themselves for careers as independent researchers in medical information science should apply for admission to the doctoral program. 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 M.I.S. 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 master's program. In addition, doctoral candidates are expected to complete two additional courses totaling at least 6 additional units of advanced coursework (see categories under (2) of the master's program requirements). The master's requirements, including the oral examination, should be completed by the end of the second year in the program (six quarters of study, excluding summers). Doctoral students are generally advanced to Ph.D. candidacy after completing the oral examination. A student's advisor has primary responsibility for the adequacy of the program, which is regularly reviewed by the Graduate Study Committee of the M.I.S. program.
2. To remain in the Ph.D. program, each student must attain a letter grade indicator (LGI) as outlined from the master's 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 an LGI of 3.0. The student must fulfill these requirements and apply for admission to candidacy for the Ph.D. by the end of six quarters of study (excluding summers).
3. By the end of nine quarters (excluding summers), each student must orally present a thesis proposal to a dissertation committee that generally includes at least one member of the Graduate Study Committee of the M.I.S. Program. The committee determines whether the student's general knowledge of the field, 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 2 units of teaching assistant service in M.I.S. courses, 1 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 dissertation 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 M.I.S. Program faculty.

6. No oral examination is required upon completion of the dissertation. The oral defense of the dissertation proposal satisfies the University oral examination requirement.

7. The student is expected to demonstrate an ability to present scholarly material orally and presents 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 is required to write a paper suitable for publication, usually discussing 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 is 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.

**COURSES**

200. Medical Information Sciences Colloquium—Series of colloquia, offered by program faculty, students, and occasional guest lecturers. Credit available only to students in an M.I.S. degree program. (May be taken no more than three times for credit.)

1 unit, Aut, Win, Spr, Th 2-3

201. Medical Information Sciences Journal Club—Journal club for all students and several faculty. Participants report on recent relevant articles from the M.I.S. literature. Credit available only to students in an M.I.S. degree program. (May be taken no more than three times for credit.)

1 unit, Aut, Win, Spr, T 2-3

202. Clinical Diagnosis—Designed for the learning of techniques of interviewing and symptom analysis, through the study of a variety of common and well-defined clinical entities and by role-playing in a problem-solving setting. No final exam. Open only to students in an M.I.S. degree program.

2 units, by arrangement

205. Introduction to Clinical Environments—For students not enrolled in the M.D. program or who do not have an M.D. degree. One half day per week is spent becoming familiar with a variety of clinical settings at Stanford Medical Center and the Veterans Administration Medical Center. Selected faculty introduce assigned students to the medical wards, outpatient clinics, emergency room, operating room, intensive care unit, psychiatry ward, and clinical laboratory. Meeting time is adjusted to suit the student’s class schedule. Open only to students in an M.I.S. degree program.

1 unit, by arrangement

208. Computer-Assisted Literature Searching—(Same as Medicine 225.) The techniques involved in the use of several major online databases relevant to clinical medicine. MEDLINE, CANCERLIT, and TOXLINE are emphasized. Meets training requirement for access to the National Library of Medicine’s system. Students may receive own passwords upon successful completion. Open only to medical students and graduate students in the School of Medicine.

1 unit, Aut, Spr (Lenon) by arrangement

210. Computer Applications in Medicine—(Same as Computer Science 270.) Medical computer science activities in research and applied environments. Topics: office systems, hospital information systems, medical databases, laboratory systems, image analysis, EKG analysis, history taking, library systems, multiphasic health testing, medical computer-aided instruction, decision support systems.

3 units, Aut (Fagan, Shortliffe) TTh 3:15-4:30

211A. Computer-Assisted Medical Decision Making—(Same as Computer Science 271A.) Medical decision making techniques and methods for their implementation in decision support systems. Bayesian statistics, decision analysis, and artificial intelligence (expert systems).

3 units, Win (Shortliffe) TTh 3:15-4:30

211B. Computer-Assisted Medical Decision Making—(Same as Computer Science 271B.) For students who have completed 211A and wish to implement some of those ideas in a computer project. Computer programming required in most projects. Prerequisite: 211A.

3 units, Spr (Fagan, Musen, Shortliffe) TTh 3:15-4:30

228. Influence Diagrams and Probabilistic Networks—(Same as Engineering-Economic Systems 228.) Theory of networks as representations for decision analysis and probabilistic inference: influence diagrams, belief networks,

3 units, Win (Shachter) TTh 12:30-1:45

229. Seminar on Expert-Systems Research—(Same as Computer Science 524.) For graduate students. Historical perspective and technical understanding of research in knowledge-based systems. Classic work from the 1970s and 80s compared with current investigation in the areas of knowledge acquisition, knowledge representation, user interfaces, and control of inference. Prerequisite: Computer Science 221 or equivalent. Enrollment limited to 20.

2 units, Spr (Musen, Shortliffe) M 3:30-5 alternate years, not given 1991-92

231. Computer Applications in Molecular Biology—(Same as Biochemistry 218.) Reviews/evaluates current computer methods used in molecular biology including access to various biological sequence and structure databases and analyses of the data. Topics: GenBank and other DNA databanks, protein sequence and structure databases, restriction maps, restriction enzyme sequence alignment and database search, multiple sequence alignment, phylogenies, pattern finding, pattern matching, secondary structure prediction and physical mapping of DNA. Theoretical and practical component. Algorithm is analyzed for it's strengths and weaknesses and compared with other algorithms. Future directions in algorithm improvement. Enrollment limited to 40; consent of instructor.

3 units, Aut (Brutlag)

299. Directed Reading and Research—For students wishing to receive credit for directed reading or research time.

any quarter, by arrangement
GRADUATE PROGRAM
MASTER OF SCIENCE

The department does not offer a regular M.S. program, but the degree is awarded under special circumstances. Candidates for master's degrees are 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 is also 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, including some experience in biochemistry, molecular biology, and chemistry. Formal application should be made through the Graduate Admissions Office, which submits completed applications to the department. Deadline for receipt of applications with all supporting materials is December 15.

Applicants must file a report of scores on the general tests and the subject test (normally in biology or molecular biology, or where appropriate in some other subject, e.g., chemistry) of the Graduate Record Examination (GRE). It is strongly recommended that the GRE be taken in October so that scores are available when applications are evaluated.

The policy of the department is that entering predoctoral students be fully supported with a stipend and a waiver of tuition; however, applicants are encouraged to apply for predoctoral fellowships such as those from the National Science Foundation and Howard Hughes Medical Institute.

Program for Graduate Study—The degree of Doctor of Philosophy requires coursework and independent research demonstrating an individual's creative, scholastic, and intellectual abilities. Upon entering the department, students meet with their designated supervisor and together they design the basic timetable for completion of the degree requirements. Typically, this consists of first identifying gaps in the student's undergraduate education and determining which courses should be taken. Then, a tentative plan is made for two required laboratory rotations (each lasting one or two quarters). During graduate study in the department, each student also takes six upper level (200-series) courses, at least three of which should be in this department, the other three of which may be in one of the many departments at Stanford with overlapping interests; e.g., Biochemistry, Biological Sciences, Cell Biology, Chemistry, Computer Science, Developmental Biology, Genetics, Health Research and Policy, and Pathology.

In the Autumn Quarter of the second year, each student takes the written qualifying exams which ensure that a comprehensive understanding of the basic subject areas of microbiology and immunology have been attained. In the Winter Quarter of the second year, an oral exam is taken based on a written research proposal prepared by the student, the subject of which is other than the intended thesis project. This tests the creative intellect of the student. Based on these two exams, the student is admitted to candidacy. Teaching experience and training are part of the graduate curriculum. All graduate students are required to act as teaching assistants for at least two quarters as part of their program.

COURSES

101. Introductory Microbiology—Introduction to basic and medical microbiology: diversity, classical and molecular genetics, growth, bioenergetics, unique metabolic processes, and etiology and pathogenesis of bacterial, viral, and protozoan diseases. Prerequisites: Chemistry 31, 33, and 35. Recommended: Biological Sciences 31.

101A. Laboratory—Introduction to bacterial, viral, and eucaryotic pathogens. Topics on bacterial, viral and protozoan cell structure, physiology and molecular basis of virulence. Corequisite: 101

3-4 units, Aut (Matin, Staff) MTWThF 11 discussion group optional

102. Principles of Immunology—Introduction to immune responses in vertebrates. Also, immune-like reactions in nonvertebrate animals and in plants and bacteria.

3 units, Win (Rosenberg) TTh 1:15

198A-F. Undergraduate Directed Reading—Prerequisite: consent of instructor.

15 units maximum, any quarter (Staff) by arrangement

198A. Microbiology.
198B. Immunology.
198C. Virology.
198D. Bacterial Genetics.
198E. Parasitology.
198F. Microbial Molecular Biology and Physiology.
199. Undergraduate Research—Individual study or research in microbiology by arrangement with a faculty member. Possible fields: microbial molecular biology and physiology, bacterial genetics, microbial pathogenicity, immunology, virology, and molecular parasitology. (Appropriate backgrounds for these various areas are required and must be discussed with individual faculty member.)

1-15 units, any quarter (Staff)

by arrangement

200. Immunology—(Same as Pathology 220.) Immunology as related to medicine is emphasized. Principally for medical and graduate students but may be taken by advanced undergraduates. Prerequisites: basic principles of genetics and introductory courses in biochemistry and histology.

3 units, Spr (Rosenberg, McDevitt, Weissman) MWF 10

200A. Problem Solving in Immunology—(Same as Pathology 220A.) Provides direct experience in understanding immunology, using problems. Each week 3-5 problems are to be corrected and discussed. Corequisite: simultaneous enrollment in 200.

1 unit, Spr (Rosenberg, McDevitt, Weissman) by arrangement

202. Medical Microbiology—Lectures covering the fundamentals of pathogenic microbiology, including bacteria and animal viruses. Also, some aspects of immunology, laboratory diagnosis, and preventive measures. Limited to medical students and graduate students who have the consent of the instructor.

6 units, Aut (Falkow, Greenberg, Mocarski, Schoolnik, Tompkins) TTh 1:15-3:05 F 9-10:50

203. Biological Stress Response—Stress experienced by biological entities takes many forms: heat, radiation, osmotic changes, nutrient dearth, or starvation. Elaborate regulatory mechanisms operate to switch-on special genes to cope with these and other stresses. Many stress proteins appear to have a generalized protective effect; others may be more specialized. Several stress proteins exhibit conservation through vast evolutionary distances. Seminar on regulation and function of stress proteins, including their role in development, teratogenesis, immunity and the pathogenic process, and their potential importance in cancer treatment by hyperthermia. Draws on literature on bacteria, lower eukaryotes, and mammalian cells to illustrate current understanding of different aspects of stress response. Maximum enrollment, 15. Prerequisites: Biological Sciences 31, 32, and 33.

2 units, Spr (Matin, Hahn) TTh 3:30

204. Microbial Genetics—Lecture on the genetics (molecular and classical) of microbes emphasizing *Escherichia coli*. Topics: bacteriophage, plasmids, transposons, gene expression, recombination, and transformation. Basic genetic properties of other bacteria, fungi, and protozoa. Problem sets, discussion sessions. Prerequisites: 101 and Biological Sciences 31, or consent of instructor.

3 units, Win (Bliska, Falkow) MWF 9


3 units (Mocarski, Mullins) alternate years, not given 1991-92

207. Pathogenesis of Infectious Diseases—Emphasis: an understanding of the molecular mechanisms employed by microorganisms to bring about the infection of animal and human hosts. Formal instruction plus class discussion of recent literature pertaining to microbial pathogenicity, and normal and acquired host surface mechanisms. Prerequisite: consent of instructor. Sign-up list requested.

2 units (Falkow) alternate years, not given 1990-91

208. Topics in Virology—In-depth discussion of current literature in a topical area of the molecular biology of viruses. Student participation in presentations required. Prerequisite: 206. May be taken repeatedly.

1 unit, Win (Mocarski) M 10

209. Molecular Parasitology—Advanced seminar on the molecular biology of parasites, especially protozoa. Topics: antigenic variation, molecular cloning of protective antigens, gene amplification, kinetoplast DNA and host-parasite interactions. Prerequisite: Biochemistry 201 or consent of instructor. Recommended: a background in parasitology, e.g., Health Research and Policy 204.

2 units, Spr (Boothroyd, Haldar) Th 3:15-5:05

211,212. Advanced Immunology—(Same as Cell Biology 201, 202; Immunology 201, 202.) For graduate and advanced undergraduate students. Lecture and student presentation featuring current problems in immunology. Topics: genetics and structure/function relationships of antibodies, T-cell receptors, MHC antigens; accessory
molecules; lymphocyte differentiation and activation; cellular regulation of immune responses; autoimmunity and other problems in clinical immunology. Prerequisites: biochemistry, basic immunology, consent of instructor (for undergraduates). 211 is a prerequisite for 212.

211. 3 units, Win (Davis, Parham) MWF 10
212. 3 units, Spr (Davis, Parham) Th 3:15-5:05

270. Seminar—Reports, discussions on selected topics by departmental speakers. 1 unit, Aut, Win, Spr (Staff) W 12

299. Directed Reading—Prerequisite: consent of instructor.
18 units maximum, any quarter (Staff) by arrangement

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, parasitology, and virology.
18 units maximum, any quarter (Staff) by arrangement

MOLECULAR AND CELLULAR PHYSIOLOGY

Emeriti: (Professor) Frederick A. Fuhrman, Eugene D. Robin
Chairman: Richard W. Tsien
Professors: Julian M. Davidson, Richard W. Tsien
Assistant Professors: Brian Kobilka (jointly with Medicine), Richard S. Lewis, Daniel Madison, Thomas Schwarz
Courtesy Professor: Jeffrey J. Wine
Courtesy Associate Professors: William T. Clusin, Allen D. Cooper, Andrew R. Hoffman
Courtesy Assistant Professor: Timothy Meyer
Courtesy Professor (Research): David M. Maurice
Courtesy Professor (Clinical): Mark G. Perlroth
Consulting Associate Professor: Noel Thompson
Senior Research Associate: Erla R. Smith

The Department of Molecular and Cellular Physiology was created in July 1988, replacing the Department of Physiology. In February 1989, it moved into the new facilities in the Beckman Center for Molecular and Genetic Medicine, where the department occupies 17,500 square feet, mostly on the first floor. Other academic units in the center include a new Hughes Unit of Molecular and Genetic Medicine, a new Department of Developmental Biology, and the already-existing Department of Biochemistry.

The creation and growth of the department is a reflection of the rapid development of the field of cellular signaling as it relates to intracellular, intercellular, and inter-organ communication. The department is developing a special focus on molecular mechanisms controlling excitability, contraction, secretion, neurotransmission, membrane and axonal transport, and other key physiological processes. The research programs draw upon a wide range of techniques including cell biology, molecular genetics, biochemistry, electrophysiology and imaging with light or electron microscopy. The department teaches physiology to medical students and graduate students, and also continues research in the field of neuroendocrinology.

GRADUATE PROGRAMS

The department offers required and elective courses for students in the School of Medicine and is also open to other qualified students with the consent of the instructor. Training of medical, graduate, and postdoctoral students is available. The department now offers the Ph.D. degree in Physiology. A new Ph.D. program in Molecular and Cellular Physiology is being developed. No B.S. or M.S. degrees are offered

DOCTOR OF PHILOSOPHY

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 are considered for admission to graduate study. Applicants submit a report of scores (general and subject test in biology) on the Graduate Record Examination as part of the application.

Students who do not speak English as their native language must submit scores from TOEFL, excepting students who have completed two years of coursework at an accredited U.S. college or university.

Course study is expected to occupy four or more years, including three summers. Seven quarter-long courses are required. Students take Biochemistry 200 and 201, and one of the medical physiology courses (Molecular and Cellular Physiology 200, 201, 202, 203 or 204). Neurobiology 200 is recommended. Three of the student's required courses are more focused, advanced graduate level courses in areas such as molecular and cellular physiology, cellular signaling, cell biology, or pharmacology. In addition, students
must take the Molecular and Cellular Physiology Seminar Series (219) for credit.

Each student presents a journal club to the department at least every other year, starting their second year. Acceptable letter grade indicators must be a minimum of "B-", and at least two grades equal to "A-" or above are necessary (but not sufficient) for continuation in the program.

Qualifying Examination—At the end of the second or third year in residence as a graduate student, each Ph.D. candidate presents a written thesis proposal to be defended at the time of the oral comprehensive examination. The examination may be taken only after all coursework has been completed to the required standard. Students 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 presented in a dissertation. The oral examination is largely a defense of the dissertation.

Advisors and Advisory Committees—A graduate advisory committee, currently Stephen Smith, Thomas Schwarz, and Daniel Madison, advises students during the period before the formation of their qualifying committees.

FINANCIAL AID

Students may be funded by their advisors’ research grants, by future training grants, by departmental funds, or by extramural funds. Students are encouraged to obtain funding from outside sources (e.g., NIH, NSF, Hughes etc.).

COURSES

Coursework and laboratory instruction in the Department of Molecular and Cellular Physiology conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.

199. Undergraduate Research—Investigation sponsored by individual faculty members, available to undergraduates, hours and units arranged in consultation. Fields of research open to students are decided in consultation with sponsoring faculty member.

any quarter (Staff) by arrangement

200. Physiology: Cardiovascular—Offered jointly with the Department of Medicine. Lectures, clinical presentations, and laboratory demonstrations of normal and disordered human cardiovascular physiology. Prerequisite: understanding of general biochemistry.

6 units, Spr (Perlroth) MTF 8-9:50

201. Physiology: Endocrine—Offered jointly with the Department of Medicine. Lectures, clinical presentations, and demonstrations on normal and disordered function in the endocrine system. Prerequisite: understanding of general biochemistry.

4 units, Win (Scheller, Hoffman)

MWF 9-10:50

202, 203, 204. Physiology: 202-Gastrointestinal; 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. Prerequisite: understanding of general biochemistry.

6 units (202, 1 unit; 203, 3 units; 204, 2 units) Aut (Gastrointestinal: Cooper; Renal: Maffly, Meyer, Respiratory: Raffin) MW 10-11:50 TTh 11-11:50

206. Pathophysiology—Offered jointly with the Department of Medicine. Physiology of disease, emphasizing clinical situations where two or more organ systems come together at the molecular, cellular, and organ level. Reviews, integrates, and enriches physiology of individual organ systems. Discusses genetics and physiology of diseases such as: cystic fibrosis, muscular dystrophy, and, hypertension.

2 units, Win (Perlroth, Meyer) MWF 9-10:50

212. Human Sexuality in Medicine—Multidisciplinary survey of physiological and psychosocial determinants of sexual behavior, basic concepts, and clinical approaches to diagnosis and therapy of sexual dysfunction, and related topics such as sexual differentiation and sexually transmitted disease.

2 units (Davidson) not given 1990-91

213. Special Topics in Molecular and Cellular Physiology—Seminar of guided reading and discussion in introductory and advanced physiological topics agreed upon by an individual instructor and interested students. Prerequisite: consent of instructor.

(Staff) by arrangement

215. Synaptic Transmission—The anatomical, physiological, and biochemical basis of synaptic function in the peripheral and central nervous system. Lectures by the faculty and intensive discussions of relevant research papers. Primarily for graduate students with an interest in synaptic function. Interested medical students and advanced undergraduates may also enroll.

5 units, Spr (Smith, Schwarz, Madison)

TTh 3:15 p.m. lecture; T 7-10 p.m.

219. Advances in Physiological Research—Seminar presenting current research topics in phys-
iology. Speakers are Stanford scientists and guest lecturers. Meets alternate weeks.

1 unit, Aut, Spr (Staff) T 4:15

299. Directed Reading—Prerequisite: consent of instructor.
any quarter (Staff) by arrangement

399. Advanced Research—Investigations sponsored by individual faculty members undertaken by interested, qualified medical or graduate students. Fields of research include endocrinology, neuroendocrinology, and topics in molecular and cellular physiology.
any quarter (Staff) by arrangement

NEUROBIOLOGY

Chairman: Uel J. McMahan
Professors: Denis A. Baylor, Eric I. Knudsen, Uel J. McMahan, Carla J. Shatz, Eric M. Shooter
Associate Professor: William T. Newsome
Assistant Professor: J. H. Pate Skene

GRADUATE PROGRAMS

Graduate students in the Department of Neurobiology 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 submits completed applications to the department. Applicants should familiarize themselves with the research interests of the faculty and, if possible, indicate their preference on the application form.

Medical students also are encouraged to enroll in the Ph.D. program. The requirements of the Ph.D. program are 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 is obtained 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; mechanisms of ion channel function; and neuronal growth and differentiation.

COURSES

The department offers a one-quarter course on the structure and function of the nervous system, which is open to medical and graduate students, and advanced undergraduates. Advanced courses are open to students who have completed the basic course.

199. Directed Reading (Undergraduate)—Prerequisite: consent of instructor.
1-18 units, any quarter (Staff) by arrangement

200. The Nervous System—Introduction to the structure and function of the nervous system, including neuroanatomy, neurophysiology, and neurochemistry. Topics range from the properties of neurons to the mechanisms and organization underlying higher functions. Coherent framework prepares for general work in neurology, neuropathology, clinical medicine, and for more advanced work in neurobiology. Lecture and laboratory components must be taken together.
9 units, Win (Aldrich, Baylor, Knudsen, McMahan, Newsome, Shatz, Shooter, Skene) M 1:15-3:05 T 9 W 1:15-5:05 Th 9 F 1:15-3:05

216. Ion Channels and Membrane Physiology—For students with some background in neurobiology who wish to learn basic mechanisms of signaling in nerve cells. Reading/discussion of original research papers, emphasizing concepts, quantitative analysis of experimental results, and critical evaluation of evidence. Topics: gating mechanisms in voltage sensitive and chemosensitive ion channels and ionic mechanisms in sensory transduction. Student presentations and small group discussions.
3 units, Aut (Aldrich, Baylor) by arrangement alternate years, not given 1991-92

217. Formation of the Synapse—Seminar evaluating current views on the sequence of steps and mechanisms involved in synapse formation. Emphasis is on the neuromuscular synapse; its development in the embryo and its regeneration in the adult. Students read original articles, write summaries, and present them for discussion.
4 units, Aut (McMahan) alternate years, given 1991-92

218. Neural Basis of Behavior—Advanced seminar exploring principles of information processing by the central nervous system of vertebrates, and the relationship of functional properties of neural systems with perception and behavior. Emphasis on visual and auditory systems. Study of original papers, directed group
discussions, and student presentations. Prerequisite: 200 or the consent of the instructor.

4 unit, Spr (Knudsen, Newsome)
alternate years, given 1991-92

219. Developmental Neurobiology—(Same as Biological Sciences 158/258.) Seminar for graduate students and advanced undergraduates. Considers principles of nervous system development from the molecular control of development and the role of cell-cell interactions and trophic factors, to the level of neural systems and the role of experience in influencing brain structure and function. Topics: cell lineage, neurogenesis, neuronal migration, axon path-finding and elongation, synaptic stabilization and critical periods. Prerequisites: Biological Sciences 153, Neurobiology 200, or the consent of the instructor.

4 units, Spr (Shatz, McConnell)
alternate years, not given 1991-92

299. Directed Reading—Prerequisite: consent of instructor.
1-18 units, any quarter, by arrangement

399. Individual Research—Prerequisite: consent of instructor.
1-18 units, any quarter (Staff)
by arrangement

PATHOLOGY

Emeriti: (Professors): Lysia K. Forno, Bruno Gerstl, David Glick; (Clinical Professors) Donald L. Alcott

Chairman: Klaus G. Bensch


Associate Professors: Eugene C. Butcher, Gerald R. Crabtree, Edgar G. Engleman, Richard K. Sibley, Roger A. Warnke

Assistant Professors: Michael L. Cleary, Timothy Donlon, Steven K. H. Fung, Michael Lieber, Donald P. Regula, Robert V. Rouse, William R. Ruehl, Jr., Bruce R. Smaller

Professors (Research): Lawrence F. Eng, Teresa S. F. Wang


Professors (Clinical): Dikran S. Horoupian, Jon C. Kosek

Associate Professor (Clinical): Michael R. Hendrickson

Lecturer: Glen B. Haydon

Acting Assistant Professor: R. Eric Davis Clinical Professors: James L. Bennington, John T. Difffering, Seth L. Haber, Mahendra Ranchod

Clinical Associate Professors: Robert W. R. Archibald, Stephen S. Chen, Paul L. Herrmann

Physician Specialists and Clinical Assistant Professors: P. Joanne Cornbleet, Susan A. Galel

Staff Physician and Clinical Associate Professor: Maie E. Herrick

Clinical Assistant Professors: Robert M. Cardelli, Barbara M. Egbert, Meredith Halks-Miller, Charles M. Lombard, William C. Pitts, Steven C. Quay, Jon C. Ross, Charles T. Uyeda,

Staff Physician and Clinical Instructor: Roger Reichert

Clinical Instructor: Sara Ann Michie

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 provide 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 research 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 normal molecular, cellular, and organ structure and function that manifest themselves in clinical disease. Accordingly, the department's research interests encompass a broad range that extends from fundamental molecular biology to clinical-pathological correlations, with a primary emphasis in experimental oncology.

At present, 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, immunology and genetics of the human major histocompatibility complex, developmental and cellular immunology, tumor immunology, viral leukemogenesis, fundamental studies of the AIDS virus and its effects on the immune system, 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 for qualified medical and graduate students by individual arrangement with the appropriate faculty member.

**COURSES**

Coursework and laboratory instruction in the Department of Pathology conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.

205. Clinical-Pathological Correlations—Correlation of clinical histories with surgical and autopsy material, including microscopy. Maximum enrollment 12, minimum 5.

  2 units, Win (Kosek, Fajardo, Forno, Chen, Rouse, Egbert) MF 3:15-5:15

207. Principles of Electron Microscopy—Seminar on basic optics, specimen as an optical device, nature of image contrast, image detection and interpretation, related photographic principles, specimen preparation and requirements, fixation, embedding, microtomy, staining, and some special techniques.

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

208. Interpretation of Electron Micrographs—Seminar on principles of electron optical image formation as applied to the interpretation of biological ultrastructure. Development of the wave mechanic description of the various sources of contrast in the electron microscope image.

  1 unit, Spr (Haydon) by arrangement

213. Gross Autopsy Pathology Laboratory—Students examine and discuss unfixed dissected organs from current autopsies and correlate morphologic findings with the clinical history. Students may view postmortem examinations and (alone or in a small group) participate in one postmortem examination with the assistance of residents and staff, and present the case to class. Prerequisite: currently taking or previously completed 230B or C.

  2 units (additional unit for participation in a postmortem examination)
  
  Aut (Bensch, Regula, Staff) W 12:30-2:30 or by arrangement
  
  Win (Regula, Staff) T 12:30-2:30

220. Immunology—(Same as Microbiology and Immunology 200.) Immunology as related to medicine is emphasized. Principally for medical, graduate, and advance undergraduate students. Prerequisites: basic principles of genetics and introductory courses in biochemistry (equivalent to 200-201) and histology.

  3 units, Spr (Weissman, Rosenberg, McDevitt) MWF 10

220A. Problem Solving in Immunology—(Same as Microbiology and Immunology 200A.) Provides direct experience in understanding immunology using problems. Three to five problems are corrected and discussed weekly. Prerequisite: simultaneous enrollment in 220 or Microbiology and Immunology 200.

  1 unit, Spr (Weissman, Rosenberg, McDevitt) by arrangement

230A, B, C. General and Special Pathology—Three-quarter introduction to general principles in general pathology and a detailed pathology of human disease based on disordered structure and function of individual organ systems (special pathology). Lecture and laboratory discussion groups. Course Director: Regula. Advisors: Hendrickson, Kempson and Bensch.

  230A. General and Special Pathology.
  
  6 units, Spr (Regula, Rouse, Staff) MWF 1:15-3:15

  230B. Special Pathology.
  
  6 units, Aut (Regula, Lombard, Staff) MW 11-12 TTh 9-11

  230C. Special Pathology.
  
  6 units, Win (Regula, Hendrickson, Horoupian, Staff) MW 11-12 TTh 9-11

281. Practical Introduction to Electron Microscopic Techniques—Laboratory providing, through tutorial direction in the completion of two products, basic familiarity with the major technical problems encountered in the preparation of biological material for electron microscopy. Prerequisite: basic understanding of electron microscopy.

  1-4 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. Participation in neuropathology research under the close supervision of a staff member in neuropathology. Facilities available include electron microscopy, tissue culture, neurochemistry and immunocytochemistry with antibody and molecular probes. Prerequisite: consent of instructor.

  1-18 units, Spr (Eng, Forno)
292. DNA Repair and Mutagenesis—(Same as Biological Sciences 205, Radiation Oncology 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. Prerequisite: Biological Sciences 31 or 41, or consent of instructor. 3 units Spr (Hanawalt, Smith) TTh 1:15 alternate years, not given 1991-92

299. Directed Reading—Prerequisite: consent of faculty member. 1-18 units, any quarter (Staff) by arrangement

399. Research—Department faculty are involved in active research programs at the Stanford Medical Center. Students interested in research at the molecular, cellular, and clinical-pathologic levels are encouraged to seek out faculty advisors. The department is equipped for modern research and maintains an active and vigorous postdoctoral research training program. Prerequisite: consent of the instructor. 1-18 units, any quarter (Staff) by arrangement

PHARMACOLOGY

Emeriti: (Professors) Robert H. Dreisbach, Avram Goldstein, Sumner M. Kalman
Chairman: Tag E. Mansour
Professors: Dora B. Goldstein, Tag E. Mansour, James P. Whitlock, Jr.
Associate Professors: Terrence Blaschke (jointly with Medicine), Helen M. Blau, Richard A. Roth, Howard Schulman
Assistant Professor: Stuart E. Leff
Professors (by courtesy): Kenneth Melmon, Robert T. Schimke
Associate Professor (by courtesy): Brian Hoffman
Assistant Professors (by courtesy): Phyllis Gardner, Stephen Peroutka
Consulting Professors: Gordon Ringold, Alejandro Zaffaroni

GRADUATE PROGRAMS

The department offers an interdisciplinary approach to prepare students for independent research. Members of the department and faculty associated with the Ph.D. program are involved in studying major biological questions in a variety of topics that include signal transduction by hormones, neurotransmitters, growth factors and carcinogens, transcriptional and post-transcriptional regulation of gene expression via transacting factors, molecular parasitology, developmental biology, immunopharmacology and the regulation of ion channels in T-cell activation, biotransformation of xenobiotics and the development of multidrug resistance, molecular and cellular pharmacology, and molecular neurobiology. Diverse research opportunities allow training that utilizes a variety of techniques. These include recombinant DNA procedures; cell biological procedures such as cell culture, somatic cell genetics, monoclonal antibody technology and immunocytochemistry; and biochemical procedures that include enzymology, protein, and nucleic acid chemistry and protein modification. For students with a strong interest in biochemistry or molecular biology, pharmacology offers challenging career opportunities in biochemical research on the frontiers of medical science.

The program leading to the Ph.D. degree in Pharmacology includes formal and informal study in such related disciplines as biochemistry, genetics, physiology, neuroscience, and computer science. The requirements are flexible and adapted to individual needs. Students rotate in three laboratories before choosing a mentor. Participation in an active program of research seminars and colloquia begins early in the program. Postdoctoral research training is available to graduates having the Ph.D. or M.D. degree. Research opportunities also exist for medical students and a limited number of undergraduate students. The limited size of the laboratories in the department allows for close tutorial contact between students, postdoctoral fellows, and faculty.

The department presents two basic courses in contemporary pharmacology (201 and 202) and advanced courses open to qualified medical and other graduate students. Please consult the Time Schedule for additional advanced courses.

COURSES

Coursework and laboratory instruction in the Department of Pharmacology conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.

BASIC

Pharmacology 201 and 202 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.
201. Pharmacology—Lectures on the principles of pharmacology. Topics: drug-receptor interaction; kinetic aspects of drug absorption, distribution, and elimination; drug metabolism; problems of drug addition. Also, major drug groups including those affecting the peripheral nervous system, the cardiovascular system and the central nervous system. Emphasis on the mechanisms of action of drugs in relation to their use in man. Prerequisite: biochemistry.

5 units, Aut (Staff) MTWTh 8, F 11

202. Pharmacology—Continuation of 201. Major drug groups include chemotherapeutic agents, antibiotics, antiparasitic drugs, and anticancer agents. Also, toxicology. Emphasis on the mechanisms of action drugs in relation to their use in man.

5 units, Win (Staff) MTWTh 8, F 11

ADVANCED

Open to all university students; instructor’s consent required prior to registration. These courses require a good knowledge of physiology and biochemistry and sometimes of microbiology or genetics. Students should consult with the instructor about the adequacy of their preparation.

203. Basic Principles in Therapeutics—(Same as Medicine 202.) Clinically relevant presentations on the pharmacological basis of therapeutics. Considers various pharmacological, physiological, and pathological factors involved in qualitative and quantitative decisions about drug therapy.

2 units, Win (Blaschke)


5 units (Roth) not given 1990-91

209. Topics in Molecular Neuropharmacology—Advanced survey into the action of the neurotransmitters and modulators in the peripheral and central nervous systems. Topics: receptor structure and function; the regulation of receptor sensitivity; control of neuropeptide synthesis and processing; the role of transmitters in regulating gene expression and neuronal growth and differentiation. Lectures and student presentations. Recommended: introductory biochemistry and neurobiology.

2 units, Spr (Leff) by arrangement

211. Molecular Basis of Learning and Memory—(Same as Biological Sciences 155/255.) Explores modulation of signal transduction in the nervous system. Model systems used in the study of neuronal plasticity include *Aplysia, Drosophila,* and mammalian hippocampus. Lectures/discussion. Prerequisites: Biochemistry 200, Biological Sciences 254, or equivalent.

3 units (Schulman, Scheller) not given 1990-91

219. Scientific Communication—The techniques of scientific writing and lecturing. Students write several papers, present material orally, and evaluate the work of others with respect to clarity and efficient transfer of information.

2 units (D. Goldstein) not given 1990-91

221. Biochemical and Genetic Aspects of Chemical Carcinogenesis—Analysis of the multistep mechanisms by which chemicals produce neoplasia.

2 units (Whitlock) given 1991-92

225. Frontiers of Pharmacology: Biogenic Amine Receptors—Lectures/discussions on the localization, characterization, and control of different biogenic amine receptors. Emphasis on biochemical and molecular aspects of these receptors in vertebrate and invertebrate animals. Weekly lecture and group analysis of assigned papers. Prerequisite: Biochemistry 200 or equivalent.

2 units (Mansour) given 1991-92

231. Regulation of Gene Expression in Differentiation and Development—Model biological systems for the study of differentiation and development are analyzed at a cellular and molecular level. Lecture and student discussion on recent research developments.

2 units, Win (Blau) T by arrangement

270. Research Seminar—Weekly seminars by outside speakers on current research in pharmacology. Seminars are reviewed and discussed in a separate conference with a member of the faculty.

2 units (Staff) alternate years, given 1991-92

280. Tutorial Program—Primarily for graduate students in pharmacology. Guided readings in the literature of any area of pharmacology. A critical review paper may be required.

any quarter (Staff) by arrangement

299. Directed Reading.

any quarter (Staff) by arrangement

399. Research.

any quarter (Staff) by arrangement
Emeritus: Clarence J. Karzmark
Chairman: Malcolm A. Bagshaw
Assistant Professors: Eamonn P. Dunphy, Steven L. Hancock
Professor (Teaching): Peter Fessenden

PROGRAMS OF STUDY

Radiation Oncology is a discipline focused around the use of radiation for both cancer therapy and research. The fundamental and applied research within the department reflects this spectrum: in radiation therapy and clinical oncology; in radiation biology and tumor biology.

Although the department 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 advisees for study and research. Graduate students in the Biophysics Program, for example, may choose Radiation Biology or Radiological Sciences as a major and pursue their dissertations in this field; similarly, students in the Cancer Biology Ph.D. Program may major in Radiation Biology. Undergraduate students may also arrange individual research projects under the supervision of the faculty.

At the present time, the major areas of basic research investigation in the department include: DNA repair in bacterial and mammalian cells after ultraviolet and ionizing irradiation; the role of error-prone DNA repair in spontaneous and radiation mutagenesis; 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 microcirculation 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; an in-depth investigation of the role of viruses in the etiology of animal and human tumors; clinical and basic research relating to the effects on neoplasms of hyperthermia alone and in combination with irradiation and/or cancer drugs.

COURSES

Coursework and laboratory instruction in the Department of Radiation Oncology conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.

The following are open to undergraduate and postgraduate students.

101. Selected Readings in Radiation Biology. 
   Aut, Win, Spr (Staff) by arrangement

154. Biosocial Aspects of Cancer—(Same as Human Biology 154.) Aspects of cancer as a biological phenomenon and as a clinical, emotional, and societal problem. Diagnosis and treatment of human neoplasms, their psychosocial and economic impact, organization of cancer care and research. Emphasis on 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.
   4 units (Brown, Staff)
   alternate years, given 1991-92

202. The Basic Science of Radiation Therapy—
   Primarily for residents or fellows in the Radiation Therapy division training program; open to medical or postgraduate students. Focus is on the basic biological processes underlying the treatment of malignant disease by radiation. Prerequisites: some familiarity with cell biology and physiology, and consent of instructor.
   4 units, Aut, Win, Spr (Brown) Th 8

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 DNA 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 31, 118, and 119, or consent of instructor.
   3 units, Spr (Hanawalt, Smith)
   alternate years, not given 1991-92

299. Directed Reading.
   any quarter (Staff) by arrangement

399. Research.
   any quarter (Staff) by arrangement
Vice Provost and Dean of Graduate Studies: Elizabeth C. Traugott
Associate Deans of Graduate Studies: Cecilia P. Burciaga, Karlene N. Dickey
Director of Bechtel International Center: John Pearson

The Vice Provost and Dean of Graduate Studies is generally responsible for policy concerning graduate instruction within the University. In particular, the Dean oversees admission to graduate standing, supervises the assignment of graduate fellowships, research 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, develops policy for graduate affirmative action and for the support of foreign students, and works for the improvement of graduate study at Stanford and for the welfare of graduate students.

The Dean of Graduate Studies is responsible for the following curricular programs: Biophysics, Cancer Biology, the Graduate Division Special Program, Immunology, and Neurosciences. Three independent research centers report to the Dean of Graduate Studies: the Stanford Center for Chicano Research, the Institute for Research on Women and Gender, and the Stanford Humanities Center.

INTERDISCIPLINARY PROGRAMS AND COMMITTEES

See the “Combined Admissions Mode in Biological and Biomedical Sciences” under the School of Medicine section of this bulletin for information regarding the interdisciplinary program. It enables a small number of students to enroll in a common first year of graduate study before selecting an appropriate program or department in which to complete the Ph.D.

BIOPHYSICS PROGRAM

Committee on Biophysics: Steven G. Boxer, Chairman (Professor of Chemistry); Robert Baldwin (Professor of Biochemistry); Oleg Jardetzky (Professor of Pharmacology); Michael Levitt (Professor of Cell Biology); Harden M. McConnell (Professor of Chemistry); Robert D. Simoni (Professor of Biological Sciences)

Professors: Richard W. Aldrich (Neurobiology), Robert L. Baldwin (Biochemistry), Martin J. Brown (Radiation Oncology), Steven Chu (Physics and Applied Physics), David A. Clayton (Developmental Biology), Sebastian Doniach (Applied Physics), Philip C. Hanawalt (Biological Sciences), Keith O. Hodgson (Chemistry), Wray H. Huestis (Chemistry), Oleg Jardetzky (Pharmacology), Roger D. Kornberg (Cell Biology), Michael Levitt (Cell Biology), Harden M. McConnell (Chemistry), David B. McKay (Cell Biology), Robert Pecora (Chemistry), John Ross (Chemistry), Robert D. Simoni (Biological Sciences), James A. Spudich (Cell Biology), Lubert Stryer (Cell 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 are 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, is worked out for each student individually with the help of appropriate advisors from the Committee on Biophysics.

The requirements and recommendations for the Ph.D. degree include:
1. Training in physics or chemistry equivalent to that of an undergraduate physics or chemistry major at Stanford.
2. 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.
3. Proficiency in one or more foreign languages and/or a computer language may be required at the discretion of the major professor.

4. Opportunities for teaching are available during the first nine quarters, at the discretion of the advising committee.

5. 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.

6. 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 must defend the dissertation proposal in an oral examination. The Dissertation Reading Committee normally evolves from the Dissertation Proposal Review Committee.

7. Presentation of a Ph.D. dissertation as the result of independent investigation and expressing a contribution to knowledge in the field of biophysics.

8. Passing of the University oral examination, taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the research is presented by the candidate.

COURSES

205. DNA Repair and Mutagenesis—(Same as Biology 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 heredity deficiencies in DNA repair. Relationship of DNA repair and mutagenesis to carcinogenesis.

3 units, Spr (Hanawalt, Friedberg, K. C. Smith) TTh 1:15

216. Ion Channels and Membrane Physiology—(Same as Neurobiology 216.) Reading/discussion of original research papers, emphasizing concepts, quantitative analysis of experimental results, and critical evaluation of evidence. Topics: gating mechanisms in voltage- and chemosensitive ionic channels and ionic mechanisms in sensory transduction. Student presentations and small group discussions.

3 units, Spr (Aldrich, Baylor)

225. Structure and Function of Molecular Motors—(Same as Cell Biology 225.) The molecular basis of energy transduction that leads to movements generated by microfilament-based and microtubule-based motors. Molecular motors include various forms of myosin, dynein, and kinesin. Structure of the molecular motors and their accessory proteins. Regulation of the function of motile assemblies. Functions of molecular motors in cells. Spatial and temporal controls on the formation of motile assemblies in cells. Experimental approaches covered: genetic analysis, DNA cloning and expression, reconstitution of functional assemblies from purified proteins, x-ray diffraction, three-dimensional reconstruction of electron microscope images, spectroscopic methods, and high-resolution light microscopy. Focuses on how a complex cellular process is analyzed at the molecular level by a multifaceted approach using biochemical, biophysical, and genetic techniques. Prerequisite: knowledge of basic biochemistry and cell biology.

3 units (Spudich) not given 1990-91

233. Macromolecular Structure: Diffraction Methods and Diffraction Results—(Same as Cell Biology 232.) General methods and notable accomplishments of x-ray crystallography and solution scattering. Methodology topics: small-angle scattering, fiber diffraction, and x-ray crystallography at a level making current literature in the field understandable to non-practitioner. Discussion of results: protein folding patterns, enzymology, receptor-effector systems, proteins of the immune system, and membrane proteins. Prerequisite: knowledge of basic biochemistry.

3 units (McKay) not given 1990-91

250. Seminar in Biophysics—Presentation of current research projects and results by all faculty in the Biophysics Program. All graduate students in Biophysics must participate.

1 unit, Aut, Win, Spr (Staff)

255. Advanced Inorganic Chemistry—(Same as Chemistry 255.) Structural inorganic chemistry and x-ray crystallography. Space groups and three dimensional symmetry, diffraction theory, structure solution and the phase problem, structural refinement and accuracy of results. Understanding of accuracy and limitations of crystallographic methods as applied to inorganic molecules and interpretation of material from structure reports. Laboratory portion includes complete x-ray crystallographic determination of unknown structure. Prerequisite: consent of instructor.

3 units, Spr (Hodgson, Hedman)

277. Introduction to Magnetic Resonance—(Same as Chemistry 277.) Basic principles of
magnetic resonance, relaxation mechanisms, chemical exchange, 2D-NMR, CIDNP, solid state NMR and multiple-quantum NMR. Applications to problems in biophysics stressed.

3 units (Boxer) not given 1990-91

291. Biophysical Chemistry—(Same as Chemistry 291.) Special topics in biophysical chemistry; membrane biophysics. Prerequisites: previous or concurrent registration in Chemistry 171 and 173, or the equivalent.

3 units, Win (Huestis)

295. Biophysical Chemistry—(Same as Chemistry 295.) Structural biophysical chemistry, x-ray crystallography and other techniques related to structural determination of macromolecules. Space groups and three-dimensional symmetry, diffraction theory, structure solution and the phase problem, structural refinement and accuracy of results. Understanding of accuracy and limitations of crystallographic methods as applied to biomolecules and interpretation of material from structure reports. Laboratory includes complete x-ray crystallographic determination of unknown structure. Prerequisite: consent of instructor.

3 units (Hodgson, Hedman)

not given 1990-91

300. Research.
(Staff) by arrangement

Biophysics courses in related departments:
Applied Physics 130; Biochemistry 214; Cell Biology 225, 227, 228, 229; Chemistry 251, 287, 289, 291, 297; Neurobiology 216.

Other recommended courses:
Biological Sciences 211, 222H, 230, 252; Biochemistry 200, 201, 212; Cell Biology 211, 224; Chemistry 271, 273, 275; Physics 170, 171, 230, 231, 232.

CANCER BIOLOGY PROGRAM

Committee on Cancer Biology: Errol C. Friedberg (Chairman and Program Director, Professor of Pathology); Steven G. Boxer (Professor of Chemistry), Alan Krensky (Associate Professor of Pediatrics), Ronald Levy (Professor of Medicine), Edward S. Mocarski, Jr. (Associate Professor of Microbiology/Immunology), Virginia Walbot (Professor of Biological Sciences)

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 biomed-ical areas relevant to that subject. Students in this program are based in departments appropriate to their speciality 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 in this bulletin.

GRADUATE PROGRAM

DOCTOR OF PHILOSOPHY

A few well-qualified applicants are admitted to the program each year. Applicants should have completed an undergraduate major in the biological sciences; applicants with undergraduate majors in physics, chemistry, or mathematics may be admitted if they complete background training in biology during the first two years of study. During the first year, each student is required to constitute a three-person advising committee which assists with the development of an appropriate program of courses and provides 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 chairs 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, General Pathology.
   c) Health Research and Policy 202, Biostatistics.

3. At least 12 units of additional courses given by four or more different Stanford faculty members. Coursework to be taken is determined in consultation with the student's Advising Committee.

4. 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 dissertation research or proposed disser-
tation research. The advising committee shall be presented with a brief written description of this research prior to the oral examination.

5. The presentation of a Ph.D. dissertation as the result of independent investigation and constituting a contribution to knowledge in the area of cancer biology.

6. The successful passing of the University oral examination which is taken only after the student has substantially completed his or her research. The examination is preceded by a public seminar in which the research is presented by the candidate. The oral examination is conducted by a dissertation reading committee.

COURSES

Coursework and laboratory instruction in the Cancer Biology Program conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.


3 units (Staff) alternate years, given 1991-92

251,252,253. Special Topics in Cancer Biology—Full-quarter courses or half-quarter minicourses given by different lecturers on topics of major importance in cancer research. Units given proportionately.

251. Aut (Staff) TTh 4:15-5:35
252. Win (Staff) TTh 4:15-5:35
253. Spr (Staff) TTh 4:15-5:35

299. Research—Students registered for the Ph.D. must register for this course as soon as they begin dissertation-related research work.

GRADUATE DIVISION SPECIAL PROGRAM

The Graduate Division Special Program is designed for students who have demonstrated outstanding academic performance in a doctoral program at Stanford and who are interested in an interdisciplinary Ph.D. degree which cannot reasonably be completed in an existing graduate department or interdisciplinary program. It is administered by the Committee on Graduate Studies (CGS) through a standing subcommittee appointed by the CGS chair which reviews proposals and makes recommendations on admission to CGS.

The normal eligibility criteria for application to the Graduate Special Program are:

1. Completion of a minimum of two quarters in a Stanford doctoral level program.
2. Completion of no more than three years of graduate study at Stanford.
3. Completion of all department or program requirements (including qualifying examinations) which normally would be completed within the time that the applicant has been enrolled in the primary graduate degree program. The application must also specify a formal Ph.D. qualifying procedure for the Graduate Special Program that is acceptable to the faculty members on the student's proposed supervisory committee and to the Graduate Special Subcommittee;

4. a) If the applicant is beyond the second year of study in a Ph.D. or Ed.D. program, admission to candidacy is required before the Graduate Special application is accepted;

b) Students in an M.D. or J.D. program may apply only if they wish to obtain the Graduate Special Ph.D. in addition to the graduate degree which originally brought them to Stanford.

The applicant is responsible for obtaining the agreement of at least four faculty members to serve on a supervisory committee. The principal advisor must be an Academic Council member, and at least two of the committee members must be tenured faculty. In accordance with the nature of the program, members of the committee should represent at least two departments of the University.

The deadline for applications is the second week of the quarter in which review is requested. The application must include a succinct statement of the dissertation topic, describing and justifying the field of inquiry, its interdisciplinary nature, and why it cannot be completed within an extant department or program. A title for
the program should be selected that does not include the name of any department or graduate program at Stanford. The applicant should also describe his/her preparation in the subjects relevant to the proposal and the reasons for wishing to pursue the field of inquiry.

If the proposal is approved, the student submits a Graduate Program Authorization Petition and enrolls as a Graduate Special doctoral student in the field designated on the proposal. Any subsequent changes in the program or the composition of the supervisory committee must be approved by the Graduate Special Subcommittee.

Each student in a Graduate Special program must have the agreement of a graduate department or program to provide the administrative support and services normally available to its doctoral students. This department is usually the student's previous department or that of the principal advisor. The home department is not obliged to provide financial support or to monitor academic progress.

Students registering for special research under the guidance of their committee or for the Ph.D. dissertation should use the following course numbers:

**COURSES**

400. Research.  
*by arrangement*

*by arrangement*

**IMMUNOLOGY PROGRAM**

*Director:* Patricia P. Jones (Professor of Biological Sciences)

*Committee on Immunology:* Mark M. Davis (Associate Professor of Microbiology and Immunology), C. Garrison Fathman (Professor of Medicine/Immunology and Rheumatology), Leonard A. Herzenberg (Professor of Genetics), Peter Parham (Associate Professor of Cell Biology), Jane R. Parnes (Associate Professor of Medicine/Immunology and Rheumatology), Irving Weissman (Professor of Pathology)

*Participating Departments and Faculty:*  
**Biological Sciences:** Patricia P. Jones (Professor)  
**Cardiovascular Surgery:** Carol Clayberger (Assistant Professor)  
**Cell Biology:** Peter Parham (Associate Professor)  
**Chemistry:** Harden M. McConnell (Professor)  
**Genetics:** Leonard A. Herzenberg (Professor), Lenore Herzenberg (Professor, Research)  

**Medicine/Immunology and Rheumatology:** C. Garrison Fathman (Professor), Hugh O. McDevitt (Professor), Jane R. Parnes (Associate Professor), Samuel Strober (Professor)  
**Medicine/Nephrology:** Bruce Hall (Associate Professor)  
**Medicine/Oncology:** Ronald Levy (Professor)  
**Microbiology and Immunology:** Mark M. Davis (Associate Professor), Christopher Goodnow (Assistant Professor), Hugh O. McDevitt (Professor)  
**Neurology:** Lawrence Steinman (Associate Professor)  
**Pathology:** Eugene C. Butcher (Associate Professor), Michael Cleary (Assistant Professor), Gerald R. Crabtree (Associate Professor), Edgar G. Engleman (Professor), F. Carl Grunet (Associate Professor), Michael Lieber (Assistant Professor), Robert V. Rouse (Assistant Professor), Roger A. Warnke (Associate Professor), Irving L. Weissman (Professor)  
**Pediatrics:** Alan M. Krensky (Assistant Professor), Dale T. Umetsu (Assistant Professor)

**GRADUATE PROGRAM**

**DOCTOR OF PHILOSOPHY**

The interdepartmental Immunology Program offers instruction and research opportunities leading to a Ph.D. in Immunology. The goal of the program is to develop young investigators who have a solid foundation in basic biomedical sciences and who can carry out innovative research in immunology. The program features a flexible selection of courses and seminars to enrich students' backgrounds, combined with extensive research training in the laboratories of the participating immunology faculty.

Students applying to the program should have an undergraduate major in biological sciences; majors in other sciences may be acceptable if the applicants have had sufficient coursework in biology. Formal application should be made through the Graduate Admissions Office by December 15. Applications are evaluated by the Immunology Pre-doctoral Committee based on scores on the GRE exams (including the subject test in either biology or chemistry), which should be taken by the October test date; grades; evidence of prior research experience in biological sciences; letters of recommendation, including letters from research sponsor(s); and commitment to a career in biomedical research. Interested Stanford medical students are welcome to apply to the program; they should contact the program director.

Students admitted to the program are offered financial support covering full tuition and a living stipend. Applicants are urged to apply for independent fellowships such as from the National
Science Foundation and the Howard Hughes Medical Institute. Fellowship applications are due in November of the year prior to matriculation in the graduate program. Because of the small number of funded slots, students who have been awarded an outside fellowship will have an improved chance of acceptance into the program.

On matriculation, each student is assigned an advisor from the Immunology Pre-doctoral Committee who assists in selecting courses and laboratory rotations in the first year and in choosing a laboratory for the dissertation research. Once a dissertation advisor has been selected, a dissertation committee consisting of at least three immunology faculty, including the dissertation advisor and a member of the Immunology Pre-doctoral Committee, is constituted to guide the student during the dissertation research. The student must meet with the dissertation committee at least once a year.

Candidates for Ph.D. degrees at Stanford must satisfactorily complete a three-year program of study that includes 72 units of graduate coursework and research and nine full-tuition quarters of residency. At least 3 units must be taken with each of four different Stanford faculty members. For further information on University requirements, see the "Degrees" section in this bulletin.

The requirements for the Ph.D. degree in Immunology include the following:

1. Training in biology and cognate disciplines equivalent to that provided by the undergraduate Biology major at Stanford.

2. Completion of the following courses (or their equivalents from undergraduate work):
   a) Basic immunology (Biology 230 or Microbiology and Immunology 200)
   b) Advanced immunology (Immunology 201, 202)
   c) Biochemistry, graduate level (Biochemistry 200, 201)
   d) Cell biology, graduate level (Cell Biology 200)
   e) Basic genetics (Genetics 201, 202)
   f) Statistics (Biology 141 or Health Research and Policy 202)

3. Elective courses as agreed upon by the student, advisor, and advisory committee. Electives may be chosen from graduate courses and seminars in the following departments or programs: Biochemistry, Biological Sciences, Biophysics, Cancer Biology, Cell Biology, Genetics, Microbiology and Immunology, Molecular and Cellular Physiology, Pathology, Pharmacology.

4. Completion in the first year of three one-quarter rotations of research in immunology laboratories (this requirement may be waived under certain circumstances, requiring approval of the Immunology Pre-doctoral Committee).

5. Teaching assistantships in two immunology courses, at least one of which should be completed by the end of the second year.

6. For admission to candidacy, students must complete three requirements by the end of their second year. A comprehensive written examination in immunology and related biomedical sciences must be completed satisfactorily by the end of Autumn Quarter of the second year. A research proposal on a subject other than the student's own research must be written by the end of Winter Quarter. Finally, students must prepare and defend a research proposal on their dissertation research by the end of Spring Quarter of the second year. Administration and evaluation of these requirements is the responsibility of the student's dissertation committee.

7. Participation (through regular attendance and oral presentation) in one of the immunology journal clubs for at least the first two years. Students are also expected to attend the Wednesday afternoon immunology seminars and the annual Stanford Immunology Retreat.

8. Passing of the University oral examination on the dissertation research, which is to be taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the candidate presents his/her research.

9. Completion of a Ph.D. dissertation, resulting from independent investigation and constituting a contribution to knowledge in the area of immunology.

COURSES

Coursework and laboratory instruction in the Immunology Program conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog.

BIOLICAL SCIENCES

230. Topics in Immunology—Introduction to the basic elements of the immune system: structure and functions of antibody molecules; cellular basis of immunity and its regulation; molecular biology of antigen recognition structures; genetics of autoimmunity and disease susceptibility. For graduate students and advanced undergraduate students. Undergraduate prerequisite: Biology Core or consent of instructor. 4 units, Aut (Jones) MWF 10 discussion section by arrangement
335. Seminar in Immunobiology and Immunogenetics—Literature review of current topics in immunology. Prerequisites: introductory immunology course and consent of instructor (for undergraduates).

1-2 units, Aut, Win Spr (Jones) M 12:15

IMMUNOLOGY

201, 202. Advanced Immunology—(Same as Cell Biology 201, 202; Microbiology and Immunology 211, 212.) Lecture (201) and student presentation (202) featuring current problems in immunology; for graduate and advanced undergraduate students. Topics: genetics and structure-function relationships of antibodies, T-cell receptors, MHC antigens; accessory molecules; lymphocyte differentiation and activation; cellular regulation of immune responses; autoimmunity and other problems in clinical immunology. Prerequisites: biochemistry, basic immunology, consent of instructor (for undergraduates). 201 is a prerequisite for 202.

201. 3 units, Win (Lieber) MWF 10
202. 3 units (Davis, Parham) not given 1990-91

211. Antigen Presentation: Critique and Commentary—(Same as Cell Biology 233.) For experienced graduate students. Current research in antigen presentation to T lymphocytes focusing on genetics and function of the major histocompatibility complex. Critical review of journal articles, the synthesis of knowledge in related fields, and on the directions for future research. Student preparation of written critiques and reviews and their oral presentation. Enrollment limited to 9. Prerequisite: basic knowledge of immunology.

3 units, Spr (Parham)

290. Teaching of Immunology—Practical experience in teaching by serving as a teaching assistant in an immunology course.

(Staff) by arrangement

300. Research—Research for graduate students in the Ph.D. Program in Immunology.

1-15 units (Staff) by arrangement

MICROBIOLOGY AND IMMUNOLOGY

200. Immunology—(Same as Pathology 220.) Immunology as related to medicine is emphasized. Principally for medical, graduate, and advanced undergraduate students. Prerequisites: basic principles of genetics and introductory courses in biochemistry and histology.

3 units, Spr (Rosenberg, McDevitt, Weissman) MWF 10

200A. Problem Solving in Immunology—(Same as Pathology 220A.) Problems provide direct experience in understanding immunology. Each week three to five problems are corrected and discussed. Co-requisite: simultaneous enrollment in 200.

1 unit, Spr (Rosenberg, McDevitt, Weissman) by arrangement

NEUROSCIENCES PROGRAM

Chairman: U. J. McMahan (Professor of Neurobiology)

Committee: Richard W. Aldrich (Assistant Professor of Neurobiology), Helen Blau (Associate Professor of Pharmacology), Roland Ciaramello (Professor of Psychiatry and Behavioral Sciences), Stephen Peroutka (Assistant Professor of Neurology and Neurological Sciences), David A. Prince (Professor of Neurology and Neurological Sciences), Richard H. Scheller (Associate Professor of Biological Sciences), Howard Schulman (Associate Professor of Pharmacology), Robert Sapolsky (Assistant Professor of Biological Sciences), Stephen Smith (Associate Professor of Molecular and Cellular Physiology), Richard Tsien (Professor of Molecular and Cellular Physiology), Brian Wandell (Associate Professor of Psychology), Jeffrey Wine (Professor of Psychology), Student Members: Cathy Magill-Solc, Sue Williams

Participating Faculty:
Anesthesia: Joan E. Kendig (Professor of Biology in Anesthesia), Mervyn Maze (Associate Professor), Darrell Tanelian (Assistant Professor)
Biological Sciences: William F. Gilly (Associate Professor), H. Craig Heller (Professor), Susan McConnell (Assistant Professor), Robert Sapolsky (Assistant Professor), Richard H. Scheller (Associate Professor), Stuart Thompson (Associate Professor)

Cell Biology: Lubert Stryer (Winger Professor)
Mechanical Engineering: Felix Zajac (Professor)
Molecular and Cellular Physiology: Richard Aldrich (Associate Professor), Julian M. Davidson (Professor), Daniel Madison (Assistant Professor), Thomas Schwarz (Assistant Professor), Stephen Smith (Associate Professor), Richard Tsien (Professor and Chairman)

Neurobiology: Denis A. Baylor (Professor), Eric I. Knudsen (Professor), U. J. McMahan (Professor and Chairman), William T. Newsome (Associate Professor), Carla J. Shatz (Professor), Eric M. Shooter (Professor), J. H. Pate Skene (Assistant Professor)

Neurology and Neurological Sciences: Gregory Albers (Assistant Professor), Dennis Choi (As
The interdepartmental Neurosciences Program offers instruction and research opportunities leading to a Ph.D. in Neurosciences. The program is administratively under the aegis of the Dean of Graduate Studies. 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 submits completed applications to the Neurosciences Program Admissions Committee. December 15 is the deadline for receipt in the University’s Graduate Admissions Office of applications with all supporting material. A supplemental application (obtained from the Neurosciences Program Office, M.S.O.B., Rm. X309, Stanford University 94305-6114) must be submitted to the Neurosciences office by December 15.

Applicants should familiarize themselves with the research interests of the faculty and 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 an advisory committee.

All students are required to complete the basic courses in neurobiology (Neurobiology 200 or its equivalent). Students are also required to take at least five advanced neuroscience courses offered by several participating departments. At least one course must be taken in each of the five following categories: Integrative and Behavioral Neurosciences, Membrane Excitability, Neuronal Communication, Developmental Neuroscience, and Clinical Neuroscience.

Required coursework should be completed by the end of the second year. 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 should begin research on entry or, at the latest, during the Winter Quarter of the first year. The student is required to present a Ph.D. dissertation which is the result of independent investigation contributing to knowledge in an area of neuroscience and to defend his or her dissertation in a University oral examination, which includes a public seminar.

Medical students may 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.

COURSES

Coursework and laboratory instruction in the Neurosciences Program conforms to the Policy on the Use of Vertebrate Animals in Teaching Activities as stated in the back of this catalog. The course selections of individual departments participating in the Neurosciences Program should also be consulted for complete offerings.

BIOLOGICAL SCIENCES

209. Advanced Neurosciences Laboratory—Acquaints students with the use of equipment and techniques required to record and analyze extracellular and intracellular neural activity in vertebrates and invertebrates. In-depth training in a subset of these techniques is applied to a specific research project. Enrollment limited to 10; admission by application. 4 units, Spr (Heller, Gilly)

250H. Video Microscopy and Image Processing—Advanced course in principles and confocal laser microscopy applications of digital image processing for observation of biological material. Hands-on lab with commercially available
equipment staffed by manufacturers' representatives. Guest lecturers discuss application of methods to cell biology. Open to graduate and postdoctoral students and faculty. Taught at Hopkins Marine Station. Apply to Hopkins.

6 units, Sum (Thompson) by arrangement

254. Cellular and Molecular Neurobiology—The function of the nervous system at the cellular and molecular level. Membrane biophysics, synaptic transmission, biochemistry and molecular genetics of neuronal function, and their relationship to behavior and learning.

4 units (Scheller) not given 1990-91

255. The Molecular Basis of Learning and Memory—(Same as Pharmacology 211.) Signal transduction mechanisms. Receptor, channels, second messengers, and protein kinases discussed in the context of learning and memory paradigms.

3 units (Schulman, Scheller)

not given 1990-91

258. Developmental Neurobiology—(Same as Neurobiology 219.) Lecture/seminar for advanced undergraduate and graduate students. Principles of nervous system development from the molecular control of development and the role of cell-cell interactions and trophic factors, to the level of neural systems and the role of experience in influencing brain structure and function. Topics: cell lineage, neurogenesis, neuronal migration, axon pathfinding and elongation, synaptic stabilization, and critical periods in development. Prerequisite: Neurobiology 200 or consent of instructors.

3 units, Spr (McConnell, Shatz, Skene)

not given 1991-92

263. Human Behavioral Biology—Biological bases of normal and abnormal human behavior are used to study students in approaching complex behaviors in a multidisciplinary way. Introduces relevant disciplines: sociobiology, ethology, neuroscience, and endocrinology integrating these disparate approaches in examining aggression, sexual behavior, language use, mental illness.

4 units (Sapolsky) not given 1990-91

333H. Molecular Approaches to Ion Channels—Advanced treatment of the function and regulation of ion channels and molecular-level methods of study. Lectures integrated with intensive lab work provide a working knowledge of whole cell/single channel patch clamp, voltage clamp of oocytes in conjunction with microinjection and expression of mRNA, and biochemical analysis of channel synthesis and processing. Emphasis is on biophysical analysis of channel gating, identification of channel subtypes and routes to their production, and spatial localization of channels on living cells. Taught at Hopkins Marine Station. Apply to Hopkins.

6 units, Sum (Gilly) by arrangement

MECHANICAL ENGINEERING

282. Special Projects in Neuromuscular Biomechanics—Engineering mechanics applied to coordination of the human neuromuscular system including: mechanical properties and models of muscle and tendon; dynamics and models of limbs that consist of single- and multi-joint muscles originating and inserting on a multi-segmented skeleton; application to sports and rehabilitation such as posture, walking, jumping, and cycling.

1-5 units, any quarter (Zajac) by arrangement

MOLECULAR AND CELLULAR PHYSIOLOGY

212. Human Sexuality in Medicine—Multi-disciplinary survey of physiological and psychosocial determinants of sexual behavior, basic concepts, and clinical approaches to diagnosis and therapy of sexual dysfunction and related topics such as sexual differentiation and sexually transmitted disease.

3 units, Aut (Davidson)

213. Special Topics in Molecular and Cellular Physiology—Seminar of guided reading/discussion in introductory and advanced physiological topics agreed upon by an individual instructor and interested students. Prerequisite: consent of instructor.

(Staff) by arrangement

215. Synaptic Transmission—Anatomical, physiological, and biochemical basis of synaptic function in the peripheral and central nervous system. Basic properties of synapses, quantal analysis and receptor properties, using the neuromuscular junction as a model. The role of calcium at synapses electrophysiological and biochemical processes, synaptic plasticity and modulation in the central nervous system, and biochemistry of synaptic vesicles. Lectures/discussions of relevant research papers. Primarily for graduate students interested in synaptic function; medical students and advanced undergraduates may also enroll.

5 units, Win (Smith, Schwartz, Madison)

216. Molecular and Cellular Physiology—The molecular mechanisms of signal transduction for a variety of structurally and functionally different plasma membrane receptors. Topics: structure of receptors and interaction of receptor protein with the lipid bilayer; ligand binding and ligand mediated changes in receptor struc-
ture; and cytosolic, cytoskeletal and membrane proteins that interact with receptors. Lecture/discussion emphasizes recent research developments and examines value of various experimental approaches for the study of receptors.

2 units (Kobilka) not given 1990-91

NEUROBIOLOGY

200. The Nervous System—Introduction to the structure and function of the nervous system, including neuroanatomy, neurophysiology, and neurochemistry. Topics: properties of neurons to the mechanisms and organization underlying higher functions. Presents a coherent framework as a preparation for general work in neurology, neuropathology, and clinical medicine and for advanced work in neurobiology. Lecture/components must be taken together.

9 units, Win (Aldrich, Baylor, Knudsen, McMahan, Newsome, Shatz, Shooter, Skene)

216. Ion Channels and Membrane Physiology—For students with background in neurobiology who are curious about the basic mechanisms of signaling in nerve cells. Reading/discussion of original research papers, emphasizing concepts, quantitative analysis of experimental results, and critical evaluation of evidence. Topics: gating mechanisms in voltage sensitive and chemosensitive ion channels and ionic mechanisms in sensory transduction. Student presentations and small group discussions.

3 units (Aldrich, Baylor) alternate years, given 1991-92

217. Formation of the Synapse—Seminar evaluating current views on the sequence of steps and mechanisms involved in synapse formation. Emphasis is on the neuromuscular synapse; its development in the embryo and its regeneration in the adult. Students read original articles and present written summaries for discussion.

4 units (McMahan) alternate years, given 1991-92

218. Neural Basis of Behavior—Advanced seminar on principles of information processing by the central nervous system of vertebrates, and the relationship of functional properties of neural systems with perception and behavior. Emphasis on the visual and auditory systems. Study of original papers, directed group discussion, and student presentations.

4 units (Knudsen, Newsome) alternate years, given 1991-92

219. Developmental Neurobiology—(Same as Biological Sciences 258.) Lecture/seminar for graduate students and advanced undergraduates. Principles of nervous system development: the molecular control of development and role of cell-cell interactions and trophic factors, level of neural systems and role of experience influencing brain structure and function. Topics: cell lineage, neurogenesis, neuronal migration, axon pathfinding and elongation, synaptic stabilization and critical periods. Prerequisites: Biological Sciences 153, Neurobiology 200 or the consent of the instructor.

4 units, Spr (Shatz, McConnell) alternate years, not given 1991-92

NEUROLOGY

204. Physiology of Mammalian Central Nervous System—Lab for advanced students interested in neurological sciences. Introduction to a variety of techniques used in current research in the physiology of mammalian central nervous systems. Limited to 8 students. Prerequisite: consent of instructor.

4 units, Spr (Mody) by arrangement

205. Clinical Neuroscience—Case demonstrations of selected disorders; discussion of the pathophysiological basis of the disorder; presentation of the basic principles underlying modern diagnostic and therapeutic management; and a discussion of recent research advances for each disease entity.

2 units, Win (Kriegstein, Staff)

NEUROSCIENCES

300. Neurosciences Journal Club—Students and faculty select and present for critical discussion articles from current journals.

1 unit, Aut, Spr (Aldrich, Staff)

301. Introduction to the Humane Use of Laboratory Animals—Increases the students' basic knowledge of the use of laboratory animals in research. Topics: the ethics of using laboratory animals in research; laws, regulations, and policies affecting laboratory animals; literature review; human husbandry and the importance on environmental variables; clinical pathology procedures; protocol review; and describing animal procedures in grants, applications, and other publications. Students prepare and submit an animal-use protocol for evaluation.

3 units, Win (Hamm)

PHARMACOLOGY

202. Pharmacology—Major drug groups include drugs affecting the central nervous system, and the peripheral nervous system, the cardiovascular system, and the kidney. 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.

5 units, Win (Staff)
207. Signal Transduction and Hormone Action—
Molecular mechanisms for transduction and transmission of biological signals. Topics: molecular basis for the action of polypeptide and steroid hormones, neurotransmitters and growth factors on neurotransmission, metabolism, gene regulation, and cell growth. Lectures/discussions.
5 units (Schulman, Roth)
not given 1990-91

219. Scientific Communication—(Graduate students only.) The techniques of scientific writing and lecturing. Students write several papers, present material orally, and evaluate the work of others with respect to clarity and efficient transfer of information.
2 units, Spr (D. Goldstein)

231. Regulation of Gene Expression in Differentiation and Development—The regulation of gene expression during differentiation and development at a cellular and molecular level, emphasizing approaches to resolving the mechanisms underlying different steps in mammalian neuromuscular development. Lecture and student discussion of recent research developments.
2 units (Blau) not given 1990-91

PHARMACOLOGY

209. Topics in Molecular Neuropharmacology—Advanced survey into the action of the neurotransmitters and modulators in the peripheral and central nervous systems. Topics: receptor structure and function; the regulation of receptor sensitivity; control of neuropeptide synthesis and processing; the role of transmitters in regulation gene expression and neuronal growth and differentiation. Lectures and student presentations. Recommended: introductory biochemistry and neurobiology.
2 units, Spr (Leff)

252. Neurobiological Substrates in Experimental Psychopathology—Lectures/discussions addressing animal model systems relevant to biological psychiatry. Emphasis on experimental paradigms pertinent to affective disorders including models of stress psychopathology, anxiety, coping, and learned helplessness. The biological processes subserving a particular model system are analyzed and its potential implications to the human condition explored.
3 units (Madden) given 1991-92

253. Neurological Basis of Learning and Memory—Lecture/discussion addressing model systems of learning and memory, and organized to reflect increasing levels of system complexity, ranging from invertebrates to mammals. Formal highlights the different levels of analysis used and the various contributions made within species and across phylogeny.
3 units (Madden) given 1991-92

270. Molecular Neurobiology Seminar—For those with prior background in neurochemistry. Topics decided by students and instructor and taken from areas of current importance and activity in neurochemistry. Through judicious selection of topics and articles, it will be at the cutting edge of neuroscience and offer a unique opportunity to watch the progress of a rapidly moving field. Emphasis on critical reading and evaluation of current literature, and coherent presentation of topic material. Prerequisites: permission of the instructor plus either 167 or Biochemistry 200 and Neurobiology 200.
3 units, Spr (Ciaranello, Wong)

PSYCHOLOGY

203A. Visual Sensing by Humans and Computers—Topics in basic visual science including the physiology of human vision, basic human visual performance, and computational algorithms that characterize physiology and performance.
3 units, Win (Wandell)

203B. Visual Sensing by Humans and Computers—Topics in the application of visual science to the design of images (television, computer terminals, avionics displays) for viewing, and the design of sensor systems for analyzing the content of image data (assembly line part inspection, object recognition).
3 units (Wandell) not given 1990-91

206. Behavioral Neuroscience—The biological substrates of behavior emphasizing topics currently being investigated by resident and visiting neuroscientists at Stanford. Topics: neuroanatomical and neurophysiological aspects of vision, audition, motor control and learning and memory, and hormonal and neurochemical aspects of stress and motivation.
3 units, Spr (Wandell, Wine, Staff)
   3 units (Pavel, A. Tversky, Wandell)
   not given 1990-91

228. Ion Transport—Ion channels, carriers, and ion pumps and their regulation by intracellular messengers in a variety of cell types. Laboratory demonstrations and brief hands-on introduction to some techniques (patch clamping).
   3 units, Spr (Wine)

COURSES

ANTHROPOLOGY
213. Dominance, Subordination, and the Politics of the Peasantry in Colonial India.
   Spr (Amin)

ECONOMICS
303A,B,C. Technology and Productivity Workshop.
   Aut, Win, Spr (David)

ENGLISH
   Win (Hendricks)

HISTORY
288C. Russian and Soviet Jewish History.
   Spr (Zipperstein)

ITALIAN
272/372. Calvino.
   Win (Harrison)

LINGUISTICS
150. Introduction to Sociolinguistics.
   Win (Guy)

PHILOSOPHY
371. Competing Conceptions of Property.
   Win (Satz)
380C. Mind and Action.
   Spr (Bratman)

SPANISH
   Spr (Predmore)
396. Cuban Antislavery Narratives.
   Win (Ramos)
INSTITUTE FOR RESEARCH ON WOMEN AND GENDER

Director: Iris F. Litt (Professor of Pediatrics)
Associate Director: Sherri Matteo

During the last decade, research on women and gender has had a profound effect on the social sciences and the humanities. Since its founding in 1974, the Institute for Research on Women and Gender (formerly the Center for Research on Women) has been a leading force in this conceptual revolution.

The institute’s primary mission is to support scholarship on subjects related to women and gender and to organize educational programs that communicate these findings to a broader public. By bringing together faculty, graduate students, and members of the community, the institute seeks to stimulate a more informed analysis of issues concerning gender.

Institute projects span a wide range of disciplines but rest on certain shared premises: that gender is a vital category of analysis for contemporary scholarship and policy-making and that the experiences of women as individuals and as a group can best be understood within their historical, social, and cultural contexts. The institute sponsors interdisciplinary research seminars, and conferences that examine gender issues in areas such as education, employment, law, psychology, history, literature, art, health care, and family structures.

Participants in these projects include:

1. **Stanford Faculty**—Faculty who present and share the results of their research at the institute while maintaining their appointments in their own departments. Faculty receive help in seeking funds for future projects and are eligible to apply for small research stipends. Institute-affiliated faculty also participate in the Faculty Seminars on Feminist Theory. Over 60 faculty members have been associated with the institute.

2. **Graduate Students**—Stanford graduate students work as research assistants at the institute, and have ongoing opportunities for interchange among colleagues and faculty. The institute also houses the Graduate Women’s Network which coordinates student activities. Through the institute, they can obtain exposure to the most advanced thinking in gender-related scholarship.

3. **Undergraduate Students**—Projects undertaken at the institute by Stanford faculty sometimes provide undergraduate research or work-study opportunities for students. Available research possibilities are listed through Undergraduate Research Opportunities. Determination of credit is left to the researcher and the student within guidelines established by the appropriate department. Courses are not offered through the institute, but within academic departments. Course information may be located under the “Feminist Studies” section and other departments in this bulletin.

4. **Visiting Scholars**—About half a dozen scholars affiliated with other universities are in residence each year. While engaged in their own gender-related research, they bring new intellectual concerns to the institute and help develop national and international networks of scholarly interchange.

5. **Affiliated Scholars**—Approximately 20 San Francisco Bay Area scholars working independently without other academic affiliation are selected for two-year renewable terms. This innovative program makes it possible for scholars with advanced degrees, who are not Stanford faculty members, to pursue their own research on women and gender through association with Stanford scholars.

6. **Institute Associates**—These are individuals and corporate sponsors who provide financial support to the institute and help extend its research and educational activities to the broader public. Associates attend institute activities and organize seminars designed to transmit the new scholarship on women and gender to the surrounding community.
INDEPENDENT RESEARCH LABORATORIES, CENTERS, AND INSTITUTES

Provost and Dean of Research: Robert L. Byer
Associate Dean of Research: Patricia L. Devaney

Independent Research Laboratories, Centers, and Institutes perform multi-disciplinary research which extends beyond the scope of any one of the organized schools of the University. The following report to the Vice Provost and Dean of Research:

Center for Economic Policy Research
Center for Materials Research
Center for the Study of Language and Information
Edward L. Ginzton Laboratory
W. W. Hansen Experimental Physics Laboratory
Institute for International Studies
Institute for Mathematical Studies in the Social Sciences
Stanford Synchotron Radiation Laboratory

The Stanford Linear Accelerator Center, which reports to the President and Provost, is independently operated under a contract with the Department of Energy.

Following is a description of the activities of each of these organizations including the research activities and, where applicable, courses offered.

CENTER FOR ECONOMIC POLICY RESEARCH

Director: John B. Shoven
Deputy Director: Ed Steinmueller

As its primary mission, the Center for Economic Policy Research (CEPR) fosters a rational and informed approach to economic policy. CEPR pursues four interrelated goals in support of this mission: (1) stimulating graduate student and faculty research on economic policy issues of continuing importance; (2) communicating its findings broadly; (3) building a community of scholars conducting research on policy issues; and (4) linking the policy community at Stanford with decision makers from business, government, and academia.

CEPR is a University-wide research center, involving individuals from most schools and many departments. Affiliated faculty and students maintain appointments in their home departments while working on CEPR activities. In addition, scholars visiting from other institutions may be affiliated with CEPR.

Through its General Research Program, CEPR fosters policy research initiatives that look to newly developing or recurring issues in the policy arena. This program provides seed money funding for start-up projects. Proposals are particularly encouraged from junior faculty and from faculty members with an interest in starting research on economic policy issues.

CEPR actively encourages policy research in eight topical programs: Technology and Economic Growth, directed by Nathan Rosenberg of Economics and co-directed by consulting Professor of Economics, Ralph Landau; Tax and Budget Policy Program (TAX), chaired by Michael Boskin (currently on leave) and John Shoven of Economics; Energy, Natural Resources, and the Environment Program, chaired by Alan Manne of Operations Research and James Sweeney of Engineering-Economic Systems; High Technology Impact Program (HTIP), chaired by Timothy Bresnahan and Paul David of Economics; Program in Regulatory Policy, led by a committee consisting of Chairman Roger Noll (Economics), David Baron (Graduate School of Business), John Ferejohn (Political Science), and A. Mitchell Polinsky (Law School); Macroeconomics and Monetary Policy Program, chaired by John Taylor of Economics (currently on leave); Program on Finance, chaired by John Shoven of Economics; and Program on the Economy of Japan, chaired by Masahiko Aoki of Economics.

CEPR conducts workshops, conferences, and other events designed to improve the flow of economic policy information among people from a wide variety of institutional and professional backgrounds.

CEPR does not offer courses for academic credit, admit students, or award degrees.
EDWARD L. GINZTON LABORATORY

Director: Richard H. Pantell
Assistant Director: Robert V. Strena


Associate Professors: David M. Bloom (Electrical Engineering), Aharon Kapitulnik (Applied Physics)

Assistant Professor: Martin M. Fejer (Applied Physics)

Professors (Research): Bertram A. Auld (Applied Physics and Ginzton Laboratory), B. T. Khuri-Yakub (Electrical Engineering)

Visiting Associate Professor: Byoung Y. Kim

The Ginzton Laboratory houses the research activities of a number of faculty members from the departments of Electrical Engineering, Applied Physics and Materials Science and Engineering. The multi-disciplinary foundations of the faculty, the students, and the research provide a dynamic academic environment for a broad spectrum of scientific research interests including fiber optics, laser physics and technology, microwave acoustics, non-destructive evaluation technology, pico-second optical electronics, quantum electronics, superconducting composites and electronics, and tunneling and force microscopy.

W. W. HANSEN EXPERIMENTAL PHYSICS LABORATORY

Director: Mason R. Yearian
Assistant Director: Robert A. Farnsworth
Associated Faculty: B. Cabrera, R. Hofstadter, J. Lipa, P. Michaelson, H. A. Schwettman, T. Smith, J. Turneaure and M. Yearian (Physics), P. Scherrer, G. Timothy and A. Walker (Applied Physics); C. W. F. Everitt (HEPL); B. Parkinson (Aeronautics and Astronautics)

The W. W. Hansen Experimental Physics Laboratory (HEPL) is engaged in basic research in high energy physics, astrophysics, accelerator physics, and low temperature physics, which currently includes experiments involving superconducting accelerators, a gyrorelativity satellite, gravity waves, gamma-ray and x-ray detection in space, and free electron lasers.

THE INSTITUTE FOR INTERNATIONAL STUDIES (IIS)

Director: Richard W. Lyman (President Emeritus and Wallace J. Sterling Professor in the Humanities)
Deputy Director: Thomas C. Heller (Professor of Law)
Associate Director: Nancy E. Okimoto

IIS was established in 1988 as a means of coordinating Stanford's numerous activities in the fields of international, comparative, and regional studies. Its mission is to promote excellence in teaching, research, and public service in these fields. It supports the scholarly community at Stanford by strengthening existing programs in international studies, aiding in the formation of new programs, and stimulating the development of an international perspective in subject matter not traditionally regarded as international.

IIS provides the University with a means of planning, financing, stimulating, and coordinating activities and programs in the international field. It is continuously and closely involved in the support of Stanford's foreign area and language programs and a variety of major research programs. IIS raises and administers funds from government, 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 IIS are University-wide and involve faculty members in the Schools of Humanities and Sciences, Law, Business, Education, Medicine, and scholars from the Hoover Institute. One of its goals is to develop coherent multi-disciplinary, regional, and cross-regional teaching and research programs. Its relations with departments in the social sciences and humanities are especially close, but it also seeks to develop new programmatic relationships with departments in science, engineering, and the professional schools. Other relationships include the Hoover Institution on War, Revolution, and Peace, which manages native-language library collections that support the foreign language and area studies programs; the International Relations Program, and the Overseas Studies Program. The institute and Overseas Studies are jointly developing programs at the overseas campuses that provide more opportunities for Stanford students and faculty to conduct their research in collaboration with experts abroad. The institute administers the research operations of the Stanford Japan Center, located in Kyoto, Japan.

In the sphere of public service, IIS 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 projects on China, Japan, Africa, Latin America, Western Europe, and the Soviet Union and Eastern Europe. Projects are organized within the Stanford Program on International and Cross-cultural Education (SPICE). SPICE is the curriculum-development component of the California International Studies Project (CISP), a project established to strengthen pre-collegiate teaching in history, geography, international economics, and other cultures. The institute initiated the project and manages a network of nine regional resource centers throughout the state. The institute also administers the California Foreign Language and International Studies Project (CFLISP), a statewide foreign language staff development network for teachers of foreign language.

The institute administers, on behalf of two consortia of major universities, the Inter-University Center for Japanese Language Studies in Yokohama 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.

While IIS shares a limited number of academic faculty appointments with departments or schools, it neither offers courses nor confers degrees. These academic functions are performed by the schools, departments, and programs associated with the institute.

IIS is located at 200 Encina Hall, telephone (415) 723-4581.

PROGRAMS

The institute administers four established research centers: the Americas Program, the Stanford Center for European Studies, the Center for International Security and Arms Control, and the Northeast Asia-United States Forum on International Policy. Each of these programs brings together Stanford faculty members from several scholarly disciplines with senior specialists from around the world for research projects, seminars and conferences, and international scholarly exchange. Publications from the research programs include special reports, occasional papers, working papers, conference papers, reprints, and books issued through Stanford University Press. Each program within the institute is organized separately with faculty directors, affiliated faculty, research associates, fellows, visiting scholars, and administrative staff. While they are not degree-granting programs, the research centers play an important role in organizing and administering interdisciplinary courses which are cross-listed by many departments.

In developing new programs, the institute places emphasis on research and teaching related to the political economy of interdependence, the quality of life in the global environment, national identity and culture, international security, and science and technology policy.

AMERICAS PROGRAM

Director: Clark Reynolds (Professor, Food Research Institute)

The Americas Program originated in 1980 as the Project on United States-Mexico Relations. The program was subsequently expanded to include a research emphasis on North America (U.S., Mexico, and Canada). The program's research interests include economic interdependence, regional trade, and energy policy. The program is located at 200 Encina Hall, telephone (415) 723-3096.
STANFORD CENTER FOR EUROPEAN STUDIES

Director: Philippe Schmitter (Professor, Political Science)

The Stanford Center for European Studies was established in 1986 as the focal point for promoting and coordinating teaching and research on Western Europe. It is not a degree-granting program but encourages students and faculty to include a European component in research and study within the established disciplinary or professional programs. The center concentrates its efforts on increasing interdisciplinary communication among its members and attracting distinguished visitors to the campus. Under a grant from the Mellon Foundation, the center sponsors a range of activities: conferences, workshops, special seminars, lectures by European scholars, informal discussion groups, and other similar events. The center brings to the campus each year a visiting scholar closely associated with one of the Stanford overseas campuses in Europe. It also offers two postdoctoral fellowships selected through a competitive process and a number of pre-dissertation grants that enable Stanford students to conduct research in Europe during the summer months. The center is housed in 162K-N in Building 160 (Political Science), telephone (415) 723-9593.

THE CENTER FOR INTERNATIONAL SECURITY AND ARMS CONTROL

Co-Directors: John W. Lewis (Professor, Political Science), William J. Perry (Professor, Engineering-Economic Systems)

The Center for International Security and Arms Control expanded in 1983 from its original base as the Arms Control and Disarmament Program which was established at Stanford in the early 1970s. Faculty from business, engineering, communication, history, political science, law, medicine, the Stanford Linear Accelerator Center, and specialists from outside the University comprise the membership of the center. Members work collectively on research, training, and outreach related to arms control and international security. Research foci include the technical aspects of arms control, regional security relationships (with emphasis on the Asian-Pacific region, the Soviet Union, and Eastern Europe), prevention of accidental nuclear war, and ethical issues of organized violence in the nuclear age.

The training efforts of the center include a sequence of undergraduate courses taught under the auspices of the Political Science Department (Arms Control and Disarmament, Political Science 138A, B, and D) and an annual program of visiting fellowships which brings predoctoral and postdoctoral fellows to the center each year from the U.S. and abroad. In addition, a program for science fellows, initiated in 1993, brings midcareer scientists to the center for training in the technical and political aspects of arms control and international security.

The center is located in Galvez House, 320 Galvez Street, telephone (415) 723-9725.

THE NORTHEAST ASIA-UNITED STATES FORUM ON INTERNATIONAL POLICY

Director: Daniel I. Okimoto (Associate Professor, Political Science)

Director of Research: James Raphael

The Northeast Asia-United States Forum on International Policy serves as a focal point at Stanford for research, training, and exchange activities related to international policy issues involving the U.S., China, and Japan. Some 60 faculty members throughout the university are forum members. The forum’s programs have in residence each year a group of visiting fellows and graduate research assistants. Current research projects include work on U.S.-Japan developments in science and technology, China’s emerging role in the Asian-Pacific region, and studies of comparative capitalism. Forum members offer an interdisciplinary course on Asia as a region. In Japan, the forum manages the research operations of the Stanford Japan Center in Kyoto.

The forum is located at 200 Encina Hall, telephone (415) 723-9741.

AREA STUDIES

Stanford has four interdisciplinary language and area programs: African Studies, East Asian Studies, Latin American Studies, and Russian and East European 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. Affiliated faculty members from the relevant schools and departments participate in the activities 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. For course information, see individual listings under the "School of Humanities and Sciences" section in this bulletin.

UNDERGRADUATE

A special interdisciplinary Program in International Relations is one of the largest undergraduate majors. Relevant course offerings are described in the "International Relations Program" section of this bulletin. It is possible for students majoring in International Relations to work simultaneously for a coterminal master's degree in International Policy Studies. The IPS graduate program and relevant course offerings are described in the "International Policy Studies" section of this bulletin.

INTER-UNIVERSITY PROGRAM FOR CHINESE LANGUAGE STUDIES IN TAPEI

The Inter-University Program (IUP) for Chinese Language Studies in Taipei, Taiwan, was established in September 1963. It is sponsored by 10 American universities, with Stanford University as the administrative agency. The program is a cooperative effort drawing upon the accumulated experience of the profession and provides intermediate and advanced language training to a carefully selected group of students.

The purpose of the program is to provide graduate and undergraduate students with intensive audio-lingual language instruction, as well as to further familiarity with Chinese texts and materials preparatory or leading to research in given disciplinary or professional fields. Instruction normally comprises 20 hours per week. The program is a language-training facility, not a research institution.

Undergraduate, graduate, or postdoctoral candidates are eligible to apply to the program if they have successfully completed a minimum of two academic years, or the equivalent, of Chinese language study at the college level. Applicants must also pass a short written screening examination in the Chinese language. Partial fellowship support may be available.

Stanford students attending the Inter-University Program for credit should enroll in Asian Languages C400, Advanced Language Training (15 units per quarter) graded on a Satisfactory/No Credit basis.

For further information write to:
Inter-University Program for Chinese Language Studies
Littlefield Center, Room 14, 300 Lasuen Street
Stanford University
Stanford, California 94305-5013

INTER-UNIVERSITY CENTER FOR JAPANESE LANGUAGE STUDIES IN YOKOHAMA

The Inter-University Center for Japanese Language Studies in Yokohama, Japan, is a cooperative enterprise of 14 major academic institutions in the U.S. 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 Japan provides maximum opportunities for students to gain fluency in both the written and spoken language in a Japanese-speaking and 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, depending upon programs established by their home institutions.

The academic year at the center is equivalent to three full quarters, beginning in early September. Any student may apply for admission provided that he or she: (1) 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; (2) will have successfully completed prior to attendance a minimum of two years of Japanese or its equivalent at the college level; and (3) 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) graded on a Satisfactory/No Credit basis.

For further information write to:
Inter-University Center for Japanese Language Studies
Littlefield Center, Room 14, 300 Lasuen St.
Stanford University
Stanford, California 94305-5013
The Center for the Study of Language and Information (CSLI) is an independent research laboratory bringing together computer scientists, linguists, logicians, philosophers, psychologists, and artificial-intelligence researchers. They collaborate to build theories about the nature of information and how it is conveyed, processed, stored, and transformed by agents through the use of natural and computer languages. CSLI theories reflect the reality that information exchange happens in particular situations, which in themselves contribute to the exchange, and that the agents, both human and computer, are resource-bounded. CSLI's goal is to develop and apply theories of information (explicit, systematic, and at least as rich as our implicit understanding) to an analysis of language as intelligent action. Researchers are examining theories of meaning from philosophy; rational action and decision-making from philosophy and artificial intelligence; inference and reasoning from logic and psychology; grammatical structure from linguistics; detailed programs (large but less complex units of discourse than natural language) from computer science; and the application of connectionist models to information processing.

CSLI was founded in 1983 by means of a large gift from the System Development Foundation and generous support from Stanford University, SRI International, and Xerox Palo Alto Research Center (PARC). These gifts have been supplemented by sponsored projects and the center’s Industrial Affiliates Program (IAP). During its first two years of existence, the IAP has attracted as members ATR Interpreting Telephony Research Labs, Boeing Computer Services, Fujitsu Ltd., Hewlett-Packard Laboratories, Hitachi Ltd., Matsushita Electrical Industrial Co., Mitsubishi Electric Corp., NEC Corp., NTT Nippon Telegraph and Telephone Corp., Sharp Corp., Tokyo Electric Power Co. (TEPCO), WACOM Co. Ltd., and (as founding members) SRI International and Xerox PARC. CSLI’s core researchers are Stanford faculty and members of research groups at local industrial labs, augmented by visiting IAP researchers, visiting scholars from other academic institutions, post-doctoral fellows, and graduate students.

CSLI has developed a model of research that joins academia and industry and the disciplines of artificial intelligence, computer science, linguistics, philosophy, and psychology. It encourages researchers to look at their theories from a variety of viewpoints and reshape them into coherent theories of information that will be far-reaching, not only for the study of natural languages but also for the analysis and design of computer languages and for further advances in the development of artificially intelligent agents.

Coursework related to the research at CSLI can be found in the "Program in Symbolic Systems" section of this bulletin.

**CENTER FOR MATERIALS RESEARCH (CMR)**

**Director:** S. B. Hagstrom  
**Deputy Director:** H. C. Andersen  
**Technical Director:** T. M. Gür  
**Director, Crystal Science Division:** R. S. Feigelson  

**Affiliated Faculty** (currently 81 members from the following departments and laboratories):  

CMR, located in McCullough Building, is one of nine university laboratories in the U.S. 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 and initial funding for established faculty who are changing research fields, and to support so-called “thrust research”—coherent multi-investigator projects in major thrust areas requiring expertise in two or more materials-related disciplines.

To fulfill these goals CMR operates extensive materials characterization facilities and, at the present time, sponsors 10 summer programs for undergraduates, three programs for women, four seed programs, and four multi-investigator, multi-discipline thrust programs. CMR’s professional staff also conducts research programs in crystal synthesis, vapor phase synthesis, and materials characterization.
IMSSS is a research institute primarily funded by gifts, government grants, and contracts. The current major emphases are on research in computer-assisted instruction and robotic language and learning. The staff includes research associates, graduate student research assistants, programmers, and faculty.

STANFORD LINEAR ACCELERATOR CENTER

Director: Burton Richter
Deputy Director: Sidney D. Drell
Executive Officer of the Faculty: David W. G. S. Leith
Associate Directors: Kaye D. Lathrop (Technical Division), Charles Y. Prescott (Research Division), John Rees, Eugene B. Rickansrud (Business Services Division)
Associate Professors: David L. Burke, Thomas M. Himel
Assistant Professors: Rafe H. Schindler, Morris Swartz, Walter Toki

The Stanford Linear Accelerator Center (SLAC) is devoted to experimental and theoretical research in elementary particle physics and to the development of new techniques in high energy accelerators and elementary particle detectors. The center is on 425 acres of Stanford property west of the main campus and is operated under a contract with the Department of Energy.

The two-mile-long linear accelerator, which began operations for physics research in 1966, can provide electron and positron beams at energies up to 50 GeV. Electron-scattering experiments in the late 1960's, with lower energy beams, established the existence of point-like constituents within the proton—the first evidence for the quark sub-structure of matter. In addition, polarized electron beams can be produced with polarization of 40% at full beam intensity and energy. In 1978, one of the experiments performed using this beam established the existence of clear connections between the weak and electromagnetic interactions.

Although some fixed-target experiments continue to be carried out at SLAC, the emphasis has shifted toward experiments based on collisions between high-energy beams of electrons and positrons. This work has evolved through three stages: the SPEAR storage ring, the PEP storage ring, and the more recent SLAC Linear Collider (SLC).

SPEAR is a storage-ring facility, completed in 1972, in which beams of electrons and positrons collide at center-of-mass energies up to about 7 GeV. Experiments at SPEAR resulted in the discovery of the psi particle, for which the 1976 Nobel Prize in physics was awarded, and in the discovery of the tau lepton, for which the 1983 Wolfe Prize was awarded. In 1990 the SPEAR ring was turned over to the Stanford Synchrotron Radiation Laboratory (SSRL) for its exclusive use as a source of intense vacuum ultraviolet and x-ray beams.

PEP is a larger electron-positron colliding-beam storage ring, built as a collaborative effort between SLAC and the Lawrence Berkeley Laboratory, and completed in 1980. Throughout the decade of the 1980's, experiments were carried out in all six of the machine's interaction regions, at center-of-mass energies up to 29 GeV. Modifications of the ring during this period have resulted in a significant increase in luminosity. At present, experiments continue in one of the interaction regions at PEP, at high luminosity, and with a powerful detection facility.

The most recent electron-positron colliding beam facility at SLAC is the first of an entirely new class of accelerators called linear colliders. Extensive modification of the existing two-mile linac has resulted in the SLAC Linear Collider (SLC), which can simultaneously accelerate electrons and positrons to beam energies up to 50 GeV. These beams are then separated and guided around two different magnetic arcs to a single collision point. Experiments began in 1988, and since then SLC has been used to produce and study the Z0 particle, the neutral mediator ("carrier") of the weak interaction. These studies resulted in establishing, with a
high degree of confidence, that there exists not more than three kinds of conventional light neutrinos and therefore, by inference, not more than the three "generations" of particles that are presently known within the Standard Model. In 1990 a powerful new detection facility is being installed at the SLC interaction region, with prospects for a continuing experimental program in the important energy region of the $Z^0$ resonance. In addition to its utility as a particle physics vehicle, the SLC is a pioneering embodiment of a new colliding-beam technique that carries on Stanford's leading role in high energy electron machines. Continuing development of the linear collider idea is a central element in SLAC's long-term program.

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 June 1990, physicists from more than 130 other institutions have had research programs accepted for execution at the center. The faculty of the center leads a group of some 135 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 has dealt with almost all areas of elementary particle physics at high energies. 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 SYNCHROTRON RADIATION LABORATORY (SSRL)**

Director: A. Bienenstock  
Deputy Director: H. Winick  
Associate Directors: G. Brown, R. Gould, K. Hodgson, I. Lindau (on leave), P. Pianetta, H. Wiedemann  

SSRL is a national research facility supported by the Department of Energy and the National Institutes of Health for the utilization of synchrotron radiation for research in the natural sciences, medicine, and engineering.

Synchrotron radiation is electromagnetic radiation emitted by relativistic charged particles curving in magnetic fields. SSRL has 25 experimental ports on the storage rings SPEAR and PEP located at SLAC. The radiation emitted from these rings 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. Among the types of experimental studies being performed are: x-ray absorption, spectroscopy, x-ray diffraction, atomic physics, x-ray fluorescence analysis, photoemission, photoelectron diffraction, non-invasive angiography, x-ray lithography, x-ray microscopy, and time-resolved fluorescence spectroscopy.

Accelerator physics and development of advanced sources of synchrotron radiation are major interests of the laboratory. SSRL is interdisciplinary with students from the following Stanford departments actively pursuing degrees: Applied Physics, Chemical Engineering, Chemistry, Electrical Engineering, Geology, Materials Science, Medicine, and Physics.

Students interested in working at the facility should contact a member of the affiliated faculty or one of the associate directors.
HOOVER INSTITUTION ON WAR, REVOLUTION, AND PEACE

Director: John Raisian
Counselor: W. Glenn Campbell
Associate Directors: Annelise Anderson, Richard T. Burress, Thomas H. Henriksen, Charles G. Palm
Assistant Director: Richard Sousa
Budget and Finance Officer: Sally J. Vanders
Public Affairs Manager: Gloria J. Walker
Personnel and Staff Affairs Officer: Helen M. Corrales

Research and Publications
Honorary Fellows: Friedrich A. Hayek, Ronald W. Reagan, Alexander Solzhenitsyn
Distinguished Fellow: George P. Shultz
Consultant: Yuan-li Wu


Research Fellows: Arnold Beichman, Fu-mei C. Chen, Masayo Duus, Keith Eiler, Gregory Fossedal, Stephen Jurika, Jr., Ying Lin, George Marotta, Sig Mickelson, James H. Noyes, Agnes E. Peterson, Judy Shelton, Kevin Starr, Paul Weaver

Executive Secretary of National, Peace, and Public Affairs Fellows Program: Thomas H. Henriksen

Distinguished Visiting Scholar: George Stigler
Distinguished Visiting Fellows: William R. Graham, Edwin Meese III

Library and Archives
Associate Director for Library and Archives: Charles G. Palm
Technical Services Head: Joseph Kladko
Readers' Services Head: Neil McElroy
Preservation Services Head: Judith Fortson

Africa and Middle East Collection—Stella and Ira Lillick Curator: Peter J. Duignan; Deputy Curators: Karen Fung, Lewis H. Gann; Assistant Curator: Edward A. Jayko

Central and West European Collection—Curator: Agnes F. Peterson
East Asian Collection—Curator: Ramon H. Myers; Research Fellow: Fu-mei C. Chen; Deputy Curators: Emiko Moffitt, Mark Tam
Russian, Soviet, and East European Collection—Curator: Robert Conquest; Deputy Curator: Joseph D. Dwyer; Assistant Curator: Maciej Siekierski

Latin and North American Collections—Curator: William E. Ratliff

Hoover Institution Archives—Archivist: Anne Van Camp; European Field Representative: Francis de Tarr; Deputy Archivists: Robert Hessen, Dale Reed; Associate Archivist: Elena Danielson; Assistant Archivists: Martha Hill, Marilyn Kann, Carol Leadenham

British Labour Collection—Honorary Curator: Peter Stansky

Hanna Education Collection—Curator: Gerald A. Dorfman

Since its founding by Herbert Hoover in 1919 as a special collection dealing with the causes and consequences of WWI, the Hoover Institution on War, Revolution, and Peace has become an international center for documentation, research, and publication on political, economic, social, and educational change in the 20th 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, Russia and the Soviet Union, 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 who have played significant roles in the events of this century, the 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. The International Studies Program, the Domestic Studies Program, and the National Security Affairs Program publish basic research, documentary studies, and current public policy analyses.

Notable long-term research in progress in the International Studies Program includes the areas of world-wide democratic movements, African colonialism, post-Mao China, the international communist movement, non-Russian nationalities in the Soviet Union, Latin America, and the U.S., and the role of education in development abroad. Research on the latter has been enhanced by the establishment of the Paul and Jean Hanna Collection on the Role of Education in 20th-Century Society. Richard F. Staar is coordinator of the program.

The Domestic Studies Program sponsors scholarship on social, economic, and policy issues in the U.S. The program carries out both basic and applied research in the social sciences and brings into focus broad policy issues in such vital areas as fiscal policy and budget reform. Political economy and public choice, welfare and regulatory reform, as well as other domestic policy concerns. Edward Lazear coordinates the program.

The National Security Affairs Program was significantly expanded four years ago. Many of the scholars in the program combine theoretical knowledge with practical experience at high levels of government service. They have served, or are serving, in such agencies as the National Security Council, the Arms Control and Disarmament Agency, the Department of State, and the Department of Defense. Their knowledge and expertise place them in a unique position to analyze the strategic, political, ideological, and economic challenges confronting the U.S. in today's bipolar world. The program, which is interdisciplinary in nature, is coordinated by Dennis L. Bark.

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. The National Peace and Public Affairs Program, for example, provides about 14 scholars annually with the opportunity to pursue advanced postdoctoral research. Thomas H. Henriksen coordinates the National Fellows Program.

The institution also maintains a publications program. In addition to books published by the Hoover Institution Press, research results are disseminated through seminars, conferences, journal articles, lectures, testimony, and the news media.

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 E. Hall on a joint appointment with the Economics Department; senior fellow Seymour Martin Lipset on joint appointment as the Caroline S. G. Munro Professor of Political Science and with the Sociology Department; senior fellow John A. Ferejohn on joint appointment with the Political Science Department; senior fellow Henry S. Rowen on joint appointment as the first Edward B. Rust Professor of Public Policy and Management at the Graduate School of Business; Professor Thomas F. MaCurdy in Economics is a senior fellow; senior research fellow Kenneth E. Scott on joint appointment as Ralph M. Parsons Professor of Law and Business in the Law School; senior research fellow Mauro Capelletti on joint appointment with the Law School; senior research fellow Joseph Berger on joint appointment as chair of the Sociology Department; Professor Kenneth J. Arrow in Economics; Peter Duus in History; Heinz Eulau and Robert E. Ward in Political Science; Nancy B. Tuma, in Sociology, is a senior fellow (by courtesy). East Asian curator Ramon H. Myers is adjunct professor at the Food Research Institute and acting professor in the History Department; senior fellow Bruce Bueno de Mesquita is professor (by courtesy); senior research fellow Larry Diamond is assistant professor (by courtesy) in the Sociology Department; research fellow Fu-mei C. Chen is a lecturer at the Law School; and deputy archivist Robert Hessen teaches in the Graduate School of Business.

In addition, Peter J. Duignan, who is the institution's curator on Africa, serves as a 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 institution's East Asian library collects research materials in the Chinese and Japanese languages for all of Stanford University.

Hoover scholars have received many awards and distinctions. Associated with the Hoover Institution are five Nobel laureates, a recipient of the National Medal of Freedom, 17 fellows or foreign honorary members of the American Academy of Arts and Sciences, 11 fellows of the American Association for the Advancement of Science, six members of the National Academy of Sciences, four members of the National Academy of Education, and five members of the American Philosophical Society.

The Hoover Institution's complex includes the tower and two adjacent buildings, one of which is the Herbert Hoover Federal Memorial. An exhibit pavilion displays selected archival and library materials for the public.

**UNIVERSITY LIBRARIES**

**Emeriti:** William P. Allan (Curator for English and American Literature); 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); 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 S. Morehead (Assistant Chief for Monograph Cataloging); Jack Plotkin (Chief Circulation Librarian); Marion Smith (Director, J. Hugh Jackson Library, Graduate School of Business); Grace Stillson (Assistant Chief, Catalog Department)

**University Libraries**

- Vice President for Library and Information Resources: Robert L. Street
- Director of Administrative Services: Bruce A. Jones
- Director of Technical Services: Cynthia I. Gozzi
- Director of Meyer Library and Research Branch Libraries: Karen Nagy
- Director of Library Collections: Michael T. Ryan
- Library Development Officer: Ann W. Bender

**Department Chiefs:** Anthony M. Angiletta (Foreign Languages and Area Collections, General Reference); Constance Brooks (Preservation); Win-Shin Chiang (Government Documents); Diane Chilamoczyk (Catalog); Delia Jacob (Human Resources); Karen Kalinsky (Catalog); Joan K. Krasner (Access Services); Jerry C. Persons (Systems); Victoria Reich (Acquisitions and Serials); Michael T. Ryan (Special Collections and University Archives)

**Branch Librarians:** Alan Baldridge (Marine Biology); Grace Baysinger (Swain Chemistry and Chemical Engineering); Barbara Celone (Cubberley Education); Charlotte Derksen (Branner Earth Sciences); Eleanor Goodchild (Engineering); Rebecca Lasher (Mathematical and Computer Sciences); Henry Lowood (Physics); Charles C. Milford (Food Research Institute); Alexander Ross (Art and Architecture); Barbara Sawka (Music); Joseph G. Wible (Falconer Biology)

**Curators—Collection Development Program:**
- James M. Breedlove (Latin American Collections); Eleanor Goodchild (Science Collections); James Knox (U.S. and British History Collections); Henry Lowood (Germanic Collections); William McPheron (English and American Literature Collections); Mary Jane Parrine (Romance Language and Humanities Collections); Alexander Ross (Art and Architecture Collections); Roberto Trujillo (Mexican American Collection); Anthony M. Angiletta (Social Science Collections); Wojciech Zalewski (Slavic and East European Collections)

**Curators—Honorary:** W. Conyers Herring (Physics Collection); William R. Moran (Archive of Recorded Sound); Margaret C. Sowers (Map Collections); Samuel Stark (Theater collection); Charles J. Tannenbaum (Exhibits)

**Hoover Institution**

See “Hoover Institution” section in this bulletin.

**J. Hugh Jackson Library, Graduate School of Business**
- Director: Bela Gallo
- Assistant Director/Head Technical Services Librarian: Robert E. Mayer
- Head Public Services Librarian/Assistant Director: Karen A. Wilson

**Lane Medical Library**
- Director: Peter Stangl
- Deputy Director and Head of Public Services: Valerie Su

**Head of Technical Services and Systems Librarian:** Dick Miller

**Crown Law Library**
- Law Librarian: Lance E. Dickson
- Associate Law Librarian: Rosalee M. Long
- Public Service Librarian: J. Paul Lomio
The Stanford University Libraries sponsor educational activities that promote awareness of its resources, and instruct patrons in their effective use. All the major library units provide some educational activities; the J. Henry Meyer Memorial Library places particular emphasis upon media and services in support of the curriculum of the university and of the Continuing Studies Program.

In each library unit, reference staff provide general advice on locating and using both print and online information sources. Subject specialists and reference librarians offer assistance in specific disciplines either individually or in groups, by lecture to classes upon request, tours, demonstrations, or special workshops. The libraries provide workshops each quarter that instruct patrons on the use of Socrates, the online catalog. Instructional support is provided at the libraries' microcomputer clusters, audio-visual facility and language laboratory.

The libraries also produce publications about physical facilities, scope of collections, and services for those patrons interested in self-learning. Examples include the "Library Resource Guide" distributed in the Stanford Daily each Autumn Quarter, "Socrates: A User's Guide to the Online Catalog," and "Guide to the Engineering Library." A general description of the libraries, their collections, and services can be found in the Stanford University Bulletin Information.

COURSES

Intended to serve those students for whom a more extended study of bibliographic organization is useful.

Art 236, Art History Bibliography and Library Methods—Introduction to reference works essential to study in art and architectural history. Sources of artistic, historical, and cultural information in printed and automated forms. Primarily for art history graduate students; junior or senior undergraduate majors who plan to continue in art history on the graduate level may enroll with consent of the instructors.

4 units (Bowen, Ross)
alternate years, given 1991-92

French and Italian 397. Colloquium on Research Methods in French and Italian Studies—Acquaints graduate students with general and specialized resources for French and Italian studies. Emphasis on overall strategy for research, but provides an opportunity to explore bibliographical sources in the particular fields of interest to each student.

2 units, Aut (Parrine)

Latin American Studies 260. Colloquium on Latin American Bibliography—Directed to the needs of beginning graduate students. Acquaints them with the principal resources for Latin American studies in the humanities and social sciences and teaches the mechanics of utilizing the bibliographic data available for the study of Latin America.

3 units, Aut (Breedlove)

Medical Information Sciences 208. Computer-Assisted Literature Searching—(Same as Medicine 225.) See description listed under those departments.

Music 200. Music Bibliography—Survey of essential research resources and methods of information retrieval for music. Introduction to the use of local, institutional, and network resources. Practical experience in evaluation and use of dictionaries, encyclopedias, bibliographies, discographies, indexes, and catalogs. Guest presentations related to resources and programs of the Music Department.

4 units, Aut (Nagy)

Slavic Languages 200A. Introduction to Slavic Bibliography—Historical and evaluative analysis of Slavic bibliographic and research tools emphasizing Russian and Soviet materials. Application of bibliographic search methodology. Final bibliographic project required. Reading knowledge of Russian required, another Slavic language helpful.

1-3 units, Aut (Zalewski)
Vice President for Libraries and Information Resources: Robert L. Street

Libraries and Information Resources (LaIR) is responsible for the University Libraries (see the "Libraries" section of this bulletin), for campus-wide academic and administrative computing, and for computer networking and telecommunications. LaIR facilitates the acquisition and availability of hardware and software, supplies communications paths and links, and develops computing and communications expertise. It also offers consultation and advice for planning, development, and use of information technology, and furnishes training and support for faculty, staff, and students who use this technology.


ACADEMIC INFORMATION RESOURCES

Director: Ralph E. Gorin

Academic Information Resources seeks to support and enhance instruction and research through the application of computer technology. It provides the Stanford academic community with access to computers and software. Through courses, publications, and consulting, AIR educates and assists community members so they may become knowledgeable users of computers. By developing and supporting applications of computer technologies for learning, AIR supports Stanford faculty, students, and staff in their computer-related academic endeavors. In addition, AIR develops system software environments for distribution on campus. For more information about AIR programs, call (415) 723-1055, or send electronic mail to info-desk@air. AIR operates several computers for the Stanford academic community. In general, Stanford students and faculty can use the computers free of charge, for purposes of instruction and unsponsored research only; sponsored research and commercial use are prohibited. They can also use the computers for electronic mail. Users receive allocations of computer resources in proportion to their coursework and research needs. The time sharing services on the mainframe computers are: UNIX, VM/CMS, and TOPS-20. Information about these services, including information about opening AIR computer accounts, is introduced in separate handouts. They are found in the document racks on the second floor of Sweet Hall. For more information about the AIR computers, contact AIR by calling (415) 723-1055 or sending electronic mail to info-desk@air. UNIX time sharing services are available on a VAX 8800, called Portia. Interactive services include text editors; statistical packages such as Isp and S; and programming languages such as Pascal, FORTRAN, C, and Ibuki Common LISP. Other UNIX services are available through AIR workstations, described below.

VM/CMS time sharing services are available on two IBM 4381 computers, called Watson and Oberon. Interactive services include the graphical display manager GDDM, statistical packages such as BMDP, SAS, and SPSS*, and programming languages such as FORTRAN; and Pascal/VS. These computers were made available through a grant from IBM; their use is limited primarily to research and instruction in the School of Humanities and Sciences, particularly the Departments of Chemistry, Communication, Economics, Political Science, and Sociology. Other users with special needs for the statistical and numerical analysis programs under VM/CMS may apply for access to these systems. For more information, contact AIR by calling (415) 723-1055 or sending electronic mail to info-desk@air. VM/CMS services will be discontinued in June 1992.

TOPS-20 time sharing services are currently available on a Systems Concepts SC30M computer called Macbeth. TOPS-20 services will be discontinued in June 1991. Users of this system should consider changing to another system during the academic year. For more information, contact AIR by calling 723-1055 or sending electronic mail to info-desk@air.

Besides mainframe services, AIR offers UNIX workstations, e.g., DEC, NeXT, and Sun, in the computer cluster on the second floor of Sweet Hall. AIR also furnishes Apple Macintosh computers at AIRport, the cluster in Tresidder Union. Stanford students or faculty members can use the AIR computers without charge. Document racks on the second floor of Sweet Hall have instructions on how to obtain an AIR UNIX computer account.
AIR also offers technical consulting and advice on AIR computers, personally-owned microcomputers and workstations, and supercomputing. Staff members test and evaluate computer systems and software, produce informational and instructional computing publications, provide introductory classes, sponsor seminars and demonstrations of new products in conjunction with computer vendors, and help managers administer clusters of microcomputers located in Stanford Libraries and other buildings on campus (including some residences).

As part of their consulting service, AIR operates a lab located in room 222 on the second floor of Sweet Hall. Faculty, students, and staff may experiment with a variety of both personal computers and workstations and software such as word processing programs, spreadsheets, programming languages, and graphics packages. The AIR Consulting Lab's hours are Monday through Friday, 9:00 a.m. to 5:00 p.m. For access, come to the Information Desk on the second floor of Sweet Hall. For more information, contact AIR at 723-1055, info-desk@air.

The Courseware Development Lab on the ground floor of Sweet Hall is where faculty and students can design and build academic microcomputer software or "courseware." The lab provides advanced development systems for special projects. If a professor or a student has an idea for software development and provides programmer(s), AIR provides space, hardware, software, and advice. The facility contains Apple Macintosh, IBM PC, and NeXT development environments. Faculty and students interested in using the lab should contact Steve Loving, (415) 723-9214, loving@air.

Located in room 029, the AIR Sight and Sound Lab is for faculty and students creating libraries of multimedia source materials: videos, sounds, and still images. Video digitizing and synthesizing, videodisc prototyping, and slide-to-video transfers are possible. The center is largely self-service with special training required. For help on creating multimedia source materials, contact Steve Loving, 723-1055, loving@air.

The Courseware Development Lab also has facilities for developing multimedia courseware. Working with AIR staff, faculty can develop these videodisc-based computer programs, which use any combination of text, video (clips from commercial films or a professor's own video), audio (voice or music), slides, and computer graphics. For more information on developing multimedia courseware, contact Barbara Jasinski at 723-3153, bjj@air.

AIR is also active in the development and distribution of the UNIX operating system on campus and in the development and integration of workstations into the mainstream of academic computing.

**COURSES**

During the first few weeks of each quarter, AIR offers short, non-credit introductory classes about using its computer systems. The Stanford Data Center offers other non-credit classes in computing. See the "Computer Science" Department section of this bulletin for programming classes for credit.

Schedules for the AIR classes are found in the document racks on the second floor of Sweet Hall. Students can view class videotapes either at home, in the Math/Computer Science, Terman Engineering, and Meyer Libraries, or on SUNet cable television. Videotapes can be borrowed from Meyer Library. For the SUNet broadcast schedule, consult the flyer Enjoy the View: Computer Training Videotapes on SUNet, found in the document racks in AIRport, the Macintosh cluster in Tresidder, and on the second floor of Sweet Hall.

**EMACS Introduction** — Introduction to EMACS, the screen-oriented test editor on Portia and Macbeth.

0 units, Aut, Win, Spr, Sum

**Macintosh Cluster at Tresidder Introduction** — For those with little or no previous Macintosh experience. Overview of hardware and basic operations (initializing diskettes, selecting icons, creating folders, and opening and closing applications and files). AIRport policies and introduction of fileservers. Accelerated class assumes prior knowledge equivalent to that of the beginning course, and covers materials specific to the Macintosh AIRport (file and printing services, electronic mail services, and the cluster's priority system).

0 units, Aut, Win, Spr, Sum

**UNIX™ Introduction** — Provides minimum instruction necessary to use the UNIX™ operating system that runs on Portia. Topics: opening an account, logging in, logging out, features of the UNIX™ file system, useful utilities, creating and editing files, and running programs on Portia.

0 units, Aut, Win, Spr, Sum

**VM/CMS Part I** — Provides minimum instruction necessary to use the VMS operating system that runs on Watson and Oberon. Topics: logging on, basic file manipulation, electronic mail, basic CMS, and XEDIT (text editing) commands.

0 units, Aut, Win, Spr, Sum

**VM/CMS Part II** — Topics: introductory and intermediate commands for XEDIT, and advanced mail commands. For those who know the basics...
of VM/CMS and XEDIT and wish to increase their knowledge and skill.

0 units, Aut, Win, Spr, Sum

X Window System Introduction—Hands-on introduction to the X Window System that runs on Sun, VAX, Macintosh II (running A/UX), and IBM PC RT systems. For beginners and others.

0 units, Aut, Win, Spr, Sum

Introduction to Statistical Packages Using VM/CMS—Provides minimum instruction necessary to begin using the statistical packages SAS, SPSS®, Minitab, and BMDP. For those who have a working knowledge of the VM/CMS operating system and little or no knowledge of statistical packages.

0 units, by arrangement

LIBRARY INFORMATION SYSTEMS

Director: Bruce Jones.

The Library Information Systems program provides access to computer-based services and resources, including: catalogs of teaching and research materials located at Stanford and around the country; indexes to articles and papers in journals, magazines, and dissertations and technical reports; collections of data, news, and facts in a variety of computer, broadcast, and printed formats; and courseware and magnetic media used for classes, laboratory sessions, and independent study assignments.

The staff provide consulting services at each library’s reference desk. They help you identify, locate, and use the information resources that Stanford makes available to students and faculty. For more information, contact the Office of the Director of Library Information Systems by calling (415) 723-2018 or sending electronic mail to cn.lib@forsythe.

NETWORKING AND COMMUNICATION SYSTEMS

Director: William H. Yundt.

Networking and Communication Systems provides technical advice and counsel to faculty, students, and staff on their data, video, and voice networking needs. It operates both SUNet (a University-wide computer and video network which connects all major academic buildings and student dormitories) and the campus telephone system. It identifies network standards, evaluates products, and provides the hardware and software that allow departmental networks to access SUNet services, including electronic mail, file transfer, the sharing of expensive resources, and video communication for instructional television and image retrieval. SUNet also offers connections to off-campus networks, including access to supercomputing facilities. The division offers publications and consulting services and seminars on local and cross-campus networks. For more information, call Networking and Communication Systems, (415) 723-3909.

STANFORD DATA CENTER

Director: John R. Sack

Stanford Data Center supports the institutional processes of the University and the Hospital by providing them with highly reliable data processing, and centralized and decentralized printing technologies. The center supports local systems, offering consultation services, and services based on the Data Center's mainframe computer. More specifically, the center helps departments and programs to effectively acquire, develop, and use these technologies for managing information. The Data Center also handles all campus mail services and provides Vector processing through AIR (Academic Information Resources).

In Forsythe Hall, the center operates an IBM 3090 and provides machine and staff services to the Stanford community. Public terminals are available at Forsythe and other accessible campus locations. The center also maintains connections for Stanford to national networks such as Telenet.

Computer-based services include: screen text editing (WYLBUR) and formatting (SCRIPT) programs for preparing reports, letters, data, and theses; SPIRES, the Stanford-developed data base management system; Prism, the online collection of Stanford administrative files and services; and Folio, a system which provides on-line access to Stanford’s academic and institutional data resources such as Socrates, the online library catalog.

The Data Center has an extensive master library of application-specific computer routines encompassing statistical, data analysis, and other data processing functions, including SAS®, SPSS-X®, and BMDP®. Extensive data files are available on a variety of subjects. Programming languages for use in interactive and/or batch mode include APL, Assembler H, COBOL, FORTRAN, Pascal, and PL/I. Other software packages that run under the IBM MVS-ESA operating system are also available. Other serv-
ices include high speed page printers; support for local laser printers; CONTACT/EMS™ (an electronic mail handling system); and micro-mainframe linkage using the Samson™ file transfer software.

**COURSES**

Courses and seminars help clients learn to use the facilities and services independently. Courses are non-credit but require registration through the center. They include orientation seminars on the Data Center, beginning-level courses in the use of computers (including microcomputers) for functions such as text editing or information retrieval, and advanced seminars.

Microcomputer courses generally carry a fee; other mainframe courses are free. For current information on places, times, and fees, see the quarterly Class Schedule, available at the Data Center Information Desk in Forsythe Hall, (415) 723-4392 and online in the Prism application IPRIS. To read the course descriptions and schedules online, logon to the Data Center computer and type PRISM SEL IPRIS COURSES.

**UNIVERSITY INFORMATION SYSTEMS**

161A, B. Introduction to Prism—Teaches use of Prism, a mainframe program that houses the departmental applications (SUFIN, SNAP, and NS1) in a consistent and easy-to-use framework. Retrieve records, print copies, enter information into existing files, and generate printed reports.

0 units

165A. Introduction to Folio and Socrates—For non-library staff members. Introduction to the academic and institutional information files available in Folio emphasizing Socrates, the online library catalog. How to search Socrates and the commands used to display, print, save, and transfer your search results.

0 units

**TEXT EDITING AND FORMATTING**

121. Fundamentals of Using Forsythe—Hands-on orientation to the Forsythe computer. The basic tools needed to use Forsythe effectively: Wylibur text editor, electronic mail (comparison of Wylibur and EMS mail systems), Samson (a file transfer and terminal emulation program for microcomputers), logon files, and techniques for saving files on Forsyte.

0 units, Aut, Win, Spr, Sum

211. Advanced Wylibur Editing—Hands-on class reviewing and expanding Wylibur text editing skills. Working with more than one file, merge files and text, make multiple changes to a file, and modify, replace and insert text using line mode. Advanced printing options, special effects (flashing, bold, and underlined text), routing printed output to a U.S. or on-campus mail address.

0 units, Aut, Win, Spr, Sum

212. Wylibur for Statistical and Programming Applications—Batch programs (SAS, SPSS-X, Script/GML, or FORTRAN), and the components necessary to use them. Emphasis on library management, file format for batch jobs, file protection, transferring files from microcomputers, logon EXEC files, and command retry. The differences between Edit Format, LRECL, and card formats and how to send consulting questions and suggestions online.

0 units, Aut, Win, Spr, Sum

215. Document Formatting Using Generalized Markup Language—How to produce an attractively laid out report, manuscript, or other document with a minimum amount of work. Use of simple labels (GML "tags") to organize major parts and headings of a document to simplify layout, and choosing a format from a set of pre-defined document styles. Several basic document layouts, type styles, and printers are available for the various layouts.

0 units, Aut, Spr

221. EXEC Files—Writing simple EXEC files. Topics: file environment; use of variables, expressions, and functions; use of program flow control (e.g., if-else, while, repeat, and cases statements); use of input-output statements (e.g., read, write statements); and the use of procedures to help structure file programs. Corresponds with chapters 1 to 6.2 of Extended EXEC Manual (#808).

0 units, Aut

222. Advanced EXEC Files—For those writing production EXEC files, who want to learn advanced file techniques. Topics: structure of production EXECs; procedures and argument passing; error and attention control; scanning input strings; variables of extended scope; use of multiple active files; and advanced topics.

0 units, Aut

411. WordPerfect Basics—Introduction to basic word-processing concepts, and WordPerfect. Learn basic functions to create, edit, and print documents.

0 units, Aut, Win, Spr, Sum

413. Intermediate WordPerfect—Design documents that include boldface and underlined text, headers, and footers. Learn block-feature, spelling-checker and thesaurus, and page-break and numbering features. Change margins, line spacing, tab settings, and paper size.

0 units, Aut, Win, Spr, Sum

0 units, Aut, Win, Spr, Sum


0 units, Aut, Win, Spr, Sum

418. WordPerfect Graphics and Style Sheets—WordPerfect's desktop publishing features. Create and manage document formats and styles; incorporate graphics within documents for newsletters, presentation graphics, and teaching materials.

0 units, Aut, Win, Spr, Sum

421. Introduction to MultiMate Advantage II—The basic capabilities of MultiMate II, a word processing software program for microcomputers. Focuses on editing functions (inserting, deleting, moving, copying, and replacing text) and modifications of the document's format. Storing files and printing.

0 units, Aut, Spr

423. Advanced MultiMate II—For the experienced MultiMate user. Reinforces and expands word processing skills using advanced features of MultiMate Advantage. Create and use libraries, build key procedures, incorporate shortcuts in formatting and editing, merge form letters with names and addresses, work with long documents using automatic repagination, incorporate headers and footers, and work with columnar numbers for tabular reports.

0 units, Aut, Spr

511. Introduction to Microsoft WORD—Use WORD's short menus to create, edit, and print documents. Select, edit, and format characters, paragraphs, and pages. Delete, insert, copy, and move text and graphics to create professional reports. Search and replace words and phrases, create headers and footers, create footnotes, and check spelling. Produce form letters and labels.

0 units, Aut, Win, Spr, Sum

513. Intermediate Microsoft WORD—Use WORD's full menus to create tables, put borders around text and tables, total figures in a column, move columns, and sort data in a table. Copy character and paragraph formats; create glossary entries, style sheets, templates, and side-by-side columns.

0 units, Aut, Win, Spr, Sum

515. Advanced Microsoft WORD—WORD 4.0's features: setting up facing pages with gutter, creating even and odd headers and footers, creating and manipulating an outline, creating and formatting tables without tabs, wrapping text around objects, etc.

0 units, Aut, Win, Spr, Sum

DESKTOP PRESENTATIONS AND PUBLICATIONS

561. Introduction to MacDraw II—The ease of use of the old MacDraw with sophisticated features. Topics: basics of creating and manipulating objects and text; moving, arranging, duplicating, grouping, aligning, and locking items, and creating a brief slide presentation. Working with libraries, layers, styles and color, customizing menus, patterns, arrows, lines and line spacing; rotating text and graphics to any degree.

0 units, Aut, Spr

571. Introduction to PageMaker—Fundamentals of PageMaker; creation of a one-page flyer and a five-page proposal. Margin, column, and ruler guides to set up a grid and create a multiple column format. Graphics and text from other programs, and manipulating them. Master pages, headers and footers, reverse type, and use PageMaker's auto text flow and built-in styles to lay out a proposal.

0 units, Aut, Win, Spr, Sum

575. Creating a Newsletter with PageMaker—Time-saving tips and design techniques to give newsletters a professional look. Templates by designing master pages and developing a masthead. Spacing between letters, words, lines, and paragraphs, flow text around irregularly-shaped graphics; drop-caps, drop-shadows, screens, and pull-quotes; fit text to the layout and apply styles, image control, and color.

0 units, Aut, Spr

DATABASE MANAGEMENT

231. Introduction to SPIRES—Stanford Public Information Retrieval System allows users to store, retrieve, and add to or modify information contained in its databases. SPIRES database introduction. Search techniques, how to generate simple reports, and how to add, modify, or remove information.

0 units, Aut, Win, Spr, Sum

include dynamic elements, filtering elements or structures, and SPISORT.

0 units, Aut, Spr

234. SPIRES Concepts and Facilities—Databases, particularly SPIRES, and the components necessary to design and create them. Develop a small database (to design, create, and enter information) and maintain and use files.

0 units, Aut, Win, Spr, Sum

239. SPIRES for Programmers—Comprehensive introduction to database development and programming in SPIRES and Prism for those who have programming experience in other languages. High-level overview of application development concepts and facilities of SPIRES and Prism in order to integrate the components of those systems. Students read 700 pages of documentation, complete homework problems on the class and reading material, and design, implement, and package a small database application. Five hours of preparation time for each class session.

0 units, Aut, Spr

431. Introduction to DataEase 4.0 Level I—Seven-hour, hands-on workshop introducing database management with DataEase 4.0. Define forms, enter, view, and modify data, prepare and format quick reports, define and use database relationships, define custom menu systems.

0 units, Aut, Win, Spr, Sum

432. Introduction to DataEase 4.0 Level II—Further database management capabilities. Design and use multiforms, assign form properties, use the DataEase Query Language, define imports and exports to communicate with other software products, define custom menus to tailor DataEase application.

0 units, Aut, Win, Spr, Sum

435. Intermediate DataEase 4.0—Advanced additional capabilities such as referenced, nested, and multi-field relationships. Form definition and record entry, including the use of predefined functions in field derivations/range checks, modifying choice fields, and using relational operators in form definition.

0 units, Aut, Spr

441. Introduction to dBASE IV—Provides familiarity with commands and basic database concepts. Introduces the Control Center and menu selection. Create and modify records, create reports and mailing labels, and copy files for backup purposes.

0 units, Aut, Win, Spr, Sum

531. Introduction to FileMaker—Create a new file, add records to a database, import records from existing database, sort records, and find specific information. Design layouts and create and print reports.

0 units, Aut, Spr

532A. Introduction to Hypercard—HyperCard is an interactive Macintosh application that allows you to store and retrieve information in new ways. Uses and benefits of HyperCard. Basic terminologies and concepts. Start up HyperCard, create, modify, and save stacks, and the paint tools, and create buttons. Emphasis on using stacks and searching for information.

0 units

STATISTICAL AND PROGRAMMING APPLICATIONS

301. JCL for Statistical Packages on the Data Center Mainframe—Use of Job Control Language to read and write files using SPSS-X and the SAS system. How to submit jobs and examine output critically.

0 units, Aut, Win, Spr, Sum

311. Vector FORTRAN and Specials Subroutine Libraries at the Data Center—Vector or array processing is one technique that supercomputers (Cray) use to decrease calculation time. Introduces and demonstrates vectorization techniques, overview of VS FORTRAN, and Special Subroutine Libraries available on the mainframe. Topics: elliptic partial differential equations and linear algebra to eigenvector and nonlinear least square problems.

0 units, Aut, Spr

331. SAS Overview—Statistical Analysis System (SAS) is a package of programs used for data analysis. Methods of preparing data for analysis (entering data and writing code to transform and create variables); elementary statistical procedures; advanced data step applications.

0 units, Aut, Win, Spr, Sum

333. Advanced DATA Step Applications in SAS—Write custom reports using the SAS system files as input. Programming of techniques for transformation and creation of variables; use of the macro facility. SAS's code generation language. Techniques for intermediate to advanced users; detailed examination of report writing, data manipulation and variable handling procedures and macro language. Students present DATA Step needs in first session. The second session is devoted primarily to user topics.

6 units, Aut, Spr

335. SAS/Graph on the Data Center Mainframe—SAS/Graph, a sophisticated graphics system, is demonstrated. General bivariate plotting. Full color graphs, charts, contour plots, maps,
and three-dimensional plotting on the Data Center mainframe.

0 units, Aut, Win, Spr

337. Regression and ANOVA in SAS—Choosing SAS procedures for specific options and lowest cost. Linear models. Statistical implications for PROC's GLM, ANOVA, and REG; their similarities and differences; and research design issues. Research design or statistics questions. User topics.

0 units, Win, Sum

341. SPSS-X Overview—SPSS-X (Statistical Package for the Social Sciences, extended version) for analysis, presentation, and management of data. Methods to prepare data for analysis. Enter data, create and merge system files, write code to transform and create variables, and run elementary statistical procedures. For nonprogrammer, SPSS-X is easier to learn than the SAS system.

0 units, Aut, Spr

381. JCL for Application Programmers—For those who write or maintain batch administrative systems at Stanford. Production system architecture as applied to the Stanford environment. Topics: description of equipment and services offered; JCL coding and differences between IBM vanilla JCL and Stanford enhancements; batch utilities used to manage production networks; and staging EXECs and the role of the production group. A walkthrough of a real application that follows production standards.

0 units, Aut, upon request

COMMUNICATING BETWEEN MACHINES

711. Using Electronic Mail on Forsythe—Send, receive, file, retrieve, and "tickle" mail on the Data Center mainframe computer. Address messages by personal name, use distribution lists, BITNET, network mail, and an automatic answering feature. How to connect to other mail networks.

0 units, Aut, Win, Spr, Sum

741. Beyond the Basics of Samson for the IBM PC—For those familiar with using Forsythe who wish to take advantage of MacSamson, a communications program that connects a Macintosh computer to the Data Center mainframe computer. Upload and download files (move information between a Mac and the mainframe), print and log terminal sessions, edit MacSamson scripts, bind keys, and modify MacSamson's default settings. Techniques of logging on and transferring files (via FTP) over SUNet.

0 units, Aut, Win, Spr, Sum

FUNDAMENTALS OF MICROCOMPUTING


0 units, Aut, Win, Spr, Sum

145. Hard Disk Management—For experienced PC users requiring knowledge and skills in organizing files on hard disk drives. DOS commands to format different density diskettes, create and manage subdirectories, copy and erase files, and check for disk damage. Exercises: practice using the DOS commands PATH, PROMPT, and TREE. Hard disk backup strategies.

0 units, Aut, Win, Spr, Sum

147. DOS in Depth—For experienced PC users requiring advanced skills in DOS to customize and enhance the performance of their computers. Topics: creating menus and other batch files (.BAT) using EDLIN, modifying system files (.SYS), and advanced DOS commands such as ATTRIB, XCOPY, and SUBST. Use of commercial DOS utility programs for file management.

0 units, Aut, Win, Spr, Sum

151. Introduction to the Macintosh—Introduction to the Macintosh family of computers and concepts that make it unique. Use of mouse, icons, and pull-down menus to create, save, and print documents. Standard methods of editing and formatting text, and basics of creating and manipulating object-oriented graphics. Integrating text and graphics and use of Macintosh desk accessories (calculator and the scrapbook). How
to back up, rename, and erase documents and disks in order to protect and organize work.

0 units, Aut, Win, Spr, Sum

155. MacExpert—How to manage the hard disk efficiently, install new software, add and remove fonts and desk accessories with the Font/DA Mover, update the System Folder as new versions of the operating system become available, and use MultiFinder. How to work with HyperCard stacks and the other utility programs that come with a Macintosh.

0 units, Aut, Win, Spr, Sum

SPREADSHEETS


0 units, Aut, Win, Spr, Sum

453. Creating LOTUS 1-2-3 Graphs—Introduction to LOTUS PrintGraph on the IBM PC or compatible computer. Enter format data, create and edit formula, and build simple financial models for conducting "what if" analysis. Produce graphs and print simple reports.

0 units, Aut, Win, Spr, Sum

454. Working With Lotus 1-2-3 Data Base Commands—For advanced Lotus 1-2-3 users using the IBM PC/XT spreadsheet as a data base management tool. Emphasis on developing data base skills and techniques: sorting data on one of two keys; using data query to locate and extract information from a complex spreadsheet model; constructing and using the data table capabilities of Lotus 1-2-3; and statistical functions.

0 units, Win, Spr

456. Lotus 1-2-3 Tips and Tricks—For experienced spreadsheet users refreshing advanced Lotus skills and to learn additional skills in building sophisticated spreadsheet models. Mixed and absolute cell addressing, logical functions, and additional range commands.

Techniques for building formulas for mixed cell references, lookup tables, function, and if-then-else logic, "what-if" analysis, and how to create a frequency distribution analysis.

0 units, Aut, Win, Spr, Sum

457. Introduction to Lotus 1-2-3 Macros—For those who set up or develop Lotus spreadsheets for others to use. Automate frequently used commands and keystrokes so that chain events can be started and executed by pressing two keys or selecting a keyword from a menu. Simple keystroke macros, complex branching macros that allow one to modularize repetitive tasks: customize menu macros to provide interface with Lotus environment.

0 units, Aut, Spr

551. Introduction to Excel—Excel is an integrated electronic spreadsheet, business graphics, and database program with automated Macros (mini programming) capability. The basics of Excel: create, format, edit, and print a spreadsheet; create, customize, and print graphs of spreadsheet data; and create, research, sort, and print a database.

0 units, Aut, Spr

556. Intermediate Excel: Spreadsheets—Absolute and relative references, naming ranges, creating "what-if" tables, using advanced spreadsheet development and editing techniques, and special printing commands. Use of Excel's Statistical, Financial, and Logical functions, including PMT, NPER, IF, and LOOKUP.

0 units, Aut, Win, Spr, Sum

557. Intermediate Excel: Databases and Charts—Sort, search, and extract data based on complex criteria; use Excel's database functions, create complex reports. Edit and customize charts and create overlay charts.

0 units, Aut, Spr

559. Excel Macros—In-depth look at macros, starting with basics of creating, editing, and running macros through the use of branching techniques, conditional statements, linking macros, and creating interactive macros. Use of macros to customize menus, and the dialog editor.

0 units, Aut, Spr
UNDERGRADUATE
INTER-SCHOOL PROGRAM

PROGRAM IN VALUES, TECHNOLOGY, SCIENCE, AND SOCIETY

Emeriti: (Professors) Eric Hutchinson (Chemistry), Alex Inkeles (Sociology), Bernard Siegel (Anthropology), Walter G. Vincenti (Aeronautics and Astronautics)
Chairman: Timothy Lenoir
Associate Chairman: Robert E. McGinn
Director, Honors Committee: Joseph J. Corn
Director, Technology and Culture Sequence: Barry M. Katz
Professors: Herbert Abrams (Radiology), James L. Adams (Industrial Engineering and Engineering Management, on leave 1990-91), Barton J. Bernstein (History), Raymond B. Clayton (Psychiatry), W. Bliss Carnochan (English), Stephen J. Kline (Mechanical Engineering), John McCarthy (Computer Science), Robert Osserman (Mathematics), William Perry (Engineering-Economic Systems), Nathan Rosenberg (Economics), Paul S. Seaver (History)
Associate Professors: Peter Galison (History of Science, Philosophy, and, by courtesy, Physics), Timothy Lenoir (History of Science, History)
Assistant Professors: Paul Adler (Industrial Engineering and Engineering Management), Clifford I. Nass (Communication)
Professors (Teaching): Gilbert Masters (Civil Engineering), Robert E. McGinn (Industrial Engineering and Engineering Management, and VTSS)
Senior Lecturers: Joseph J. Corn (History, American Studies, and VTSS), Barry Katz (Mechanical Engineering and VTSS)
Lecturers: Robert L. Adams, Sharona Ben-Tov (VTSS), Keith Gandal (VTSS), Patricia Nabti (VTSS)
Consulting Professor: Richard Meehan (VTSS)

Technology and science are activities of pivotal importance in modern life, intimately bound up with industrial society's evolving character, problems, and potentials. If scientific and technological pursuits are to enhance human well-being, they and their effects on society and the individual must be better understood by non-technical professionals and ordinary citizens as well as by engineers and scientists. Issues of professional ethics and social responsibility confront practicing engineers and scientists. At the same time, lawyers, public officials, and business people are increasingly called upon to make decisions requiring a basic understanding of science and technology and their ethical, social, and environmental consequences. Ordinary citizens, moreover, are being asked with increasing frequency to pass judgment on controversial matters of public policy related to science and technology. These circumstances require a new form of liberal education adequate to the technical character of the contemporary era.

The Program in Values, Technology, Science, and Society (VTSS) is an interdisciplinary enterprise devoted to understanding the nature and significance of technology and science in modern industrial society. Achieving this understanding requires critical analysis of the interplay of science and technology with human values and world views, political and economic forces, and cultural and environmental factors. Hence, students in VTSS courses study science and technology in society from a wide variety of perspectives in the humanities and social sciences. To provide a basic understanding of technology and science, technical literacy courses are also included among the VTSS offering, and are requirements in some program curricula.

GENERAL INFORMATION

Selected VTSS courses may be used, individually or in integrated groups, for various purposes:
1. To satisfy University Distribution Requirements.
2. To satisfy the VTSS requirement of the School of Engineering.
3. To comprise parts of student-designed concentrations required for majors in Human Biology and Public Policy.
4. To satisfy the requirements of the VTSS Honors Program complementing any standard major (see below).
5. To satisfy requirements for majors in VTSS (see below).

VTSS courses are particularly valuable for undergraduates planning further study in graduate professional schools (e.g., business, education, engineering, law, journalism, medicine)
and for students wishing to relate the specialized knowledge of their major fields to broad technology- and science-related aspects of modern society and culture.

WALTER G. VINCENTI PRIZE
An annual prize is awarded to the author of the best student essay written in VTSS 1, 2, 3. This prize honors historian of technology Professor Walter G. Vincenti, founding member and first chairman of the VTSS Program.

UNDERGRADUATE PROGRAMS
Degree programs in VTSS are interdisciplinary curricula devoted to understanding the nature and significance of technology and science in modern society. Majors analyze phenomena of science and technology in society from philosophical, ethical, aesthetic, historical, economic and other social scientific perspectives. In addition, students pursuing the A.B. degree study a technical field in sufficient depth to obtain a grasp of basic concepts and methods and complete a concentration on a science-and-technology-in-society-related theme, sub-area, or problem. Those seeking the B.S. degree complete at least 50 units in technology, science, and mathematics. The particular technical courses chosen reflect the student's special interest in the field of science and technology in society. The specific requirements for the bachelor's degree in VTSS are as follows:

BACHELOR OF ARTS
1. VTSS Core (8 courses)
   a) VTSS Foundations (VTSS 101)
   b) Economics Perspective (VTSS 107)
   c) Philosophical and Ethical Perspectives (VTSS 110)
   d) Aesthetics Perspective (VTSS 115 or 117)
   e) Historical Perspective (VTSS 121 and either 125 or 126)
   f) Social Science Perspective (one of VTSS 155, 161, or 162)
   g) Senior Colloquium (VTSS 200)
2. Technical Literacy (5 courses)
   a) Computer literacy, normally demonstrated by successfully completing Computer Science 106A or its equivalent.
   b) Science or engineering literacy demonstrated by:
      1) completing a four-course "sequence" (minimum of 12 units) in one field of engineering or science (sample sequences available in the VTSS office), or
      2) completing the program's technical literacy sequence (VTSS 51, 52, 53) and one other complementary technical course chosen in consultation with the program chair or associate chair.
3. Thematic Concentration (minimum of 20 units, at least 5 courses, one each from among those designated on the appropriate concentration course list as "foundational" and "advanced"). Thematic Concentrations are organized around a science-or-technology-related theme, problem, or sub-area. The VTSS Policy Committee has certified the following topics as suitable Thematic Concentrations for the VTSS B.A. degree: aesthetics, development, environment, history and philosophy, industrial organizations, public policy, social change, war and peace, and work.

Course lists for these concentration topics are available in the VTSS office. A student selecting one of the certified topics may include one or more courses not on the corresponding course list if they are germane to the concentration and meet the student's special interests. Alternatively, the student may choose to design a Thematic Concentration topic and course package subject to program approval. Each Thematic Concentration, certified or self-designed, requires the signature of an appropriate faculty advisor. See the associate chairman for details.

BACHELOR OF SCIENCE
The student pursuing the B.S. degree shall complete the VTSS Core and a package of at least 50 units of technical courses designed to impart not only an understanding of, but an ability to work with, basic concepts of engineering and science. Introductory courses in mathematics or physics (e.g., Math. 19 or Physics 19) are normally not counted as parts of this Technical Depth component.

The B.S. candidate follows one of two models as guidelines for fulfilling the minimum 50-unit requirement:
1. "Focused depth": at least 24 units in a single field of science or engineering, with the remaining units, except for at most two stand-alone courses, grouped in clusters of at least three courses each in other fields of science or engineering, e.g., eight industrial engineering, three physics, three mathematics, and three computer science courses, and one course each in electrical engineering and chemistry.
2. "Clustered depth": 50 units comprised of two or more clusters of at least five courses each in different fields of science or engineering, with at most two stand-alone courses, e.g., five courses each in physics, electrical engineering, and computer science, and one
course each in industrial engineering and earth sciences.

It is strongly recommended that B.S. majors complete Computer Science 106A or its equivalent.

HONORS PROGRAM

The VTSS program offers a limited number of students the opportunity to enrich their education through in-depth study of the interaction of science and technology with society leading to Honors in VTSS. The honors program is open to students majoring in any field (including VTSS). Students accepted for this program carry out an honors project, the work for which normally begins in Spring Quarter of the junior year and is completed by mid-May of the senior year. Usually, this project entails writing an honors essay, although occasionally students have chosen to produce a technical artifact or carry out some other work that itself represents original thinking. When a project results in a work other than an essay, students must also submit an accompanying written explanation of the work.

ADMISSION

Application for admission to the VTSS Honors Program is typically made during the student's junior year. By May 15 of the Spring Quarter of that year, interested students must have completed at least two of the first four course requirements listed below for honors and have submitted a detailed formal proposal for their project to the VTSS Honors Committee (for details on proposal submission, see the brochure, "Pursuing Honors in VTSS," available in the VTSS office). Students whose proposals are accepted by the honors committee may then take from 12 to 15 units of credit for work on the honors project, distributed so as best to support the student's academic progress. Under exceptional circumstances, students may be admitted to the honors program in the Autumn Quarter of the senior year.

REQUIREMENTS

1. Foundation Course: VTSS 101
2. Philosophical and Ethical Perspectives: VTSS 110
3. Historical Perspective: one of VTSS 107, 121, 125, or 126
4. Social Science Perspective: one of VTSS 155, 161, or 162
5. Honors Tutorial: VTSS 195A and B
6. Honors Project: an original critical essay or investigative project with accompanying expository essay on a VTSS topic of general importance (12 to 15 units). Past honors projects are on file in the VTSS library.

To earn honors, the project must receive a grade of at least "B." The student must also achieve an LGI of at least 3.3 in the courses taken to satisfy requirements 1-4 above. In the case of VTSS majors, the student must compile an LGI of at least 3.3 in the entire major curriculum. If all these requirements are met, the designation "Honors Program in Values, Technology, Science, and Society" is affixed to the student's permanent record and appears in the commencement program.

COURSES

CULTURES, IDEAS, AND VALUES SEQUENCE

1,2,3. Technology and Culture—The development of science and technology in society from antiquity to the modern world through study of the interconnections among intellectual, material, and societal values.

1. The Ancient World—Technology and culture in the ancient societies of the Near East, Greece, and Rome. (DR:1, three-quarter sequence.)

5 units, Aut (Katz, Staff) MTW 11 two-hour section by arrangement

2. The Pre-Modern World—The diverse influences that shaped the cultures of the Middle Ages, Renaissance, and Enlightenment. Chinese origins, Islamic transmission, and European exploitation of scientific and technological ideas. (DR:1, three-quarter sequence.)

5 units, Win (Katz, Staff) MTW 11 two-hour section by arrangement

3. The Modern World—Industrialization and its global impact on politics and society, art and literature, philosophy and religion, war and peace. (DR:1, three-quarter sequence.)

5 units, Spr (Katz, Staff) MTW 11 two-hour section by arrangement

TECHNICAL LITERACY SEQUENCE

51,52,53. The Nature of Technology, Mathematics, and Science—Integrated three-quarter sequence enhancing the ability to think quantitatively and to understand the character and interrelationships of technology, mathematics, and science. Treats quantitative questions that confront people intending to comprehend and influence contemporary society. Basic concepts include conservation laws, energy, entropy, equilibrium, feedback, probability, reliability, symmetry, uncertainty. Topics: sources of problems, nature of invention and discovery, exper-
101. Science, Technology, and Contemporary Society—Key social, cultural, and values issues raised by scientific and technological developments in contemporary life, focusing on the U.S. in the early 1990s. Topics: distinctive features of contemporary science and technology; the influence of scientific and technological developments on 20th-century society, including major changes and problems in work, religion, ethics, the arts, and international relations; the social control of science and technology; effects of the organization of research and development on the ideals and ethical conflicts of scientific and engineering practice; and science, technology, and society in the future. (DR:5)

4-5 units, Aut (McGinn) TTh 2:15-4:05
optional section for extra unit

107. Technology and Modern Industrial Society—(Same as Economics 113.) The interplay of technology and the process of economic development from 1870 to the present. Topics: origins of modern industry in the U.S. and Europe, factors affecting the rate and direction of technological change and diffusion, technology and the growth of large-scale organization, the spread of industrialization to less-developed countries, late-comers to industrialization (Japan and newly industrializing countries), the growth and slowdown in mature industrial countries, and present concerns and future prospects (the influence of technology on employment, civilian "spillovers" from military R&D spending, and coping with technological change). (DR:5)

4-5 units, Spr (Rosenberg) TTh: 2:15-4:05
optional section for extra unit

110. Philosophical and Ethical Issues in Public Policy—(Same as Public Policy 103B.) Philosophical and ethical issues in science- and technology-related public policy conflicts. Develops the capacity for rigorous critical analysis of complex, value-laden policy disputes. Topics: the natures of ethics and morality; the natures of and rationales for liberty, justice, and human rights; and the use (and abuse) of these concepts in recent and current policy disputes. Cases from: biomedicine (euthanasia, pre-determination of sex of offspring, and genetic testing); environmental affairs (endangered species, wilderness and landmark preservation, high-rise proliferation); the technical professions ("whistle-blowing", fraud, human subjects research); and international relations (warfare, technology transfer, immigration, and repatriation of artistic patrimony). (DR:3)

5 units, Win (McGinn) TTh 2:15-3:30 plus two-hour section by arrangement

115. Technology and Aesthetics—The aesthetic dimension of technology in the modern world and in history. The role of subjective factors in technological and scientific problem-solving and in the response of users and observers to technological phenomena. Analysis of such concepts as beauty, elegance, quality, appropriateness, and function as they apply to specific works of technology and science. Technology as art and art as technology. Attention to improving the ability to analyze the "fit" of technological products to individual needs and cultural values. Case studies of personal computers, buildings, machines, weapons, structures, and networks.

4-5 units (Adams, Katz) given 1991-92


4 units, Aut (Katz) MW 2:15-4:05

121. History of Technology in Western Society, 1500-1918—(Same as History 115, History of Science 121.) The interplay of technological change and cultural developments from the late Middle Ages through WWI. Focuses on Europe and the U.S. with attention to contemporary developments in the non-Western world and to the consequences of adopting Western technologies. Topics: mechanization and labor, the changing relationship of technology to science, the industrialization of warfare, technology and imperialism, and the cultural implications of innovations in communications. (DR:5)

4 units, Win (J. Corn) T/WTh/F 10

125. The Scientific Revolution—(Same as History 139, History of Science 145, Philosophy 145.) Social, intellectual, and institutional background of the 17th-century period that established modern science. Theories of matter and motion, Descartes, Galileo, Bacon, Boyle, 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 era texts and modern historical studies. Interpretations of the
revolution and what is meant by science and revolution. (DR:3)
5 units, Aut (Galison) TTh 11-12:15
126. History and Philosophy of 20th-Century Physics—(Same as Philosophy 168, History 139A, History of Science 168.) The philosophical questions raised by historical developments in 20th-century physics. Late 19th-century reductionist world-views leading to special and general relativity. Einstein's response. How did early workers in quantum mechanics attack the wave-particle duality? The problem of scientific realism in quantum mechanics. Nuclear fission, the bomb, and growth of large-scale experimental high-energy physics. What is meant by "unified" field theories in contemporary physics? Readings: scientific, historical, and philosophical texts. (DR:3)
5 units, Win (Galison) TTh 11-12:15
200. Senior Colloquium—Reading/discussion of key analytical and theoretical texts treating the nature and relationship of science, technology, and society. Prerequisite: senior standing and four VTSS core courses, or permission of the instructor.
4 units, Win (Katz)

APPLICABLE TO CORE REQUIREMENTS

To satisfy the Social Science Core Requirement (see "Undergraduate Programs" section above), students select one of the following three courses:

155. The Sociology of Scientific Knowledge—(Same as Anthropology 158, History of Science 155, Philosophy 155, History 133B, Sociology 140.) Some of the classical problems in the sociology of knowledge as represented in the writings of Marx, Durkheim, and Mannheim. Recent work in the social construction of scientific knowledge. Emphasis on recent studies in the historical sociology of experimental science and laboratory practice and a critique of historically situated practical reason is explored as the foundation for the sociology of scientific knowledge.
4 units (Lenoir) given 1991-92

161. Anthropology of Development—(Same as Anthropology 149.) History of anthropology in development projects from the Colonial Period through WWII. The involvement of anthropologists at the community level, e.g., Vicos, Administration of Pacific Trust Territories; intervention in development projects and disillusionment with same, "Camelot", the "trickle down" paradigm, e.g., the Green Revolution; the "Bottom-up" paradigm, anthropologists in AID, local systems analysis, including the farm research, small-scale fisheries, the rationality of peasant producers, and a consideration of comparative research on diet, nutrition, and forms of exchange (implications of change from subsistence production to production to the market). Extensive use of case studies. Lecture-seminar format.
5 units, Win (Siegel)

162. Communication, Technology, and Society—(Same as Communication 169/269.) Methods for analyzing and addressing the question: Does technology drive societal change or does society drive technological change? Examples focus on the relationship between information and information-processing technologies since 1850 and the self, mass society, and the information economy.
4 units, Aut (Nass) MW 10-11:50

OTHER OFFERINGS

106. The Nature of Technology in Modern Society—(Same as Engineering 221.) Development of unified consideration of technology, science, society, and human values. Basic patterns underlying the physical bases of human societies. Systems covering areas of major human concern and the disciplines that study them. The world views of technology, science, and other disciplines, and the problems and advantages associated with combining them. Necessary routes to better connect science and technology with society and values and suggested agenda for clarification of unresolved conflicts and for the provision of a better basis for cooperative interdisciplinary work. The bases of cooperation in groups. Limited enrollment. (DR:5)
4 units, Spr (Carnochan, Kline) MW 1:15-3:05

4 units, Spr (Meehan) TTh 9-10:50

116. War and Technology—The role of technology, military and civil, in human conflict; theories of aggression; origins of organized violence and changing relationship between specific technological innovations and warfare in history.
4 units (Adams) given 1991-92

124. Introduction to Material Culture—(Same as American Studies 152, History 152.) American history through the evidence of things. Introduces methods of interpreting or "reading"
ARTIFACTS AND THE DIFFERENT CATEGORIES OF MATERIAL CULTURE, INCLUDING FOLK ART, INDUSTRIALLY PRODUCED ARTIFACTS, AND VERNACULAR ARCHITECTURE AND LANDSCAPE.

5 UNITS, SPR (J. CORN) TTH 1:15-3:05


3 UNITS, SPR (GANDAL) M


3 UNITS, SPR (BEN-TOV) T 1:15-3:05

142. ISLAMIC SCIENCE AND TECHNOLOGY—ISLAMIC DOCTRINE AND CULTURE AS THEY HAVE AFFECTED AND BEEN AFFECTED BY SCIENCE AND TECHNOLOGY. TOPICS: THE ROLE OF RELIGION IN THE ACHIEVEMENTS AND SUBSEQUENT DECLINE OF LEARNING IN THE ISLAMIC WORLD; DOCTRINAL PARAMETERS OF ISLAMIC SCIENCE AND TECHNOLOGY; ISLAMIC RESPONSES TO ETHICAL AND MORAL ISSUES PRESENTED BY SCIENCE AND TECHNOLOGY; AND TECHNOLOGIES, HISTORICAL AND CONTEMPORARY, THAT HAVE BEEN DEVELOPED OR ADAPTED BY AND FOR MUSLIMS SPECIFICALLY TO SERVE THEIR NEEDS.

4-5 UNITS, AUT (NABTI) T 2:15-4:05


4 UNITS (CLAYTON) GIVEN 1991-92

148. NEUROSCIENCES, TECHNOLOGY, AND VALUES—(SAME AS HISTORY OF SCIENCE 159) HISTORICALLY BASED DISCUSSION OF THE NEUROSCIENCES IN RELATION TO THE CONCEPT OF HUMAN PERSONALITY. EMPHASIS ON THE EMERGENCE OF MODERN VIEWS OF THE STRUCTURE AND FUNCTION OF THE BRAIN, RELATED DIAGNOSTIC AND PSYCHOTHERAPEUTIC TECHNOLOGIES, AND THE IMPLICATIONS OF THESE DEVELOPMENTS FOR HUMAN VALUES. LIMITED ENROLLMENT; CONSENT OF INSTRUCTOR.

4 UNITS, SPR (CLAYTON) BY ARRANGEMENT

152. RISE OF INDUSTRIAL ASIA—(SAME AS POLITICAL SCIENCE 125) INTERDISCIPLINARY SEMINAR ON THE POLITICAL, ECONOMIC, SECURITY, SOCIAL, AND CULTURAL MEASURES FROM THEORY TO PRACTICE. LIMITED TO 15.

5 UNITS, AUT (OKIMOTO, LAU, LEWIS) T 3:15-5:05

156. ACCIDENTAL OR UNINTENTIONAL NUCLEAR WAR—LECTURE ON THE LIKELIHOOD OF NUCLEAR WAR OCCURRING THROUGH ACCIDENT, MISCALCULATION, MISUNDERSTANDING, OR INADVERTENCE. ANALYSIS OF PAST ACCIDENTS IN WORLD'S NUCLEAR WEAPONS SYSTEMS, THE IMPACT OF FALSE ALERTS, HUMAN FALLIBILITY, SYSTEMS FALLIBILITY REFLECTING COMMAND AND CONTROL AND COMPONENT FAILURE, THE SECURITY OF NUCLEAR FUEL AND WEAPONS, TERRORISM AND POTENTIAL THEFT BY NON-STATE ACTORS, THE NATURE OF DECISION-MAKING IN CRISIS, AND THE SYNERGY BETWEEN ACCIDENTS AND CRISIS. MECHANISMS OF RISK REDUCTION, ANTICIPATORY PLANNING, CRISIS PREVENTION AND MANAGEMENT, AND THE MEANS OF TRANSLATING SUCH MEASURES FROM THEORY TO PRACTICE. LIMITED ENROLLMENT.

5 UNITS (ABRAMS) GIVEN 1991-92
Values, Technology, Science, and Society

164. America and the "Bomb": Politics, Diplomacy, and Culture in the Nuclear World, 1939-Present—(Same as History 163, History of Science 163.) Issues of nuclear weapons emphasizing early development, use on Japan in 1945, military planning and diplomatic leverage and threats, efforts at disarmament and arms control, the H-bomb decision and tactical weapons, disputes over nuclear testing and fallout, the development of deterrence and its critics, the roles of scientists and the strategy community, and various peace movements.

3 units, Win (McCarthy) TTh 1:15-2:30

165. Technology and Musical Aesthetics—Interrelations between technologies used in the creation of music and music itself. Impact of technological developments on aesthetic expectations of society. Topics: physics of music, hearing and perception; traditional acoustic instruments; electric instruments; sophistication and abstraction; acoustics; digital audio; synthesis; computer music. Limited enrollment.

4-5 units (Bernstein) given 1991-92

166. Innovation—The nature, processes, and management of research and development in industrial societies. Socio-technical systems as the physical bases of society. The creation of abundant societies and the rise of R&D in the final quarter of the 19th century in the U.S. and Germany. Conventional linear model and improved chain-linked model. Comparison of scientific (reductionist) view with the consistent view needed in innovation, operational consequences. Japanese and U.S. styles of innovation and their cultural bases. Modes of institutionalizing R&D. Barriers to innovation, and countervailing forces. Revolutionary and evolutionary innovation in small and large companies. Effects of management style on the development of group cooperation. Effects of industry and product life cycle. Government role in innovation. Limited enrollment.

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

167. The Early Nuclear Age: Diplomacy, Politics, and Culture, 1939-1953—(Same as History 270A.) Colloquium exploring in discussion and in papers major problems of the early nuclear age and emphasizing the careful analysis of arguments and sources. Major issues: why the A-bombs were used; their effects on U.S.-Soviet relations and on American culture; the roles and self-conceptions of scientists during and after WW II; the emergence of strategic thought; psychological literature on denial and survivorship; and the decisions for the H-bomb. Students may take an additional 5 units and write a research paper. Prerequisite: consent of instructor.

5 or 10 units, Spr (Bernstein) W 1:15-3:30

169. Development and Technology in the Third World—The relationship between technology and industrial development from technical, social, and economic perspectives. Technology in developing countries and in newly industrializing countries (India, Brazil, Mexico, and Korea), including transfer of technology, "appropriate" technology, factors affecting choice of technology, technological capability, and the relationship between technology and culture. Limited enrollment.

4 units (Forbes) given 1991-92

170. Work, Technology, and Society—Problems of work in contemporary society as influenced by rapid technological innovation. Causes and consequences of the current revolution in work. Public and private policies for grappling with resultant problems. Focuses on the U.S. and corresponding situations in Italy, Mexico, and Japan. Topics: new technology at the workplace and its bearing on occupational, structural, and organizational changes; unions and industrial relations; the global factory and office; employment and unemployment; worker health, safety, and well-being; economic competitiveness; public education; women; and workplace ethics. Recent innovations in work policy in Silicon Valley. (DR:5)

4 units, Spr (McGinn) TTh 2:15-4:05

171. The Role of Technology in National Security—(Same as Engineering-Economic Systems 170.) Examines critical decisions made by the U.S. government, including the decisions to develop the A-bomb and H-bomb, the crash development of the ICBM and SLBM after Sputnik, the decisions made in the wake of the energy technology policy crisis of the early 70's, key decisions in the U.S. space program, and current issues such as support for high-density TV, the human genome project and the SDI program. How decisions to develop the A- and H-bombs were made in the Soviet Union and China, and the roles of the U.S. and Soviet governments in their respective space programs. The process by which technical issues are synthesized into the decision processes, and how
they are explicated for the policymaker with no background in technology; the role of technical agencies, governmental committees, and science advisory boards and the way these groups interact to advise senior policymakers. Guest specialists lecture from the business, technological, and governmental communities.

3 units, Aut (Perry) MW 4:15-5:30

172. Automation and Work—(Same as Industrial Engineering 272.) A combination of theoretical reflection on and pragmatic analysis of the implementation of new technologies. Topics: human resource management in technology-intensive environments, skill and organizational impacts of advanced technologies (numerical control, word processing, CAD), technology and industrial relations, Taylorism and new job design approaches, etc. Emphasis on current issues; some historical background. Enrollment limited and at discretion of instructor. Open to seniors and graduate students only.

4 units (Adler) given 1991-92

190A, B, C. Honors Project—Project for students in VTSS Honors Program

190A. Submission of Proposal.
2-5 units, Spr (Staff) by arrangement

190B. Continued Study and Writing.
5 units, Aut (Staff) by arrangement

190C. Final Work on Project.
5 units, Win (Staff) by arrangement

195A. Honors Tutorial—Problems of research and writing the honors essay. Required of seniors doing VTSS honors.
2 units, Aut (Staff) by arrangement

195B. Honors Tutorial—Problems of research and writing the honors essay. Required of seniors doing VTSS honors.
2 units, Win (Staff) by arrangement

199. Individual Work.
1-5 units, Aut, Win, Spr (Staff) by arrangement

ADVANCED UNDERGRADUATE AND GRADUATE

210. Ethics and Technology—Seminar on ethical issues raised by recent developments in technology and science. Topics: technology, science, and the genesis of ethical controversy; ethical issues raised by developments such as in vitro fertilization, embryo experimentation and cryopreservation, and sex selection of offspring; electronic “bulletin boards”, software copyrighting, and computer “viruses”; genetic testing, therapy, and “enhancement” of humans, and genetically engineered drugs and animals; nuclear deterrence and strategic defense; and moral rights and responsibilities in scientific and engineering practice. Prerequisite: 110, another course in ethics, or permission of the instructor

4 units, Spr (McGinn)

215. Computers, Ethics, and Social Responsibility—(Same as Computer Science 201, Symbolic Systems 100.) Analysis of ethical and social issues related to the development and use of computer technology. Introduction to relevant background in ethical theory, and social, political, and legal considerations. Analysis of scenarios in a number of specific problem areas: privacy, reliability and risks of complex systems, and the responsibility of professionals for their applications and consequences of their work. Small group discussion emphasizes developing analytical skills. Primarily for majors entering computer-related fields. Prerequisite: Computer Science 106B or equivalent.

3-4 units, Spr (Nissenbaum, Winograd) MWF

217. Technology and Cultural Theory—The place of technology in the shaping of modern culture; theoretical perspectives on technology developed by the Frankfurt School (Marcuse, Horkheimer and Adorno, Benjamin); existentialism and phenomenology (Husserl and Heidegger); theorists of modernism and post-modernism (Lyotard, Baudrillard, Habermas); gender and sexuality (Foucault, de Lauretis); current debates over technology within the arts and architecture. Open to upper-division undergraduates.

4 units, Spr (Katz)

221. Technical Knowledge in the U.S.—(Same as American Studies 231, History 256S/356S.) Seminar on the production, dissemination, reception, and changing content of technical texts, including handbooks, household management guides, trade periodicals, popular science writing, owner's instruction manuals, and trade and engineering textbooks to illuminate the history of education and the book, the experiences of users of technology, the culture of consumption, and cultural history generally. Prerequisite: prior coursework in American history, the history of science or technology, or permission of instructor.

5 units, Spr (J. Corn) W 3:15-5:30

269. Comparative Technology Policy—Policies affecting technology are critical to human welfare in all countries, regardless of ideology, geography, and wealth. Decisions on technology are made at many levels: international, national, state, local, firm, and individual. Characteristics of technology policy in various countries at different stages of economic development: Japan, Italy, the U.S., India, and Mexico. Topics: technology policy in relation to economic growth
and competitiveness, import and export of technology, foreign investment, supply and education of engineers and scientists, taxation, research and development, and public attitudes toward technology.

4 units (Adams, Forbes) given 1991-92

CROSS-LISTED

127. History of Biological Thought—(Same as History of Science 62, Philosophy 62, History 116A.) Examination of central issues in biological thought since Darwin on: theological vs. mechanistic explanations, vitalism, reductionism, the units and levels of biological organization, the origins of life, development, inheritance, and evolution.

4 units, Win (Smocovitis) MWF 9

128. The Rise of Scientific Medicine—(Same as History of Science 154, History 133A.) The intellectual, social, and institutional dimensions of the rise of scientific medicine in the 19th century. How did medicine become "scientific" in the 19th century? What differences did it make to the physician? Why did scientific medicine displace other approaches to medicine? Focus is on developments in France, Germany, and England from 1750 to 1912 and U.S. from 1890-1912. The development of experimental physiology and biomedical technology and their claimed contributions to the medical revolution of the 19th century. The concrete relationships of scientific developments in physiology, pharmacology, and bacteriology to changes in medical practice and therapy. The patterns of professionalization of medicine in different national contexts. Were the forces driving the professionalization of medicine in these contexts the same or different? How the institutional structure of the medical profession differed according to its local context.

4 units, Win (Lenoir) TTh 2-3:15

130. The Darwinian Revolution—(Same as History 133, History of Science 133, Human Biology 152, Philosophy 152.) The conceptual developments leading to the establishment of the major unifying paradigm of biological science, the theory of evolution by natural selection. Biological thought before Darwin, 1750 to 1836. The formation of Darwin’s thought in terms of its broader intellectual and social context; attention to Origin of the Species. The difficulties the theory had to overcome and their resolution in the union of evolutionary biology and population genetics.

4 units, Aut (Lenoir) TTh 2:15-3:30

135. Feminism, Science, and Technology—(Same as Feminist Studies 148A.) Interdisciplinary approach to contemporary feminist interventions into science as institution, cultural system, and social practice. Utilizing insights from literary criticism, art history, political science, sociology, and philosophy, examines how scientists from classical Greece to the present have constructed and perpetuated notions of gender and gender difference in the elaboration of knowledge, methodologies, and in the scientific disciplines and professions. Readings: critiques of biology, medicine, physics, history of science, and international division of labor.

5 units, Win (Chang)

143. Peace Studies—(Same as Political Science 133, Psychology 142, Sociology 188, History 154.) Interdisciplinary, dealing with the challenges of pursuing peace in a world where the sources of conflict are many and regional/ethnic/religious antagonisms are rising. Creating and maintaining peace is analyzed from historical perspectives. The nature of peace and peaceful processes (e.g., historical and political perspectives, questions of harmony and aggression at different social levels, and feminist analyses). Peace at the operational level (e.g., socio-psychological analyses, studies of bureaucracy, theories of conversion, and the making of "enemies". Peace-Moral and normative considerations (e.g., pacifism and its critics, studies of moral disengagement and of concepts of responsibility). Hopeful developments and important successes.

5 units, Spr (Drekmeier, Ross, Moses, Bland, Dornbusch) TTh 2:15-4:05

154A. Arms Control and Disarmament—(Same as Political Science 138A.) Introductory survey of international security relations since 1945, from the breakdown of the WWII alliance through recent political and military changes in the Soviet Union, Europe, and Asia. Lectures on development of nuclear weapons, arms competition, and efforts at arms control and disarmament in post-WWII period. Stresses political, technological, and conceptual problems of security policies and arms control.

5 units, Win (Lewis) MTWThF 1:15

175A,B. Modern Architecture I, II—(Enroll in Art 175A,B.) A two-quarter tracing of 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) MWF 10

assumptions of current linguistics and artificial intelligence with alternatives drawn from phenomenology, theoretical biology, and socially-oriented speech act theory. Emphasis on relevance of theoretical orientation to the design, implementation, and impact of computer systems dealing with language.
3 units, Aut (Winograd) MWF 10

180. Specialized Workshop: Science Writing—(Same as Communication 177B/277B.) Aimed at both science and communication students. Writing projects cover the range of science and medical fields. Organization, structure, and writing style for lay and professional audiences. Discussions of relationships between scientists and the media.
4 units, Spr (Lewenstein)

181. Creative Problem Solving—(Same as Industrial Engineering 201, Engineering 190.) Problem solving emphasizing problem definition, creativity, and the interpersonal and organizational factors that influence thinking. Common blocks to problem solving and methods of dealing with them. The advantages of integrating various problem solving strategies through the use of reading, abstracted problem situations, and projects. Open to all undergraduates and graduates.
3 units (Adams) given 1991-92

182. Environmental Science and Technology—(Same as Civil Engineering 170.) Introduction to the causes, effects, and methods of controlling environmental degradation. Global warming, stratospheric ozone depletion, urban and indoor air quality, water resource development, water quality, and hazardous waste management. For both science and nonscience majors. (DR:8)
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 and air and water quality impacts. Open to all students. Recommended: one year of college mathematics and Civil Engineering 170.
4 units, Win (Ortolano) TTh 1:15-2:30
THE CONTINUING STUDIES PROGRAM

Dean: Marsh H. McCall, Jr.
Assistant Dean and Administrative Director:
Jeffery H. Wachtel

The Continuing Studies Program provides adult members of the surrounding communities and University staff with the opportunity to take classes on a part-time basis for intellectual enrichment, both personal and professional.

The faculty is drawn from the ranks of the University's distinguished professoriate and present a variety of courses in each instructor's special areas of interest and expertise.

All courses are offered for credit only. These credits cannot, at this time, be applied toward any Stanford degree or requirements for a degree but are recorded on each student's Continuing Studies transcript. The units may be transferable to another University's program.

Courses are offered in all four academic quarters. For a course catalogue, contact the Continuing Studies Program, Building 1, Room 2A, Stanford, California 94305 or call (415) 725-2650.

STATEMENTS OF NONDISCRIMINATORY POLICY

Stanford University admits students of either sex and any race, color, religion, sexual orientation, 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, religion, sexual orientation, 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 regulations, which prohibit discrimination on the basis of sex. Sally Mahoney, Acting Vice President for Student Resources, 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) 725-1798.

REHABILITATION ACT OF 1973

In its programs, activities, and employment, Stanford University does not discriminate on the basis of handicap. An 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 the Affirmative Action Officer at (415) 723-3484.
POLICY ON THE USE OF VERTEBRATE ANIMALS
IN TEACHING ACTIVITIES

It is the policy of Stanford University that the use of either live or deceased vertebrate animals for solely instructional purposes is permitted when (1) the cognizant instructor(s) judges that the educational goals of the program or course is best achieved by such usage and when (2) the Administrative Panel on Laboratory Animal Care determines that such usage is humane, proper, and appropriate, and consistent with government principles and regulations for the utilization and care of vertebrate animals used in teaching and research. Only the minimum number of animals essential to instructional objectives should be used. Instructors should be encouraged to use alternatives to animals whenever feasible.

INFORMATION TO STUDENTS

Academic departments and programs should alert prospective students if any courses which are required for a major or degree involve the use of animals. This requirement may be met by a statement to the effect that some required courses for certain degrees may involve the use of animals or animal tissue, and that interested students should seek further information about such requirements from the department. Normally, this statement should appear in Courses and Degrees.

Instructors must inform their students during the first week of class if animals or animal tissue will or may be used as part of that course. Students who have concerns about the use of animals may then choose whether or not to take the class. Students should feel free to discuss their concerns with the instructor, but should be aware that instructors and departments are not obligated to alter course requirements which are consistent with University policies.

PROCEDURES FOR USE OF ANIMALS

Any faculty member who intends to use vertebrate animals for teaching purposes must submit an Animal Use Protocol, signed by the department chairperson, to the Administrative Panel on Laboratory Animal Care. Reuse of previously preserved material requires no approval. Courses taught each year with no significant changes in animal usage must submit a Renewal Animal Use Protocol every year.

The protocol must include information about the source from which animals are procured. In addition, the protocol must explain why animals are needed to achieve the goals of the course, and justify the species and the number of animals to be used. If the Administrative Panel on Laboratory Animal Care questions the species of animal chosen, the procurement process, the number of animals to be used or other related matters, such questions need to be resolved before the animals may be ordered.

Live vertebrate animals must be cared for according to the Division of Laboratory Animal Medicine policies and procedures governing the use of laboratory animals. Disposal of animal tissue must be in compliance with relevant health and safety regulations.
Following is a guide to Stanford publications of general interest. Requests for these publications and other information about Stanford should be addressed to specific offices at Stanford University, Stanford, CA 94305.

Admissions information and applications can be obtained from the Office of Undergraduate Admissions (Old Union) and the Office of Graduate Admissions (Bldg 590).

Financial aid information for undergraduate and graduate students is available from the Financial Aids Office (Old Union).

Library guides, facts, maps, and borrowing regulations are available at service desks of all Stanford libraries (address request to Green Library).

Maps and visitor's guides can be obtained at the Visitors' Information Office in Memorial Court, at the Stanford Bookstore, or by writing to the Guide and Visitors Service at the Office of Public Affairs (Bldg. 170).

Minority students, undergraduate and graduate, and their opportunities and experiences at Stanford are addressed in special publications directed to Alaska Natives, American Indians, Blacks, Chicanos, Mexican/Americans, and Puerto Ricans. The Office of Undergraduate Admissions (Old Union) and the Office of Graduate Studies (Bldg 1) will respond to requests for the appropriate publication.

Stanford University Bulletins of general interest, (Information and Summer Session) are available through the Registrar's Mailroom and the Information Window in the Office of the Registrar (Old Union). Courses and Degrees may be purchased from the Bookstore or by sending a $5.00 check or money order ($5.35 if a California resident; add $2.40 if domestic first class mail desired) to the Registrar's Mailroom. Individual schools and departments may be contacted directly for more specific information.

Students from other countries may contact the appropriate Admissions Office for Information for Prospective Graduate (or Undergraduate) Applicants from Other Countries; Bechtel International Center also provides helpful information to the international community.

The Time Schedule (course listings and registration information) is published quarterly and may be obtained at the Information Window in the Office of the Registrar (Old Union).

Other publications of interest:

Access Stanford, a guide for the physically limited, available at the Office of the Dean of Student Affairs (Old Union) and the Disability Resource Center (Meyer Library).


ASSU: Constitution and By-Laws, inquire at Associated Students of Stanford University, (Tresidder Union).

ASSU Course Guide, summaries of student evaluations of approximately 200 undergraduate courses, available at the ASSU Office (Tressider Union).

Campus Report, the weekly faculty/staff newspaper (includes events calendar and employment opportunities), available from News Service (Press Bldg).

Conference Planning at Stanford, available at the Conference Office (Encina Commons).


Faculty/Staff Directory, on sale at Stanford Bookstore.

Guidebook for Graduate Students, an introduction to offices and people who serve graduate students, available at the Office of the Dean of Student Affairs (Bldg. 590) and at the Office of Graduate Studies (Bldg. 1).

Life Off the Farm, a guide to off-campus goods, services, and activities, available at the Office of Residential Education (Old Union) and the Stanford Bookstore.

The Lively Arts at Stanford season brochure of concerts and other performances, available at University Events and Services (Press Bldg).

Stanford from the Beginning, a history, available at the Visitors' Information Office in Memorial Court (write Guide and Visitors Service, Bldg. 170), and the Stanford Bookstore.

The Stanford Daily, the student newspaper, available at many pickup sites on campus and by request to the Daily office (Storke Bldg.).

Stanford Memorial Church, a guide and history, available at the Visitors' Information Office in Memorial Court (write Guide and Visitors, Bldg. 70) and the Stanford Bookstore.
Courses Certified for 1990-91 as Fulfiling the Undergraduate Distribution Requirements

Information regarding the Distribution Requirements may be found in the “Degrees” section of this bulletin, p. 11-12. Included in the section is information regarding a petition process for students who believe they have strong reason to fulfill a requirement by substituting some alternative course for any certified listing.

The following courses have been certified as fulfilling the Distribution Requirements in 1990-91. The symbol (*) indicates courses in Areas 2-8 which also fulfill the non-Western culture requirement.

NOTE 1—In order to satisfy particular Area Distribution Requirements with transfer work, the transfer course(s) must be substantially similar to those course(s) offered at Stanford which satisfy specific Distribution Requirement Area(s).

NOTE 2—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 noted below.

NOTE 3—Courses offered overseas during 1990-91 which satisfy Distribution Requirements are listed at the end of this section following Area 8.

NOTE 4—By way of standing exception, the non-Western component of the Distribution Requirements may be satisfied by completing one course from among those approved for inclusion on a list of routine substitutes drawn up annually by the Dean of Undergraduate Studies, based on information provided by the departments and approved by the C-US Subcommittee on Distribution Requirements. These courses are listed at the end of the appendix.

AREA 1: CULTURES, IDEAS, AND VALUES

CIV 1, 2, 3; Great Works (entire sequence must be completed)
CIV 4, 5, 6; Europe and the Americas (entire sequence must be completed)
English 7, 8, 9; Literature and the Arts (entire sequence must be completed)

CIV 4, 5, 6; Europe and the Americas (entire sequence must be completed)
English 7, 8, 9; Literature and the Arts (entire sequence must be completed)

History 1, 2, 3; Europe: From the Middle Ages to the Present (entire sequence must be completed)

Humanities 61, 62, 63; Literature and the History of Ideas (entire sequence must be completed)

Philosophy 5A, B, C; Philosophy and Human Nature (entire sequence must be completed)

SLE 91, 92, 93; Program in Structured Liberal Education (entire sequence must be completed and thereby also satisfies Areas 2 and 3)

VTSS 1, 2, 3; Technology and Culture (entire sequence must be completed)

AREA 2: LITERATURE AND FINE ARTS

A) Courses typically taken either by non-majors or by people without special preparation:

Art 1; Introduction to Art
Art 2; Ideas and Forms in Asian Art
Art 3; Introduction to the History of Architecture
Art 5; Introduction to Ancient Art
Art 10; Introduction to Art: Renaissance to Modern

*Art 20; Introduction to the Art of Asia: to 600 A.D.
*Art 21; Introduction to the Art of Asia: 7th-13th Centuries
*Art 22; Introduction to the Art of Asia: 14th Century to the Present
*Asian Languages 91; Traditional East Asian Civilization: China

*Asian Languages 131; Chinese Poetry in Translation
*Asian Languages 132; Chinese Poetry and Drama in Translation

*Asian Languages 135; Japanese Drama in Translation
*Asian Languages 136; Japanese Poetry in Translation

*Asian Languages 137; Japanese Fiction in Translation

*Asian Languages 138; Modern Japanese Literature in Translation

*Asian Languages 181; Japanese Women Writers Classics 12 (same as Drama 153); Greek Tragedy: Aeschylus, Sophocles, Euripides

Dance 160A (same as Drama 127A); Dance History and Philosophy

Dance 160B (same as Drama 127B); Dance and Live Art in the 20th Century

*Dance 177 (same as Anthropology 109); Dance and Culture in Latin America
* Dance 268 (same as Education 218); Society, Education, and Dance

Drama 2; Introduction to Theatrical Styles

Drama 50; Introduction to Drama

Drama 59 (same as English 73); Shakespeare

Drama 150N; Major Dramatic Texts I: Greek and Roman

Drama 151; Major Dramatic Texts II: Renaissance to Romantic

Drama 152N; Major Dramatic Texts III: Early Realistic to Present

Drama 154N; American Drama: 1920s to 1950s

Drama 155N; American Drama: 1960s to Present

Drama 157N; Contemporary Black Playwrights

Drama 160; Theaters and Staging: Ancient to 18th Century

English 10/110; Masterpieces of English Literature I: Chaucer, Shakespeare, Milton and Their Contemporaries

English 11/111; Masterpieces of English Literature II: From the Enlightenment to the Modern Period

English 12/112; Masterpieces of American Literature

English 30/130; The Novel

English 40/140; Drama

Music 1; Introduction to Music

Music 2A; The Symphony

Music 4A; The Music of J. S. Bach

Music 4C; The Music of Beethoven

Music 4D; The Operas of Mozart

Music 4F; The Music of Richard Wagner

Music 5A; Music in America

Music 21; Elements of Music I

Religious Studies 121; The Hebrew Bible

Slavic Languages and Literatures 145; Survey of Russian Literature in English Translation I: The Age of Experiment

Slavic Languages and Literatures 146; Survey of Russian Literature in English Translation II: The Age of Realism

Slavic Languages and Literatures 147; Survey of Russian Literature in English Translation After 1917: Invention of Tradition

Slavic Languages and Literatures 151; Fyodor Dostoevsky

Slavic Languages and Literatures 153; Leo Tolstoy

SLE 91, 92, 93; Structured Liberal Education (entire sequence must be completed and thereby also satisfies Areas 1 and 3)

VTSS 165; Technology and Musical Aesthetics

B) More advanced courses that can still be appropriate:

Art 100A; Archaic and Early Classical Greek Art

Art 100B; Ancient Art II

Art 100C; Ancient Art III: Roman Art

Art 107; Age of Cathedrals

Art 110A; The Origins of the Renaissance

Art 110B; Early Renaissance Art

Art 110C; High Renaissance Art

Art 115A; Artistic Culture in Italy During the 17th Century

Art 115B; 17th-Century Art in the Low Countries: The Age of Rubens and Rembrandt

Art 116A; Masterpieces and Monuments of the Baroque Age

Art 120A; 18th-Century Art in Europe

Art 120B; Painting in the Age of Revolution

Art 120C; Realism and Impressionism

Art 120D; Alternatives to Impressionism

Art 130; American Art and Culture: 1670-1860

Art 130A; American Art and Culture in the Gilded Age

Art 130B; Paris and N.Y.: Transatlantic Exchange in Early Modernism

Art 130C; Culture in Crisis: American Art in the 1930s

Art 175A; Modern Architecture I

Art 175B; Modern Architecture II

Art 176; American Architecture and Urbanism

English 132; 19th-Century English Novel

English 133; 20th-Century English Novel

English 137; Development of the Short Story

English 161B; Afro-American Writing, 1970 to the Present

English 173A, B, C (same as Drama 159A, B, C); Shakespeare

Italian 233; Dante’s Divine Comedy

Italian 250; The Italian Renaissance

C) Courses where some foreign language preparation is necessary:

French 130; French Literature I: Middle Ages and Renaissance

French 131; French Literature II: 17th and 18th Centuries

French 132; French Literature III: 19th and 20th Centuries

Italian 227; Italian Literature I: Middle Ages and the Renaissance

Italian 228; Italian Literature II: Modern Italian Narrative

Spanish 130B; Spanish Cultural Readings
Spanish 131B; Hispanic-American Cultural Readings and Composition
Spanish 132B; Mexican and Chicano Cultural Readings
Spanish 140; Introduction to the Methods of Literary Analysis
Spanish 150; Spanish Literature I
Spanish 151; Spanish Literature II
*Spanish 160; Spanish-American Literature I
*Spanish 161; Spanish-American Literature II

AREA 3: PHILOSOPHICAL, SOCIAL, AND RELIGIOUS THOUGHT
*African and Afro-American Studies 115; Africa and Philosophy, Philosophy and Africa: Introduction to a Polemic
American Studies 151 (same as History 163); The Transformation of American Thought and Culture: 1865-Present
Biological Sciences 114; Scientific Philosophy and Bioethics
Classics 3; Democracy and Imperialism
Classics 8; Political Philosophy in Classical Antiquity
Classics 18; Greek Mythology
Classics 115; Greek Attitudes, Values, Beliefs
Feminist Studies 102B (same as Philosophy 177); Feminism and Philosophy
German Studies 33A/133; Democracy, Protest, and Political Culture in German-Speaking Europe

*History 21 (same as Anthropology 21); World Outside the West: Change and Tradition before the Age of European Imperialism (must be taken in sequence with History 22 to satisfy Area 3; taken independently, satisfies Area 5 and non-Western culture)
*History 22 (same as Anthropology 22, Political Science 22); World Outside the West in the Age of European Imperialism (must be taken in sequence with History 21 to satisfy Area 3; taken independently, satisfies Area 5 and non-Western culture)
*History 187A; The Middle East, 570-1718
History of Science 145 (same as History 139, Philosophy 145, VTSS 125); Scientific Revolution
History of Science 147; Science in the Enlightenment
History of Science 168 (same as Philosophy 168, VTSS 126); History and Philosophy of Physics
Philosophy 10; God, Self, and World: Introduction to Philosophy
Philosophy 20; Introduction to Moral Theory
Philosophy 30 (same as Political Science 51D, Public Policy 103A); Introduction to Political Philosophy

*Philosophy 46/104 (same as Asian Languages 46, Religious Studies 55); Introduction to Chinese Thought
Philosophy 60 (same as History of Science 60); The Growth of Scientific Knowledge
Philosophy 100 (same as Classics 65); Greek Philosophy
Philosophy 102; Modern Philosophy, Descartes to Kant
Philosophy 138A (same as Classics 138A, History 138A, History of Science 138A); Introduction to Cosmology (when taken in sequence with 138B or 138C, satisfies Area 6)
Philosophy 138B (same as Classics 138B, History 138B, History of Science 138B); Introduction to Cosmology: Middle Ages to Newton (when taken in sequence with 138A, satisfies Area 6)
Philosophy 138C (same as Classics 138C, History 138C, History of Science 138C); Introduction to Cosmology: Newton to Einstein (when taken in sequence with 138A, satisfies Area 6)
Political Science 153; Utopian Political Thought
*Religious Studies 11E; Eastern and Western Conceptions of Self
*Religious Studies 14; Introduction to Buddhism
*Religious Studies 18; Zen Buddhism
Religious Studies 23; Judaism
Religious Studies 24A; Christianity
Religious Studies 42 (same as Philosophy 42); Philosophy of Religion
Religious Studies 65; Introduction to Christian Ethics
*Religious Studies 116; Japanese Buddhism
Religious Studies 126 (same as History 110); Age of the Reformation
Religious Studies 164 (same as Philosophy 174); The Morality of Peace and War
SLE 91, 92, 93; 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 (same as Public Policy 103B); Philosophical and Ethical Issues in Public Policy
VTSS 145; Chemistry and the Life Sciences in Historical and Philosophical Perspective

AREA 4: HUMAN DEVELOPMENT, BEHAVIOR, AND LANGUAGE
*Anthropology 1/101; Social and Cultural Anthropology
*Anthropology 4 (same as Linguistics 4); Language and Culture
Anthropology 5 (same as Linguistics 5, Human Biology 113); Biology and the Evolution of Language
*Anthropology 165; Psychological Anthropology
Communication 170; Communication and Children 1
Education 255 (same as Psychology 155); Human Abilities
English 102 (same as Linguistics 102); History of the English Language
German Studies 118/218 (same as Linguistics 176); Introduction to Germanic Dialects
German Studies 19A/119 (same as Linguistics 75); Introduction to Germanic Languages
Human Biology 2B, 3B, 4B; Human Biology Core (entire sequence must be completed and thereby also satisfies Area 5)
Linguistics 1; Introduction to Linguistics
Linguistics 60 (same as Anthropology 178); Introduction to Language Change
Linguistics 70; The Structure of English Words
Linguistics 71B (same as English 101); Linguistics and Literature
Linguistics 73; Black English
Linguistics 110; Introduction to Phonetics/Phonology
Linguistics 120; Introduction to Syntax
Linguistics 130; Introduction to Semantics and Pragmatics
Linguistics 153 (same as Urban Studies 165); Inter- and Intra-Ethnic Variation in Urban Vernacular English
Linguistics 160; Languages in Contact
*Linguistics 162 (same as Anthropology 177); Pidgins and Creoles
Philosophy 180; Philosophy of Language
Psychology 1; General Psychology
Psychology 102; Perception
Psychology 106; Introduction to Cognitive Psychology
Psychology 111; Developmental Psychology
Psychology 115; Social Development
Psychology 116 (same as Feminist Studies 126); Psychology of Women
Psychology 146 (same as Linguistics 145); Language and Thought
Slavic Languages and Literatures 1, 2, 3; First-Year Russian (entire sequence must be completed)
Sociology 5; Status, Friendship, and Social Pressure: An Experiential Approach
Sociology 120; Interpersonal Relations
Symbolic Systems 20 (same as Education 120); Problems of Intelligence, Information, and Learning

AREA 5: SOCIAL PROCESSES AND INSTITUTIONS
*African and Afro-American Studies 105 (same as Anthropology 105); Introduction to African and Afro-American Studies
*African and Afro-American Studies 114; Core Seminar: Africa and the Black Diaspora
*Anthropology 1/101; Social and Cultural Anthropology
*Anthropology 3; Human Pre-History
*Anthropology 11 (same as Feminist Studies 140); Sex Roles and Society
Anthropology 15/116 (same as Education 116X); Anthropological Perspectives on American Culture
*Anthropology 102; Indians of North America
*Anthropology 108; African Societies in a Changing World
Anthropology 110 (same as History 64); Introduction to Chicano Life and Culture
*Anthropology 115; Peoples of Island Southeast Asia
*Anthropology 117; Traditional Chinese Society
*Anthropology 123; Japanese Economic Organization
Anthropology 130 (same as African and Afro-American Studies 122, Communication 138); Film Images of African-American Culture
*Anthropology 157 (same as Law 316); Law in Radically Different Cultures
*Anthropology 187 (same as Human Biology 183); Hunter-Gatherers in Archaeological Perspective
Anthropology 188 (same as Human Biology 188); The Evolution of Prehistoric Civilizations
Anthropology 266 (same as Education 315); Cultural Transmission
*Asian Languages 92/192; Traditional East Asian Civilization: Japan
*Asian Languages 152 (same as History 195); Nomad Empires of Inner Asia
*Asian Languages 153 (same as History 193, History of Science 153); Science and Technology in Traditional China
*Asian Languages 156 (same as History 192A); China from Earliest Times to the 9th Century
Classics Art/Archaeology 14 (same as Athletics, Recreation, and Physical Education 107); Classical Athletics
Classics Art/Archaeology 20; Introduction to Classical Archaeology
Classics History 101 (same as History 101); History of Greece
Classics History 102 (same as History 102); Greek and Roman History from Alexander to Caesar
Classics History 103 (same as History 103); History of the Roman Empire
*Classics History 105; Culture of Ancient Egypt
Communication 1; Mass Communication and Society
Communication 140; History of American Journalism
Economics 1; Elementary Economics
Economics 51/51Q; Economic Analysis I
Economics 122; The Theory of Capitalist Development
Feminist Studies 101 (same as Anthropology 12, History 173C); Introduction to Feminist Studies: Issues and Methods
Feminist Studies 102C (same as Political Science 163); Contemporary Issues in Feminist Thought
German Studies 31A/131; Central Europe: Geography, Institutions, and Society
*History 21 (same as Anthropology 21); The World Outside the West; Change and Tradition Before the Age of European Imperialism (when taken in sequence with History 22, satisfies Area 3)
*History 22 (same as Anthropology 22, Political Science 22); The World Outside the West in the Age of European Imperialism (when taken in sequence with History 21, satisfies Area 3)
*History 24A; Russian Civilization I: The Shaping of Culture and Society from the 9th to 17th Century
History 107; Politics and Society in the High Middle Ages
History 119; Aristocracy and Absolutism: Eastern Europe, 1300-1800
History 120C; Russia in Revolution, 1861-1930
History 142; Revolutionary England, 1603-1689
History 145; Britain, 1851 to Present
*History 148C; Africa in the 20th Century
History 165A; 18th Century America
History 165B; 19th Century America
History 165C; 20th Century America
History 172A; America Since 1945
History 173B (same as Feminist Studies 122); U.S. Women's History, 1820-1990
History 177; Modern Latin America
*History 187B; The Modern Middle East, 1718-Present
History 188A; Jewish History from the Biblical Period to 1492
History 188B; Jewish History from 1492 to the Present
*History 192B; China from the 9th to the 19th Centuries
*History 192C; Modern and Contemporary Chinese History
*Human Biology 1 (same as Anthropology 2); Genes, Culture, and Human Diversity
Human Biology 2B, 3B, 4B; Human Biology Core (entire sequence must be completed and thereby also satisfies Area 4)
*Latin American Studies 80 (same as History 80); Culture, Politics, and Society in Latin America
Linguistics 50; Language and Social Issues in America
Linguistics 150; Introduction to Sociolinguistics
Linguistics 153 (same as Urban Studies 165); Inter- and Intra-Ethnic Variation in Urban Vernacular English
Political Science 1; Major Issues of American Public Policy
Political Science 10; American National Government
*Political Science 25; Colonialism and Nationalism in the Third World
Political Science 35; International Politics
Political Science 60; The American Dream
Political Science 113A; Politics and Development in Latin America
*Political Science 114; Japanese Politics
Political Science 114K; The Political Economy of Development
*Political Science 115; Politics in the People's Republic of China
Political Science 116A; European Politics and Society I
Political Science 116B; European Politics and Society II
*Political Science 118A; Political Change in Tropical Africa
*Political Science 118B; Politics of Race and Class in Southern Africa
Political Science 119A (same as History 123A); The Soviet Union: Politics and Society Since 1917
Political Science 134; Strategy, War, and Politics
Political Science 136 (same as History 122B); Soviet Foreign Policy
*Political Science 139A; Japanese Foreign Policy
Political Science 182F (same as American Studies 179, Law 106); Introduction to American Law
*Religious Studies 27; Islam
Religious Studies 142 (same as Classics/History 104); Early Christianity
Sociology 1; Introduction to Sociology
Sociology 5; Status, Friendship, and Social Pressure: An Experiential Approach
Sociology 120; Interpersonal Relations
Sociology 130; American Society in Film and Literature
Sociology 141; Politics and Society
Sociology 145; Race and Ethnic Relations
Sociology 160; Formal Organizations
VTSS 101; Science, Technology, and Contemporary Society
VTSS 106 (same as Engineering 221); The Nature of Technology in Modern Society
VTSS 107 (same as Economics 113); Technology and Modern Industrial Society
VTSS 121 (same as History 115, History of Science 121); History of Technology in Western Society, 1500-1918
VTSS 170 (same as Industrial Engineering 107); Work, Technology, and Society
AREA 6: MATHEMATICAL SCIENCES

Biology 141; Biostatistics
Mathematics 19; Calculus and Analytic Geometry
Mathematics 20; Calculus and Analytic Geometry
Mathematics 21; Calculus and Analytic Geometry
Mathematics 41; Calculus and Analytic Geometry
Mathematics 42; Calculus and Analytic Geometry
Mathematics 103; Matrix Theory and its Applications
Mathematics 113; Linear Algebra and Matrix Theory

Operations Research 50/150; Models and Applications of Operations Research in Society
Philosophy 57/157; Introduction to Logic
Philosophy 138A and 138B or 138C (same as Classics 138A and 138B or 138C; History 138A and 138B or 138C; History of Science 138A and 138B or 138C) (138B and 138C are offered alternate years); Introduction to Cosmology (both courses must be completed to satisfy Area 6; taken independently, each course satisfies Area 3)

Philosophy 159 (same as Linguistics 135, Symbolic Systems 159); Basic Concepts in Mathematical Logic
Psychology 60; Statistical Methods
Statistics 40; Chance and Strategy
Statistics 60; Introduction to Statistical Methods I
Statistics 110; Statistical Methods in Engineering and the Physical Sciences

Chemistry 32; Frontiers in Chemistry
Chemistry 33; Structure and Reactivity
Geology 1; Interpreting the Earth
Geology 2; Earth History
Geology 150; The Oceans: An Introduction to the Marine Environment
*Human Biology 1 (same as Anthropology 2); Genes, Culture, and Human Diversity

Human Biology 2A, 3A, 4A; Human Biology Core (entire sequence must be completed)

*Human Biology 1 (same as Anthropology 2); Genes, Culture, and Human Diversity

Physics 11; Symmetries of Nature
Physics 14; Physics of Music
Physics 15; Cosmic Horizons
Physics 19; An Introduction to Physics (Physics for Poets)
Physics 21; Mechanics and Heat
Physics 23; Electricity and Optics
Physics 25; Modern Physics
Physics 51; Mechanics

*Human Biology 1 (same as Anthropology 2); Genes, Culture, and Human Diversity

Physics 53; Electricity and Magnetism
Physics 55; Light and Heat
Physics 57; Modern Physics
Physics 61; Advanced Freshman Physics
Physics 63; Advanced Freshman Physics

Physics 65; Advanced Freshman Physics

Psychology 103A; Visual Sensing by Humans and Computers

VTSS 51, 52, 53; Nature of Technology, Mathematics, and Science (entire sequence must be completed and thereby also satisfies Areas 6 and 8)

AREA 7: NATURAL SCIENCES

Anthropology 6; Human Origins

Applied Physics 15; The Nature of the Universe
Applied Physics 25; Evolution of the Cosmos
Applied Physics 50; Astronomy Laboratory and Observational Astronomy

Chemistry 31; Chemical Principles

Physics 11; Symmetries of Nature
Physics 14; Physics of Music
Physics 15; Cosmic Horizons
Physics 19; An Introduction to Physics (Physics for Poets)
Physics 21; Mechanics and Heat
Physics 23; Electricity and Optics
Physics 25; Modern Physics
Physics 51; Mechanics

Psychology 103A; Visual Sensing by Humans and Computers

VTSS 51, 52, 53; Nature of Technology, Mathematics, and Science (entire sequence must be completed and thereby also satisfies Areas 6 and 8)

AREA 8: TECHNOLOGY AND APPLIED SCIENCE

Aeronautics and Astronautics 100; Introduction to Aeronautics and Astronautics

Applied Earth Sciences 1; Introduction to Earth Resources
Applied Earth Sciences 130; Environmental Earth Sciences I
Applied Earth Sciences 184; Management of Geologic Hazards
Applied Physics 20; From Klystrons to Lasers: The Stanford Connection

Civil Engineering 170 (same as VSST 182); Environmental Science and Technology

Civil Engineering 176; Small Scale Energy Systems

Computer Science 105A; Introduction to Computers

Computer Science 106A; Programming Methodology

Computer Science 106X; Programming Methodology and Abstractions

Computer Science 109A; Introduction to Computer Science

Electrical Engineering 106; Planetary Exploration

Engineering 10; Applied Mechanics-Statics

Engineering 12; Intermediate Dynamics
APPENDIX 765

Engineering 30; Engineering Thermodynamics
Engineering 35; Automotive Technology
Engineering 40; Introductory Electronics
Engineering 50 (same as Materials Science and Engineering 50); Introductory Science of Materials
Geophysics 4; Natural Hazards and Man
Music 120; Introduction to Music Synthesis and Programming Using MIDI Based Systems
Operations Research 50/150; Models and Applications of Operations Research in Society
Operations Research 152 (same as Engineering 62, Statistics 152); Introduction to Operations Research I
Petroleum Engineering 103; Survey of the Energy Industries
Physics 105; Intermediate Physics Laboratory: Electronics
VTSS 51, 52, 53; Nature of Technology, Mathematics, and Science (entire sequence must be completed and thereby also satisfies Areas 6 and 7)
VTSS 165; Technology and Musical Aesthetics

OVERSEAS STUDIES COURSES

NOTE—In the case of courses offered by faculty other than Academic Council members, no more than one course per quarter and no more than two courses overall may count toward the Distribution Requirements. This limitation does not apply to courses offered by faculty who are Academic Council members.

BERLIN

A) Courses taught by non-Academic Council members:

AREA 2:
Overseas Studies Germany 4; West German Literature Between the Reality of Ruins and the Student Movement, 1945-68
Overseas Studies Germany 101A (same as Drama 101A); German Theater
Overseas Studies Germany 117V (same as Art 173Y, VTSS 117V); Industrial Revolution and Its Impact on Art, Architecture, and Theory
Overseas Studies Germany 120X (same as Art 120X); New Ways of Seeing
Overseas Studies Germany 123X (same as Art 123X); German Art in the Weimar Republic and the Nazi Reich
Overseas Studies Germany 179B; Split Images; German Film Culture, East and West

AREA 3:
Overseas Studies Germany 133X (same as Philosophy 133X, Political Science 164X); The Frankfurt School: From Marxism to Post-Modernism

AREA 5:
Overseas Studies Germany 135X (same as Political Science 135X); East-West Relations in Europe
Overseas Studies Germany 144X (same as Political Science 144X); The Federal Republic in East-West Relations
Overseas Studies Germany 227V (same as History 227V); Introduction to German History: Politics and Culture from the Middle Ages to the Unification of Germany, 900-1870
Overseas Studies Germany 230B (same as History 230B); Berlin: Its History, Politics, and Culture

B) Courses taught by Academic Council members:

AREA 8:
Overseas Studies Germany 170 (same as Civil Engineering 170, VTSS 182); Environmental Science and Technology

FLORENCE

A) Courses taught by non-Academic Council members:

AREA 2:
Overseas Studies Florence 111A (same as Art 111A); Tuscan Art from Giotto to Leonardo
Overseas Studies Florence 111B (same as Art 111B); The High Renaissance and Mannerism in Florence, Rome, and Venice

AREA 4:
Overseas Studies Florence 1901 (same as History 1901, Psychology 112X); Seeing and Measuring Human Differences: A Historical Perspective in Human Science (1800-1940)

AREA 5:
Overseas Studies Florence 125X (same as Political Science 125X); Contemporary West European Politics
Overseas Studies Florence 126X (same as Political Science 126X); Italian Political System, Part I
Overseas Studies Florence 218X (same as Political Science 218X); European Integration and 1992

B) Courses taught by Academic Council members:

AREA 2:
Overseas Studies Florence 333F (same as Italian 333F); Dante's Divine Comedy: The Influence of Florence
AREA 5:
Overseas Studies Florence 121X (same as History 135V, Political Science 121X); The United States and Western Europe after World War II
Overseas Studies Florence 106V (same as History 106V, Political Science 158X); Italy: From Agrarian to a Post-Industrial Society

KRAKOW
A) Courses taught by non-Academic Council members:

AREA 5:
Overseas Studies Krakow 120V (same as History 120V); History of Eastern Europe

OXFORD
A) Courses taught by non-Academic Council members:

AREA 2:
Overseas Studies Oxford 120Y (same as Art 120Y); Art and Society in Britain: 1730-1914
Overseas Studies Oxford 254Z (same as Drama 158D, English 254X); Drama in Britain Today
Overseas Studies Oxford 176X (same as Art 176X); History of British Architecture
Overseas Studies Oxford 178Z (same as English 178Z); Charles Dickens: Bleak House and After

AREA 3:
Overseas Studies Oxford 81 (same as Philosophy 81); Values, Ethics, and Law

AREA 5:
Overseas Studies Oxford 144V (same as History 144V, Political Science 132X); The British Empire and the Commonwealth
Overseas Studies Oxford 143V (same as History 143V, Urban Studies 146U); Urban History in Britain from the 16th to 20th Centuries
Overseas Studies Oxford 167X (same as Economics 167X); European Economies in a Changing World

TOURS

A) Courses taught by non-Academic Council members:

AREA 2:
Overseas Studies Tours 102T (same as French 102T); The 19th-Century French Novel
Overseas Studies Tours 103T (same as French 103T); Topics in 20th-Century French Literature
Overseas Studies Tours 115X; History of Art: The Renaissance in Italy and France

Overseas Studies Tours 119X (same as Art 119X, Urban Studies 179U); Introduction to French Art: Romanesque to Renaissance
Overseas Studies Tours 121X (same as Art 121X); Painting and Society in France
Overseas Studies Tours 154T (same as French 154T); Moliere and the Traditions of Comedy
Overseas Studies Tours 181T (same as French 181T); Modern French Poetry: From Baudelaire to Surrealism

AREA 5:
Overseas Studies Tours 111X (same as Political Science 111X); Contemporary French Politics: A Comparative Approach
Overseas Studies Tours 120X (same as Political Science 120X); French Foreign Policy
Overseas Studies Tours 128X (same as Economics 128X); Contemporary Problems of Economic Growth
Overseas Studies Tours 130V (same as History 130V); Survey of French History: 1715 to the Present
Overseas Studies Tours 168X (same as Economics 168X); Economic Analysis of Europe and the Single European Act
Overseas Studies Tours 219X (same as Political Science 219X); 1993: Towards the United States of Europe?

B) Courses taught by Academic Council members:

AREA 2:
Overseas Studies Tours 132 (same as French 132); French Literature III: 19th and 20th Centuries
Overseas Studies Tours 191T (same as French 191T); The Short Story in France

AREA 5:
Overseas Studies Tours 101V (same as History 101V); Industrialization in Three Societies: France, Mexico, and Japan

UPPER-LEVEL COURSES SATISFYING THE NON-WESTERN CULTURE DISTRIBUTION REQUIREMENT 1990-91

ANTHROPOLOGY
90. Theory in Social Anthropology
103. Mesoamerican Communities, Ethnicities and Nations
109. Dance and Culture of Latin America
111. Islamic Science and Technology
114. The East-West Game
120. Modern India: History, Society, Culture
126. Issues in the Ethnography of the Middle East
APPENDIX

149. Anthropology of Development
154. Creation/Procreation: A Comparative Study
164. Ecological Anthropology (same as Human Biology 134)
165. Psychological Anthropology
168. Medical Anthropology

ART
125A. Indian Painting
125B. The Art of India
125C. The Art and Architecture of Moghul India
126. Introduction to Chinese Art
126A. Introduction to Chinese Painting
126B. Early Chinese Pictorial Art
126C. Later Chinese Painting
128A. Ritual Bronzes of Ancient China
128B. Chinese Ceramics
128C. Buddhist Art in Asia
128D. Architecture and Gardens of Japan
128E. Japanese Ceramics
129A. Japanese Art from Prehistory to the Muromachi Period
129B. Japanese Art of the Momoyama and Edo Periods
129C. A Survey of Japanese Painting

ASIAN LANGUAGES

CHINESE
230. Interpreting Confucian Texts
231. Neo-Confucianism
241. Modern Chinese Literature: The Short Story
242. Modern Chinese Literature: The Essay
243. Modern Chinese Literature: The Novel
263. Lyric (shih) I
271. Traditional Chinese Fiction

JAPANESE
248. Readings in Classical Japanese
250. Introduction to Kambun
275. Canons and Conventions in Traditional Japanese Literature
396. Seminar in Modern Japanese Literature

ECONOMICS
124. Japanese Economy

FOOD RESEARCH INSTITUTE
103. The World Food Economy (same as Economics 106)
121. Development and Population Interactions in the Third World (same as Economics 119)

136. Population Perspectives in the Third World (same as Economics 133, Human Biology 136, Sociology 153)
146. Economic Development in China (same as Economics 121)
218. Economic Development in Latin America (same as Economics 123)
250. Nutritional Problems of Developing Nations (same as Anthropology 250, Human Biology 110)
251. Food and Nutrition Strategies in Development

HISTORY
195. Nomad Empires of Inner Asia
490B. Research in Modern and Contemporary China

PHILOSOPHY
129. Confucian Ethics

POLITICAL SCIENCE
125. Seminar: Rise of Industrial Asia
139. Seminar: Chinese Foreign Policy
215. Japan’s Political Economy

RELIGIOUS STUDIES
150. Systems of Buddhist Thought
207. Religion, Culture, and Gender
209. Buddhism in Central Asia
211. The Taoist Religion
212. Interpreting Confucian Texts
218. A Trickster in East Asia

SPANISH AND PORTUGUESE

SPANISH
248. The Caribbean Americas: An Introduction to their Literature, Thought, and Culture
249. Afro-Hispanic Cultural Worlds: An Introduction

PORTUGUESE
130. Brazilian Cultural Readings and Composition
240. Brazilian Literature I: The Origins to Independence
241. Brazilian Literature II: Naturalism to the Present
290. Brazilian Cinema Film
294. Luso-Brazilian Women in a Postmodern Context
Desktop Presentations and Publications, 741
Developmental Biology, Program in, 639
Diagnostic Radiology and Nuclear Medicine, 693
Directed Reading and Research, Dissertation and Practica (All Area Courses), 85
Directing (Drama), 353
Distribution Requirements, 11
Credit Transfer, 12
Current System, 12
Petition, 12
Purpose, 11
Undergraduates who entered prior to Autumn, 1980, 12 see also Appendix
Doctor of Education, 67,
General Requirements for 17
Doctor of Jurisprudence, General Requirements for, 17
Doctor of Musical Arts (D.M.A.), General Requirements for, 17, 536
Doctor of Philosophy, 17
Candidacy, 18
Dissertation, 19
Doctoral Dissertation Reading Committee, 18
Foreign Language Requirement, 18
General Regulations, 17
Teaching Requirements, 18
University Oral Examination, 18
Doctor of the Science of Law,
General Requirements for, 17
Drama, 352
Drama and Humanities, Joint Ph.D. Program in, 354
Dramatic Literature/Criticism/Theater History, 353
Drawing, 260
Earth Resources, 23
Earth Sciences, School of, 22
East Asian Studies
and Business, 364
and Education, 364
and Food Research, 365
and Health Services Research, 365
and Law, 364
East Asian Studies, Center for, 361
East Asian Studies Theme House, 272, 363
Econometrics, 385
Economic Analysis, 175, 382
Economic Development, 382
Economic History, 383
Economic Perspectives and Policies, 372
Economics, 370
Economics, Quantitative, 372
Economics and Law, Joint Program in, 375
Ed. D. Degree, 17, 67
Ed. S. Degree, 16, 67
Education, School of, 63
Educational Specialist, 16, 67
Electrical Engineering, 89, 94, 153
Electrical Engineering, Administration, 155
Energy Modeling and Analysis, 175
Engineer Degree,
Requirements for, 16, 96
Engineer (Management Option), 57
Engineering-Economic Systems, 94, 172
Engineering in Biology and Medicine, 94
Engineering Management, 182
Engineering, School of, 86
Engineering, (3/2) Degree Programs, 87
English, 387
and American Literature, 389, 393
and Classics, 390
and Comparative Literature, 393
and French Literatures, 390, 421
and German Literatures, 390, 438
and Humanities, Joint Ph.D. in, 395
and Italian Literatures, 390, 421, 425
and Linguistics, 394
and Spanish or Spanish-American Literatures, 390, 648
English as a Foreign Language, 511
Environmental and Water Studies, 121
Environmental Earth Sciences, 25
Environmental Programs, 24
Environmental Studies, 35
Epistemology, Metaphysics, and Philosophy of Language, 565
Ethics, Aesthetics, and Social and Political Philosophy, 565
Ethics in Society, Program in, 405
Ethics of Development in a Global Environment (EDGE), 101
European Studies, Stanford Center for, 728
Exploration and Development, Master of Science in, Geophysics, 48
Feminist Studies, Program in, 407
Film, see Communication
Florence, Stanford Program in, 425, 546
Food Research Institute, 415
Foreign Languages, 503, 511
French and English Literatures, 390, 421
French and Italian, 419
French Division, 419
Italian Division, 424
Literatures, 421, 425
Freshman-Sophomore Seminar Programs, 679
Fundamentals of Microcomputing, 743
Genetics, 694
Geochemistry, Petrology, and Mineralogy, 38
Geologic Remote Sensing, 26
Geology, 36
Geomathematics in Process Simulation and Petroleum Resource Analysis, 27
Geomechanics, 27
Geophysics, 47
Geostatistics for Natural Resources Management, 28
German, Stanford Tubingen Graduate Exchange, 438
German Studies, 437
Ginzton, Edward L., Laboratory, 726
Graduate Division Special Program, 715
Graduate Final Requirement Registration, 15
Graduate School of Business, 21
Greece, Stanford in, 322
Greek, Classical and Modern, 324, 325
Hansen, W. W., Experimental Physics Laboratory, 725
Health Research and Policy, 695
History, 448
History and/or Philosophy of Science, Special Program in, 555, 557
History of Art, 258, 262
History and Humanities, Joint Ph. D. Program in, 452
History of Philosophy, 562
History of Science, Program in the, 465
History of the University, 6
Honors Cooperative Program, 93
Hoover Institution on War, Revolution and Peace, 733
Hopkins Marine Station, 309
Human Biology, Program in, 467
Humanities and Sciences, School of, 224
Humanities Center, Stanford, 723
Humanities Special Programs, 477
Hydrogeology, 28
Immunology Program, 716
Independent Research Laboratories, Centers and Institutes, 725
Individual and Team Sport Activities, 291
Individually Designed Majors, (IDM), Program for, 14, 91, 677
Indo-European Studies, Graduate Program in, 324
Industrial Engineering and Engineering Management, 89, 94, 181
Information Systems, Electrical Engineering, 156
Innovative Academic Course, 678
Institute for International Studies (IIS), 726
Institute for Mathematical Studies in the Social Sciences (IMSSS), 731
Integrated Circuits, Electrical Engineering, 157
Intelligent Systems, 174
Intercollegiate Athletics, 285
Intercollegiate Athletic Teams, 294
International Development Education (SIDECS), 83
International Economics, 385
International Policy Studies (IPS), 479
International Relations, 481
International Relations, Political Science Courses in, 586, 592
International Security and Arms Control, Center for, 728
Inter-University Center for Japanese Studies, in Yokohama, 274, 729
Inter-University Program for Chinese Language Studies in Taipei, 274, 729
Intramural Sports, 285
Italian Division, 424
Italian and English Literatures, 390, 425
Italian, English, and French Literatures, 421, 425
Italy, Stanford in, 424
Jackson Library, J. Hugh, 735
Japanese, Courses in, 278
Programs of Study in, 273
Summer Program of Intensive Language Courses, 272
Jasper Ridge Biological Preserve, 296
Jewish Studies, Program in, 495
John S. Knight Fellowship Program, 330
Journalism, see Communication
J.S.D. Degree, 17
J.S.M. Degree, 17
Krakow, Stanford Program in, 547
Korean, Courses in, 280
Land Resources Planning, 25
Lane Medical Library, 735
Language Requirement, 12
Language Program, Special, 511
Lasers and Quantum Electronics, Electrical Engineering, 157
Latin, see Classics
Latin American Studies, Center for, 497
Joint Degree Programs, 499
Summer Field Research, 500
Law, School of, 684
Libraries, 733
Library Information Systems, 733
Linguistics, 501
Anthropology, 247
and Cognitive Science, 502
and Literature, 502
Structure, 501
Literature in Translation, 512
Logic and Philosophy of Science, 563
Major, the Undergraduate, 13
Individually Designed, 14
Limits on Requirements for, 13
Management, M.S. Degree in, 21
Manufacturing, Programs in, 92, 96
Manufacturing Systems Engineering (MSE), 182, 198
Marine Biology, Division of, at Hopkins Marine Station, 309
Martial Arts, 293
Mass Media Institute, 333
Master of Arts, General Requirements for, 15
Master of Arts in Teaching (M.A.T.), 16, 66
(Subject), 66
Master of Business Administration (M.B.A.), General Requirements for, 16, 21
Master of Fine Arts (M.F.A.), General Requirements for, 16, 260
Master of Legal Studies (M.L.S.), General Requirements for, 16
Master of Science (M.S.), General Requirements for, 15
Master of the Science of Law, General Requirements for, 17
Materials Science and Engineering, 90, 94, 187
Mathematical and Computational Science, 514
Mathematical Economics, 385
Mathematical System Analysis, 175
Mathematics, 515
M.B.A. Degree, 16, 21
M.D. Degree, 17
Mechanical Engineering, 90, 94, 193
Medical Information Sciences, Program, 697
Medicine, School of, 686
Medieval Studies, 628
Mellon Foundation Program in Teacher Education for Undergraduates, 64
Microbiology and Immunology, 701
Microwaves, Acoustics, and Optics, Electrical Engineering, 157
Modern Thought and Literature, 528
and Humanities, Joint Ph.D. Degree in, 530
Molecular and Cellular Physiology, 704
Monetary Theory and Advanced Macroeconomics, 383
Monotype, 260
Music, 533
Networking and Communications Systems, 739
Neurobiology, 706
Neurosciences Program, 718
Nondiscriminatory Policy, Statement of, 755
Nonmatriculated Graduate Study, 19
Non-Western Culture Distribution Requirements Courses, 766
Northeast Asia-United States Forum on International Policy, 728
Numerical Analysis/Scientific Computation, 136
Operations Research, 95, 216
Ore Deposits and Exploration, 29
Organizational Behavior, 632
Organizational Economics, 175
Overseas Studies, Program, 543
Overseas Studies, Distribution Requirements, 765
Oxford, Stanford Program in, 548
Painting, 260
Paris, Stanford Program in, 550
Pathology, 707
Petroleum Engineering, 53
Petroleum Geology, 29
Pharmacology, 709
Ph.D. Degree, 17
Ph.D. Minor, 19
Philosophy, 553
and Humanities, Joint Ph.D. Degree in, 559
of Language, Special Program in the, 557
and Religious Studies, Joint Major in, 555
and/or History of Science, Special Program in, 557
and Symbolic Systems, Special Track in, 559
Photography, 260
Physical Education, and Sports Theory, 289
Leadership Opportunities, 289
Physics, 569
Political Science, 579
Political Theory, 598, 592
Population and Resource Studies, Morrison Institute for, 595
Portuguese Language Program, 658
Premedical Requirements, 298
Preparadical Requirements, 298
Prospective Principals Program, 66
Psychological Studies in Education (PSE), 84
Psychology, 596
Cognitive Science Program, 600
Public Administration and Public Policy, 583
Public Finance, 383
Public Policy, Political Science Emphasis in, 579
Public Policy Program, 610
Public Service, Haas Center for, 680
Radiation Oncology, 711
Registration Requirements, 15
Rehabilitation Act of 1973, 755
Religion and Mythology, 329
Religious Studies, 614
and Humanities, Joint Ph.D. Program in, 615
and Philosophy, Joint Major in, 614
Requirements, Undergraduate, 10
Distribution, 11
Language, 12
Writing, 11
See also Appendix
Research and Evaluation Methods (REM), 84
Rome Classical Center, 322
Russian and East European Studies, Center for, 621
Salamanca, Spain, Stanford Program in, 550
Santiago, Chile, Stanford Program in, 550
Scientific Computing and Computational Mathematics, Program in, 222
Science and Technology Policy, 175
Scientific Computation, Numerical Analysis, 136
Scientific Computing and Computational Mathematics Program, 222
Sculpture, 260
Second Bachelor's Degrees, 9
Sedimentary Geology and Paleontology, 38
Slavic Languages and Literatures, 623
and Humanities, Joint Ph.D. Program in, 627
Sloan Program, Stanford, 21
Social and Cultural Anthropology, 245
Social Psychology and Interpersonal Processes, 632
Social Sciences, Anthropology Major in, 239
Social Sciences in Education (SSE), 84
Sociolinguistics, 502
Sociology, 632
Joint Program with the Law School, 635
Software Theory, 136
Solid State, Electrical Engineering, 157
Space Science and Astrophysics, Center for, 645
Space Physics and Radio-science, Electrical Engineering, 157
Spanish and Portuguese, 647
and Humanities, Joint Ph.D. Program in, 650
Language Program, 650
Special Language Program, 651
Spreadsheets, 744
Stanford Linear Accelerator Center, (SLAC), 731
Stanford Linear Accelerator Library, 736
Stanford Synchrotron Radiation Laboratory (SSRL), 732
Stanford Teacher Education Program (STEP), 66
Statistical and Programming Applications, 742
Statistics, 659
Structural Engineering and Geomechanics, 122
Structured Liberal Education, Program in, 350, 667
Structures and Composites Laboratory, 194
Summer Session, 20
SWOPSI (Stanford Workshops on Political and Social Issues), 679
Symbolic and Heuristic Computation, 136
Symbolic Systems, Program in, 667
Systems, Computer Science, 136
Table of Contents, 4
Teaching, Master of Arts in, 66
Tectonic, Structural, and Regional Geology, 38
Telecommunications and Space Information Systems, Electrical Engineering, 157
Terminal Graduate Registration (TGR), 15
Text Editing and Formatting, 740
Theoretical Computer Science, 136
Thermosciences Division (Mechanical Engineering), 194
Title IX of the Education Amendments of 1972, 755
Tours, Stanford Program in, 551
Undergraduate Academic Advising Center, 14
Undergraduate Degrees, 8
Undergraduate Research Opportunities (URO), 682
Undergraduate Scholars Program (USP), 226
Undergraduate Special Courses, 680
Undergraduate Study at Stanford, 10
University Libraries, 735
University Publications, 757
Urban Planning Option, 672
Urban Studies, Program on, 671
Values, Technology, Science, and Society, Program in (VTSS), 745
Vertebrate Animals in Teaching Activities, Policy on the Use of, 756
Washington, Stanford in, 683
Women and Gender, Institute for Research on, 724