Academic Units

African American Studies, Department of
African American Studies, Program in
African Studies, Program in
American Studies, Program in
Andlinger Center for Energy and the Environment
Anthropology, Department of
Applications of Computing, Program in
Applied and Computational Mathematics, Program in
Archaeology, Program in
Architecture, School of
Architecture and Engineering, Program in
Art and Archaeology, Department of
Astrophysical Sciences, Department of
Biophysics, Program in
Center for the Study of Religion
Chemical and Biological Engineering, Department of
Chemistry, Department of
Civil and Environmental Engineering, Department of
Classics, Department of
Cognitive Science, Program in
Committee for Film Studies
Committee for Statistical Studies
Committee on Renaissance and Early Modern Studies
Comparative Literature, Department of
Computer Science - A.B., Department of
Computer Science - B.S.E., Department of
Contemporary European Politics and Society, Program in
Council of the Humanities
Council on Science and Technology
Creative Writing, Program in
Dance, Program in
East Asian Studies, Department of
East Asian Studies, Program in
Ecology and Evolutionary Biology, Department of
Economics, Department of
Electrical Engineering, Department of
Engineering and Applied Science, School of
Engineering and Management Systems, Program in
Engineering Biology, Program in
Engineering Physics, Program in
English, Department of
Entrepreneurship, Program in
Environmental Studies, Program in
Ethnographic Studies, Program in
European Cultural Studies, Program in
Finance, Program in
French and Italian, Department of
Gender and Sexuality Studies, Program in
Geological Engineering, Program in
Geosciences, Department of
German, Department of
Global Health and Health Policy, Program in
Hellenic Studies, Program in
History, Department of
History and the Practice of Diplomacy, Program in
Humanistic Studies, Program in
Jazz Studies, Program in
Judaic Studies, Program in
Language and Culture, Program in
Latin American Studies, Program in
Latino Studies, Program in
Lewis Center for the Arts
Lewis-Sigler Institute for Integrative Genomics
Linguistics, Program in
Materials Science and Engineering, Program in
Mathematics, Department of
Mechanical and Aerospace Engineering, Department of
Medieval Studies, Program in
Molecular Biology, Department of
Music, Department of
Music Theater, Program in
Musical Performance, Program in
Near Eastern Studies, Department of
Near Eastern Studies, Program in
Neuroscience, Program in
Neuroscience - A.B., through the Princeton Neuroscience Institute
Operations Research and Financial Engineering, Department of
Philosophy, Department of
Physics, Department of
Planets and Life, Program in
Politics, Department of
Princeton Environmental Institute (PEI)
Princeton Institute for International and Regional Studies (PIIRS)
Princeton Institute for the Science and Technology of Materials (PRISM)
Princeton Neuroscience Institute (PNI)
Princeton Writing Program
Program of Freshman Seminars
Psychology, Department of
Quantitative and Computational Biology, Program in
Religion, Department of
Robotics and Intelligent Systems, Program in
Russian, East European, and Eurasian Studies, Program in
Slavic Languages and Literatures, Department of
Sociology, Department of
South Asian Studies, Program in
Spanish and Portuguese, Department of
Statistics and Machine Learning, Program in
Sustainable Energy, Program in
Teacher Preparation, Program in
Technology and Society, Program in
Theater, Program in
Translation and Intercultural Communication, Program in
University Center for Human Values
Urban Studies, Program in
Values and Public Life, Program in
Visual Arts, Program in
Woodrow Wilson School of Public and International Affairs
Academic Calendars

Fall Term, 2016-17

September 7, Wednesday. Academic Year Sign-In via TigerHub, 7 a.m. Sign-In must be completed by 11:59 p.m., Tuesday, September 13.
September 3, Saturday. Freshman dormitory check-in, 8 a.m. to 3 p.m., Baker Rink.
September 11, Sunday. Opening Exercises, 3 p.m., University Chapel.
September 13, Tuesday. Freshman Advising and Course Selection, Friend Center.
September 14, Wednesday. Fall term classes begin.
October 24-28, Monday-Friday. Midterm exams. (Not every midterm exam is scheduled during this week. Students should consult course instructors for exceptions.)
October 29, Saturday. Fall recess begins.
November 6, Sunday. Last day of fall recess.
November 22, Tuesday. Thanksgiving recess begins after the last class.
November 27, Sunday. Last day of Thanksgiving recess.
December 7-9. Senior spring course selection period.
December 12-14. Sophomore spring course selection period.
December 14-16. Freshman spring course selection period.
December 17, Saturday. Winter recess begins. (Recess begins after last class on Friday, December 18.)
January 8, Sunday. Last day of winter recess.
January 9, Monday. First day of Reading Period.
January 17, Tuesday. Last day of Reading Period. "Dean's Date" for written work (term papers, lab reports, final projects).
January 18, Wednesday. First day of fall term final exams.
January 28, Saturday. Last day of fall term final exams.

Spring Term, 2016-17

February 6, Monday. Spring term classes begin.
March 13-17, Monday-Friday. Midterm exams. (Not every midterm exam is scheduled during this week. Students should consult course instructors for exceptions.)
March 18, Saturday. Spring recess begins.
March 26, Sunday. Last day of spring recess.
April 24-26. Junior fall term course selection period.
May 1-3. Freshman fall term course selection period.
May 8, Monday. First day of Reading Period.
May 16, Tuesday. Last day of Reading Period. "Dean's Date" for written work (term papers, lab reports, final projects).
May 17, Wednesday. First day of spring term final exams.
May 17-18, Wednesday-Thursday. Senior departmental/comprehensive exams.
May 27, Saturday. Last day of spring term final exams.
June 4, Sunday. Baccalaureate.
June 5, Monday. Class Day.
June 6, Tuesday. Commencement.

Fall Term, 2017-18

September 6, Wednesday. Academic Year Sign-In.
September 9, Saturday. Freshman dormitory check-in.
September 12, Tuesday. Freshman Advising and Course Selection.
September 13, Wednesday. Fall term classes begin.
October 28-November 5. Fall recess.
November 22-26, Wednesday-Sunday. Thanksgiving recess.
January 8-16. Reading Period.
January 17-27, Wednesday-Saturday. Final exams.

Spring Term, 2017-18

February 5, Monday. Spring term classes begin.
March 17-25. Spring recess.
May 7-15. Reading Period.
June 3, Sunday. Baccalaureate.
June 4, Monday. Class Day.
June 5, Tuesday. Commencement.

Fall Term, 2018-19

September 5, Wednesday. Academic Year Sign-In.
September 8, Saturday. Freshman dormitory check-in.
September 11, Tuesday, Freshman Advising and Course Selection.
September 12, Wednesday. Fall term classes begin.
October 27-November 4. Fall recess.
November 21-25, Wednesday-Sunday. Thanksgiving recess.
January 7-15. Reading Period.

**Spring Term, 2018-19**

February 4, Monday. Spring term classes begin.
May 6-14. Reading Period.
May 15-25. Final exams.
June 2, Sunday. Baccalaureate.
June 3, Monday. Class Day.
June 4, Tuesday. Commencement.

**Fall Term, 2019-20**

September 4, Wednesday. Academic Year Sign-In.
September 7, Saturday. Freshman dormitory check-in.
September 10, Tuesday. Freshman Advising and Course Selection.
September 11, Wednesday. Fall term classes begin.
October 26-November 3. Fall recess.
November 26-December 1, Wednesday-Sunday. Thanksgiving recess.
December 13-January 5. Winter recess.
January 6-14. Reading Period.
January 15-25. Final exams.

**Spring Term, 2019-20**

February 3, Monday. Spring term classes begin.
March 14-22. Spring recess.
May 4-12. Reading Period.
May 13-23. Final exams.
June 1, Monday. Class Day.
June 2, Tuesday. Commencement.
*Schedules are subject to change.
University Administrators

President

Christopher L. Eisgruber, J.D., M.Litt.

Provost

David. S. Lee, Ph.D.

Dean of the Faculty

Deborah A. Prentice, Ph.D.

Dean of the College

Jill S. Dolan, Ph.D. Dean of the

Graduate School

Sanjeev R. Kulkarni, Ph.D.

Dean for Research

Pablo G. Debenedetti, Ph.D. Vice

President for Campus Life W.

Rochelle Calhoun, M.F.A. Dean of

Undergraduate Students

Kathleen Deignan, M.S.

Dean of the School of Engineering and Applied Science

Emily A. Carter, Ph.D.

Dean of the Woodrow Wilson School of Public and International Affairs Cecilia E. Rouse, Ph.D.
The provost is the general deputy of the president.

The dean of the faculty has administrative oversight of departments and programs of instruction and is responsible for the effectiveness and well-being of all ranks of the faculty.

The dean of the college is responsible for the undergraduate academic program, including the curriculum, academic advising, academic regulations, and scholastic standing. The dean also has oversight responsibility for offices and services that promote the academic development of undergraduates, as well as for the residential college system.
The vice president for campus life has oversight responsibility for the dean of undergraduate students, and for athletics, career services, health services, religious life, and the Pace Center.

The dean of undergraduate students has oversight responsibility for undergraduate residential life, University centers, and student organizations, and is also responsible for matters relating to the conduct and discipline of undergraduates.

The main University website has more detailed information on University governance.
The Undergraduate Program

This online publication presents the academic regulations, programs of study, and course offerings of Princeton University. Information about other important areas is available from various offices of the University, included in publications distributed to students, or found on the Princeton University website.

Princeton University is a private, coeducational university located in Princeton, New Jersey, midway between New York City and Philadelphia. The 500-acre central campus is residential, and all buildings are within easy walking distance of one another. Founded in 1746 as the College of New Jersey, Princeton now has an undergraduate population of approximately 5,200 students working toward the bachelor of arts (A.B.) or bachelor of science in engineering (B.S.E.) degree. The University's outstanding financial aid program provides grants rather than loans— which do not have to be repaid—and ensures that a Princeton education is affordable to qualified students from all socioeconomic backgrounds. Students come from all 50 states and from more than 95 countries. A single full-time faculty of 947 teaches both graduate and undergraduate students.

Nearly all undergraduates are in residence on the campus, and housing is guaranteed for all four years. The six residential colleges provide a vast array of educational and social activities. In housing and dining arrangements, extracurricular activities, and daily social life, undergraduates make up a single student body regardless of degree candidacy or program of study. With many lectures, classes, and laboratories in common, undergraduates enjoy a shared academic experience, no matter what their principal field of study.
The A.B. Degree

Programs of study in the humanities, the natural sciences, and the social sciences lead to the degree of bachelor of arts. Students select a concentration from the following academic departments:

African American Studies
Anthropology
Architecture
Art and Archaeology
Astrophysical Sciences
Chemistry
Classics
Comparative Literature
Computer Science
East Asian Studies
Ecology and Evolutionary Biology
Economics
English
French and Italian
Geosciences
German
History
Mathematics
Molecular Biology
Music
Near Eastern Studies
Neuroscience
Philosophy
Physics
Politics
Psychology
Religion
Slavic Languages and Literatures
Sociology
Spanish and Portuguese Languages and Cultures
Woodrow Wilson School of Public and International Affairs
The B.S.E. Degree

Programs of study in the School of Engineering and Applied Science lead to the degree of bachelor of science in engineering. Students select a concentration from the following academic departments:

- Chemical and Biological Engineering
- Civil and Environmental Engineering
- Computer Science
- Electrical Engineering
- Mechanical and Aerospace Engineering
- Operations Research and Financial Engineering

Certificate Programs

In addition to their departmental concentration, students may earn a certificate by completing the requirements in one or more of the following programs:

- African American Studies
- African Studies
- American Studies
- Applications of Computing
- Applied and Computational Mathematics
- Archaeology
- Architecture and Engineering
- Biophysics
- Cognitive Science
- Contemporary European Politics and Society
- Creative Writing
- Dance
- East Asian Studies
- Engineering and Management Systems
- Engineering Biology
- Engineering Physics
- Entrepreneurship
- Environmental Studies
- Ethnographic Studies
- European Cultural Studies
- Finance
While methods of instruction vary widely, all areas of the academic program emphasize individual responsibility and the free interchange of ideas. This emphasis is demonstrated most notably in the wide use of preceptorials and seminars, in the provision of independent study for all upper-class students and qualified underclass students, and in the availability of a series of special programs to meet a range of individual interests. The undergraduate college
encourages the student to be an independent seeker of information and to assume responsibility for gaining both knowledge and judgment that will strengthen later contributions to society.

Undergraduate regulations, academic and social, are relatively few. They represent the expectation of appropriate behavior on the part of all students and require a reasonable standard of performance in scholarly achievement.
Admission, Financial Aid, Fees

Admission

Prospective applicants are encouraged to visit the Admission and Aid website or contact the Admission Office by mail: Box 430, Princeton University, Princeton, New Jersey 08542-0430; phone: (609) 258-3060; or e-mail: uaoffice@princeton.edu.

General Principles. Princeton seeks students of good character who have demonstrated scholastic achievement and capacity for further growth. The University and its facilities are open to all persons pursuant to the equal opportunity policy.

The Faculty Committee on Undergraduate Admission and Financial Aid, which meets with a parallel student committee, is responsible for advising the administration on admission policy. The Admission Office staff seeks to identify candidates who seem best qualified to take advantage of Princeton's academic programs and to select from among them those who will represent a wide range of interests, backgrounds, and special abilities. The Admission Office staff considers each applicant individually. Candidates for admission should have demonstrated significant academic potential, as well as strength of character and maturity, and show promise of contributing to the life of the University. Princeton welcomes applications from talented students of diverse backgrounds.

Entrance Standards. Princeton does not prescribe fixed secondary school course requirements for admission. The University recognizes the diversity of programs offered by secondary schools and is primarily interested in the quality and breadth of the student's record. The secondary school's testimony about academic ability and interest as well as motivation, reliability, and strength of character are very important.

Although the applicant's course program is but one of several elements taken into consideration by the admission committee, English, foreign languages, and mathematics are so necessary to intellectual growth and attainment that sustained study of each in secondary school is expected. The following program is desirable: English, four years with continued practice in writing; foreign language, four years of one language (rather than two years each of two languages), preferably continued through the final year of secondary school; mathematics, four years of college preparatory mathematics, also preferably continued through the final year of secondary school.

In addition to these studies, the following are important components of strong preparation for work in the University: three to four years of science, including two years of laboratory science; three to four years of social studies, including at least two years of history, with some study of a country or region outside the United States; and some study of art and music. Students seeking a B.S.E. degree should have a strong record in mathematics and in the natural sciences, including at least one year of physics.

The University will give full consideration to an applicant who has been unable to pursue the recommended studies to the full extent if the record otherwise shows clear promise.

Princeton grants advanced placement for some college-level studies completed prior to matriculation. For information, see the advanced placement section of this catalog.
Application Procedures. Students may apply for admission to Princeton either through single-choice early action or through regular decision. Students seeking entrance to Princeton in the fall of 2017 must submit the Common Application or the Universal College Application. Each also has a required writing supplement. Detailed application instructions are available at the Admission Office website. Inquiries about admission can be made via e-mail, by phone at (609) 258-3060, or by mail to Office of Admission, Princeton University, Box 430, Princeton, New Jersey 08542-0430. The application deadline for singlechoice early action is November 1. For regular decision, the deadline is January 1. We encourage regular decision applicants to submit their portion of the application by December 15, if possible.

Additional information concerning admission procedures, application fees, alumni interviews, standardized testing requirements, notification date, and deferred enrollment may be found in the Admission Viewbook. Copies are available on request from the Admission Office, Princeton University, Box 430, Princeton, New Jersey 08542-0430, or online.

Transfer Admission. At this time, Princeton does not offer transfer admission. Any student who has enrolled as a full-time degree candidate at another college or university is considered a transfer applicant and is not eligible for undergraduate admission.

Undergraduate Financial Aid

Princeton’s groundbreaking financial aid program has replaced loans with grants — which do not have to be repaid — for all students who qualify for aid. Visit the Admission and Aid website, or contact the Office of Undergraduate Financial Aid by mail: Box 591, Princeton University, Princeton, New Jersey 085420591; phone: (609) 258-3330; or e-mail faoffice@princeton.edu.

Princeton's need-based financial aid program reflects the University's core value of equality of opportunity. Each student's need is determined individually based on family resources and is met in full with grants and a campus job. Loans are not included in a student's initial aid package, but may be available for expenses outside the basic budget, or to cover an earnings shortfall. Princeton does not offer academic or athletic scholarships.

Enrolled undergraduate students apply for financial aid on an annual basis, and will continue to receive University grant as long as they demonstrate financial need. A complete description of federal, state, and University aid funds, as well as detailed instructions on how to apply for aid, can be found on the Web.

Under federal tax laws that became effective in 1987, scholarship or grant support in excess of tuition and related expenses (required books, fees, supplies, and equipment), regardless of the source, is considered taxable income. Proceeds from educational loans are not considered taxable income. Compensation from the University received under the Federal Work-Study Program or other employment arrangements is also considered taxable income, but is not subject to Social Security taxes if earned during the academic year.

For further information, visit the Admission and Aid website, or contact the Undergraduate Financial Aid Office, Box 591, Princeton, NJ 08542-0591, (609) 258-3330, or e-mail the Undergraduate Financial Aid Office.

Fees and Expenses

The amount charged for tuition covers approximately one-half of the University's actual educational costs for a student. Fees and other charges for the 2016-17 academic year:
Tuition $45,320
Room charge $8,335
Board rate $6,435

The list above represents the regular University charges. These charges are subject to change without prior notice. Changes in programs and in the academic calendar do not entitle students to any credits against established fees. Students who are not covered under their family's medical insurance can purchase a Princeton health plan for an additional charge of $1,900.

The budget that is used to calculate financial aid awards includes an allowance of $3,600 for other costs that a student will incur during the year. These expenses typically include books, laundry, clothing, recreation, incidentals, dues, and activity fees. Freshmen and sophomores are charged a residential college fee of $810, which will appear on the University bill.

The total student budget for the 2016–17 academic year, therefore, is approximately $63,690, not including travel expenses, which vary depending on a student's state or country of residence. Costs for 2017-18 are expected to increase modestly.

Housing and Dining
All first year and sophomore students are required to live and dine in one of the six residential colleges.
Students with disabilities who seek accommodations must register with the Office of Disability Services (242 Frist Campus Center, 609-258-8840). Registration through self-identification is a voluntary process that is treated confidentially and may occur at any time during the student's course of study. Information for students and their families on housing and meal plans, move-in and move-out, campus safety and transportation and more is found on the undergraduate housing website.

Student Accounts
Tuition bills are sent electronically to the student's Princeton.edu email address using TigerPay, Princeton's electronic billing and payment system. Enrollment is required and once enrolled, students can invite parents to receive billing notifications. Visit the Student Accounts website for more information or contact the Finance and Treasury Department, Student Accounts Office, 701 Carnegie Center, Suite 435, Princeton, New Jersey, 08540; phone (609) 258-6378; e-mail studacct@princeton.edu.

Special Fees

Application. Information about the admission application fee and available waivers can be found at Applying for Admission + Aid.

Late Academic Year Sign-In. $75.

Change of Course. No charge for course changes during the first two weeks of classes. A fee of $45 is assessed for each course change beginning in the third week of classes.
Failure to Select Courses by Deadline. Undergraduates who do not complete course selection by the specified deadlines are assessed a penalty of $10 per day.

Transcript and Certifications. A one-time document fee of $75 is assessed in the freshman year. This fee will cover all subsequent requests for standard delivery of academic transcripts and enrollment verifications.

Student Car Parking. Information about parking is available on the University's Transportation & Parking Services website.

Continuing Education Students. For information about applications and fees, inquire at the Office of Community and Regional Affairs, or email.

Payment of Fees and Charges
Payment of the basic University charges for the academic year (tuition, room, meal contract, class dues, student health plan, and residential college and Undergraduate Student Government fees, less financial aid provided by Princeton) is due in full in two parts: half by August 17 and half by January 17. Electronic billing (E-billing) to students at their Princeton.edu e-mail account is the official method of distributing the University tuition bill. Paper bills will not be sent home. Once enrolled students can invite others to enroll such as parents and guardians, and they also will receive email billing notifications. Billing notices are sent in advance of the due date. Electronic payments can be submitted online through TigerPay and checks in U.S. dollars are acceptable forms of payment. Credit card payments are not accepted. Any balance that is unpaid beyond the due date will be assessed a late payment charge. This charge will be an annual rate of interest, to be established prior to the start of the academic year. Failure to enroll in the billing process does not prevent the assessment of late fees. Billing notices will be sent monthly for any additional charges incurred. Account activity can be viewed online at any time by all authorized parties.

The University offers a Monthly Payment Plan, which allows payment of the basic fees (tuition, room, meals, class dues, student health plan, and residential college and Undergraduate Student Government fees, less financial aid provided by Princeton University), to be divided over 12 monthly payments due on the first of each month, September through August. This method of payment requires a promissory note to be signed by the parent(s) for the total amount borrowed. Interest will be charged on the amount disbursed each semester and will be calculated daily based on the outstanding balance disbursed. Additional interest will be charged on any amounts past due. This rate will be the same as the rate for late payment on the student account. An electronic application can be submitted from the Loans & Receivables website.

The University also offers the Princeton Parent Loan Program, which enables qualified families to borrow money from Princeton to pay their share of the student's budget over an extended period. Repayment begins with the first month of borrowing and continues for 10 years after graduation. There are two interest options: variable, which is adjusted every six months, July and January, for the life of the loan and based on the six-month London Interbank Offered Rate (LIBOR), and fixed, which is determined in August. An electronic application can be submitted from the Loans & Receivables website.

Students are responsible for satisfying all student account obligations by the due date on the student bill. A student who fails to meet all financial obligations may be subject to one or more of the following: (a) prohibited from course selection and/or course changes, (b) placed on leave of absence until all financial obligations are met, (c) prohibited from enrolling or being readmitted to the University, (d) refused a transcript, (e) denied a diploma document at
graduation, and (f) responsible for payment of all collection cost, including reasonable collection agency fees, attorney charges and legal fees necessary for the collection of outstanding indebtedness.

Students leaving the University within the first two weeks of classes in either term will be charged 10 percent of the tuition for the term; during the third week of classes, 20 percent; during the fourth week of classes, 30 percent; during the fifth week of classes, 40 percent; and during the sixth and seventh week of classes, 50 percent. If a student leaves after the seventh week of classes, 80 percent of the tuition for that term will be charged; after the end of week nine, the full amount for the term will be charged. Students who leave after the beginning of a term also incur room and board charges in accordance with the terms of their contracts; ordinarily, board charges will be adjusted on a pro rata basis, while the full amount of the room charges for that term will be charged. The fees set by student organizations, residential colleges, and other dining or living units are established on a semester-by-semester basis and will not be refunded to students who leave after the beginning of a term.

Although financial assistance is awarded for the entire academic year, it is credited to a student's bill in semester installments. If a student takes a leave of absence before completing the year, aid credits will be available to pay expenses in proportion to actual charges. Financial aid will be used to pay for room and board consistent with the terms of the contracts. The residential college fee, student government fee, and class dues will be charged by semester; they also may be paid by aid once tuition, room, and board charges have been satisfied.

If not used to cover the charges mentioned above, remaining aid credits will be returned to the sources from which they came as specified by program requirements. When taking a leave of absence, students receive detailed information about refunds and aid credits from the Financial Aid Office.

Students who are required to repeat a semester for other than disciplinary reasons are eligible for financial aid as described above. Students who leave Princeton for disciplinary reasons, however, will not be eligible to receive University grant aid if they must repeat a term as a result.

Upon taking a leave of absence or graduation, the net balance of the student's account will be determined by applying all payments and available credits to the account against all outstanding amounts due to the University.

Students who take a leave of absence without meeting all financial obligations to the University will have their transcripts withheld and will not be eligible for reinstatement to Princeton until the balance has been paid. If balances remain due following a student's leave of absence, the University may secure legal assistance to obtain payment. All legal fees and reasonable collection expenses will be added to the obligation due Princeton.

While the University recognizes that continuity in its payment policies will best help parents plan to meet the educational costs of their children, due to changing financial circumstances, the University must reserve the right to alter the terms and means of payment required from year to year.
Program of Study for the Degree of Bachelor of Arts

The A.B. program at Princeton is intended to stretch students' minds and challenge their imaginations—to teach them to think and reason and document and prove, to cast a critical eye on conventional wisdom, to make sense of evidence, to read a text with care and critical insight, to conceptualize and solve problems, and to express themselves clearly and convincingly on paper and in discussion. Working within the general curricular framework, each undergraduate pursuing the A.B. degree is encouraged to develop an academic program in response to personal aspirations and interests. Each student's program of study encompasses a combination of courses that satisfy general education and departmental requirements, and substantial independent work during the junior and senior years.

With the exception of students who receive one or two terms of advanced standing, all A.B. students must successfully complete a minimum of 31 courses and two years of departmental independent work in eight terms of study. An extra term or year of study is granted by the Faculty Committee on Examinations and Standing to a student making normal progress toward the degree only under extraordinary circumstances. However, a student who has been required to withdraw for academic reasons will, in most cases, be required to repeat the unsatisfactory term in order to meet the basic graduation requirement of eight successfully completed terms of study.

Successful completion of a prescribed number of courses is necessary for advancement to each subsequent year. These requirements, as well as minimum course loads in a semester, are delineated in the section "Academic Standing, Leaves of Absence, and Reinstatement."

**Freshman and Sophomore Years**

Generally, the program of study during a student’s freshman and sophomore years is extensive in the sense that it typically includes course offerings from a range of academic departments, consistent with the exploration of academic interests and the preparation needed to enter an academic department at the start of junior year. During this time, it is expected that each student will also make significant progress toward the completion of the University's general education requirements in writing, foreign language, and distribution areas.

**Junior and Senior Years**

The program of study in junior and senior years is generally more intensive in its focus, reflecting the requirements of the departmental concentration the student has chosen. Undergraduates declare their departmental concentration prior to the start of junior year and complete a program of study that combines a set of courses with junior and senior independent work. Independent work gives students the opportunity to work closely with faculty members on library, laboratory, and field-based research, and in sustained writing projects. The independent work requirement, culminating in the senior thesis, is the keystone of the Princeton academic experience. In senior year, students take a departmental examination that is focused on some aspect of their field of concentration or on the senior thesis.

Each academic department has established a program of study leading to the awarding of the A.B. degree. These programs are described in detail in the departments' entries in this publication. Specific questions concerning departmental programs and requirements should be addressed to the appropriate departmental representative.
Program of Study for the Degree of Bachelor of Science in Engineering

The B.S.E. program at Princeton is intended to educate future leaders in many different areas – including engineering practice and research, business and finance, public service, and other professions – through the teaching of fundamental engineering principles and techniques with their applications to modern problems in a global societal context. To this end, B.S.E. students are challenged to conceptualize and solve technical problems, work together in teams, express themselves clearly and convincingly, evaluate evidence critically, and appreciate the ethical, social, economic, and cultural environments in which they will live and work.

B.S.E. students enroll in four courses for the first term of the freshman year and in four or five courses in each succeeding term, following a sequence appropriate to their individual programs. The school requirement for the B.S.E. degree is at least 36 courses in the four years of study. Sophomores, juniors, and seniors must complete at least four courses each term, with a minimum of 17 courses by the start of junior year and 26 courses by the start of senior year.

A student must obtain a background in mathematics, physics, and chemistry by successfully completing the following courses or their equivalents:

Mathematics (four semesters)

103 Calculus
104 Calculus
201 Multivariable Calculus, 203 Advanced Multivariable Calculus, 218 Analysis in Several Variables, or EGR 192 Integrated Introduction to Engineering, Mathematics, Physics
202 Linear Algebra with Applications, 204 Advanced Linear Algebra with Applications, or 217 Honors Linear Algebra, or equivalent

Physics (two semesters)

103 General Physics, 105 Advanced Physics, or EGR 191 Integrated Introduction to Engineering, Mathematics, Physics
104 General Physics or 106 Advanced Physics, or equivalent

Chemistry (one semester)

207 Advanced General Chemistry: Materials Chemistry, or 201 General Chemistry, or equivalent
While none of these requirements may be satisfied by a course taken under the pass/D/fail option, in many instances one or more may be met by advanced placement. Except under unusual circumstances, the physics, chemistry, and 100-level mathematics courses must be completed by the end of freshman year.

Computer proficiency is a requirement for the B.S.E. degree fulfilled by taking COS 126 General Computer Science. This requirement must be satisfied before the beginning of the junior year. This requirement may not be satisfied by a course taken under the pass/D/fail option. A course taken at another school may not be used to satisfy this requirement.
The choice of upperclass courses will reflect the student's individual interests, as well as the plan of study of the department in which the student is concentrating or any interdepartmental program in which the student is participating. Independent work opportunities are available for juniors and seniors.

A coherent program of courses in the humanities and social sciences, combining breadth and depth, is an essential part of every B.S.E. student's program of study. B.S.E. students must complete a minimum of seven courses in the humanities and social sciences. B.S.E. students are required to take one course in four of the following six areas: epistemology and cognition, ethical thought and moral values, foreign language (at the 107/108 level or above), historical analysis, literature and the arts, and social analysis. (See General Education Requirements for full descriptions of these distribution areas). The remaining three required courses and additional courses may be taken in any fields in the social sciences and humanities.

The ability to write English clearly and precisely is a University requirement that must be satisfied by completing a writing seminar in the freshman year. The writing seminar does not count as one of the seven humanities and social science courses.
General Education Requirements

Princeton is committed to offering an academic program that allows each student to achieve a truly liberal education. Although each department and school has its own requirements, the University requirements for graduation transcend the boundaries of specialization and provide all students with a common language and common skills. It is as important for a student in engineering to engage in disciplined reflection on human conduct, character, and ways of life or to develop critical skills through the study of the history, aesthetics, and theory of literature and the arts as it is for a student in the humanities to understand the rigors of quantitative reasoning and to develop a basic knowledge of the capabilities and limitations of scientific inquiry and technological development.

General Education Requirements for A.B. Students

- Writing Seminar--one course
- Foreign Language--one to four terms to complete, depending on the language students study and the level at which they start
- Epistemology and Cognition (EC)--one course
- Ethical Thought and Moral Values (EM)--one course
- Historical Analysis (HA)--one course
- Literature and the Arts (LA)--two courses
- Quantitative Reasoning (QR)--one course
- Science and Technology (STL/STN)--two courses. At least one course must be a science and technology course with laboratory (STL). Students may elect a second laboratory science course, or a nonlaboratory science course (STN). Social Analysis (SA)--two courses

General Education Requirements for B.S.E. Students

In addition to the School of Engineering and Applied Science requirements of four terms of mathematics including multivariable calculus and linear algebra, two terms of physics, and one term each of chemistry and computer science, candidates for the B.S.E. degree must fulfill the writing requirement by taking a writing seminar in the first year and take a minimum of seven courses in the humanities and social sciences. The humanities and social science courses must include one course in four of the six areas listed below:

- Epistemology and Cognition (EC)
- Ethical Thought and Moral Values (EM)
- Foreign Language (at the 107/108 level or above)
- Historical Analysis (HA)
- Literature and the Arts (LA)
- Social Analysis (SA)

Language courses beyond the first year also count toward the seven; a language course at the 107/108 level or above counts toward the seven and satisfies one of four distribution requirements. Students majoring in Chemical and Biological Engineering are required to fulfill one distribution area with a course in Ethical Thought and Moral Values (EM).
Writing

Undergraduates at Princeton are expected to develop the ability to write clearly and persuasively. Toward this end, all students, without exception, must fulfill the University writing requirement by taking a writing seminar in the freshman year. Writing seminars have a common goal--for students, through practice and guidance, to master essential strategies and techniques of college-level inquiry and argument. In addition to writing frequently and completing several major assignments of increasing complexity, students receive intensive instruction in academic writing, submit drafts for review, and participate in one-on-one conferences with the instructor. While writing seminars focus on the skills necessary for effective critical reading and writing, they differ in the topics and texts assigned. Students select their seminar based on their interests.

Foreign Language

Proficiency in a foreign language is required for graduation under the A.B. program. Many undergraduates satisfy the foreign language requirement by demonstrating proficiency when they enter the University; proficiency is demonstrated by documenting the results of AP tests or SAT Subject Tests, or by taking placement tests administered by academic departments at Princeton. Those tests can also determine whether a student is eligible to elect advanced courses (200 and 300 level). See the individual department entries for further information.

Foreign language study is required through successful completion of courses numbered 107 (or 108) in Arabic, Chinese, Czech, French, German, modern or classical Greek, Hebrew, Hindi, Italian, Japanese, Korean, Latin, Persian, Russian, Spanish, Swahili, Turkish, or Urdu, if taken at Princeton, or through demonstration of an equivalent level of competence. When an undergraduate begins a language at Princeton, three or four terms of study will usually be necessary. If continuing a language begun elsewhere, the student is placed at an appropriate level. At the end of any term beyond the first, a student may take a departmentally administered test and may thereby fulfill the language requirement. All A.B. candidates should begin meeting this requirement as soon as possible because students are expected to develop proficiency in a foreign language by the end of junior year.

Foreign language competence is usually necessary for any student who proposes to earn graduate degrees in arts and sciences. Certain professional schools also expect applicants to have ability in one or more foreign languages. There are also increasing opportunities to study a language in a country in which it is spoken through term-time and summer study abroad programs. For these reasons, each student should anticipate language needs and plan a program of study accordingly. Many descriptions of departmental programs of study make reference to the languages appropriate for graduate study in that field.

Distribution Areas

The distribution areas described below should serve as a broad intellectual map for students to follow as they work their way through the curriculum. These distribution areas mark the boundaries of what the faculty believes are the important substantive fields of inquiry and methodological approaches that are integral to a rich and lasting undergraduate education. There are no required courses; instead, the areas encourage students to make choices that best suit their intellectual curiosity and academic goals.

Courses that fulfill specific distribution areas will be identified by the alphabetical letters that appear as part of the course information provided in this catalog or in Course Offerings for a given semester. Where two courses are required within a distribution area, they need not be from the same academic department or program.
Courses elected on a pass/D/fail basis will satisfy distribution areas; however, audit-pass courses will not. Student-initiated seminars, reading courses, and graduate courses do not fulfill distribution area requirements. A student may, for sound educational reasons and with the prior approval of the residential college dean or the director of studies and the appropriate departmental representative, complete certain distribution courses at another college or university. Approvals will be limited to one course in each of two of the following distribution areas: literature and the arts, social analysis, and science and technology. Students participating in the study abroad program during the academic year may, with proper approvals, fulfill up to two distribution requirements abroad, provided that the total number of distribution requirements fulfilled by the courses taken outside of Princeton does not exceed two.

Students usually complete their distribution courses by the end of junior year. Most undergraduates find that the distribution requirements are met simply through electing courses in a variety of departments and programs. Questions about the distribution areas should be discussed with the residential college dean or the director of studies.

Epistemology and Cognition

The requirement in epistemology and cognition introduces students to the critical study of the nature, sources, and bounds of human knowledge. While courses in other areas examine important modes of cognition or methods of inquiry in application to a particular subject matter, courses in this category take cognition itself as their subject matter, and explore its mechanisms, potential, and limitations from a wide variety of theoretical, historical, and empirical perspectives. The topics they examine range from the basic perceptual capabilities that humans share with other animals to the distinctively human capacity for language; from theoretical models of human knowledge to empirical models of an individual's cognitive abilities; from the historical record of collective inquiry in the sciences and elsewhere to informed speculations on the outer limits of what is knowable.

Courses in this category are drawn largely from the Departments of Anthropology, Philosophy, and Psychology, and the Program in Linguistics. They introduce students to the critical study of human knowledge and thought processes. Their focus is on human beings as seekers of knowledge and builders/creators of knowledge systems. These courses raise questions about the conditions, limits, and validity of our claims to “know” and approach critically the various claims about what we know and how we know.

Ethical Thought and Moral Values

The requirement in ethical thought and moral values is designed to engage students in disciplined reflection on human conduct, character, and ways of life. Through inquiry into questions of ethics and morality as presented in works from one or more cultural traditions, these courses will help students to discern, understand, and appreciate ethical issues and to articulate, assess, and defend moral judgments in an informed and thoughtful way. Source materials may include theoretical works in various disciplines, political deliberations, autobiographies, and utopian and dystopian novels, among others. Regardless of the particular genres and the traditions to which these works belong, courses in this area focus on the ethical thought and moral values that shape individual and collective life.

Every society draws distinctions between good and evil, right and wrong, noble and ignoble. Courses in this category focus on ethical questions and moral deliberations, regardless of the historical, cultural, or religious context in which they occur. They are drawn largely, though not exclusively, from the Departments of Philosophy, Politics, and Religion. The aim of these courses is to help students explore and understand different value systems, to think about the possibility of commonalities across historical and cultural boundaries, and to introduce ways of making reasoned moral judgments.
Historical Analysis

Historical analysis begins with the problem of understanding the differences between the world of contemporary experience and the worlds of the past. Some courses in historical analysis focus on the distinctiveness of one or another part of the past, with the intention of bringing students to an understanding of political, social, and cultural configurations quite different from their own. Others stress the processes of historical change through which one configuration of institutions, ideas, and behavior is supplanted by another. Common to all courses in historical analysis is the presumption that the categories of social analysis are themselves historical and historically contingent, and that to understand the past requires entering imaginatively into languages, institutions, and worldviews quite different from those of the present day.

Courses in this category are drawn largely, though not exclusively, from the Departments of Classics, East Asian Studies, History, Near Eastern Studies, and Religion. The aim of these courses is to explore the contingency, interconnectedness, and continuity of human institutions, and to introduce the complexities of historical interpretation. Some courses focus on a distinctive historical period or a specific region; others follow the development of ideas and institutions through time; and yet others focus on the inter-relatedness of events in many parts of the world.

Literature and the Arts

The requirement in literature and the arts allows students to develop critical skills through the study of the history, aesthetics, and theory of literature and the arts, and to engage in creative practice. Students may choose among courses in literature (in English, English translation, or other languages), visual and performing arts, music, architecture, film, and electronic media. In addition to courses emphasizing critical analysis, students may explore the creative arts through practice in creative writing; in the studio arts of architecture, painting, sculpture, drawing, and photography; in the performing arts of music, theater, and dance; and in the media of film and video.

Courses in this area fall into two groups: those that emphasize a variety of critical and analytic approaches to artistic expression and those that engage students in the creative practice of "making" art. Courses in the first group are drawn largely, though not exclusively, from the Departments of Art and Archaeology, Classics, Comparative Literature, East Asian Studies, English, French and Italian, German, Music, Near Eastern Studies, Slavic Languages and Literatures, and Spanish and Portuguese Languages and Cultures, and the School of Architecture. These courses emphasize the development of the skills of reading, observing, and hearing and frequently point to the complex interplay between individual talent, artistic tradition, and historical context. Courses in the second group are drawn largely from the Programs in Creative Writing, Dance, Theater, and Visual Arts, as well as from the Department of Music and the School of Architecture. These courses emphasize the interplay between technical discipline and creative imagination in the production of works of art.

Quantitative Reasoning

Quantitative reasoning is a process in which complex problems are described mathematically and solved within a structured mathematical framework. Courses in this area involve the manipulation and interpretation of numerical and categorical information and the quantification of inferences drawn from that information. Appropriate courses include those that address theoretical and empirical problems in the natural, social, computer, and engineering sciences.
The goal of courses in this category is to give students some understanding of basic mathematical methods and their applications; to provide them with an ability to understand and appreciate quantitative issues that have become part of everyday life; and to instill in them a lasting interest in quantitative methods and their applications. Courses in this category are drawn from the Departments of Computer Science, Mathematics, and Operations Research and Financial Engineering, as well as from other departments in the social sciences, the natural sciences, and engineering.

Science and Technology

The requirement in science and technology is designed to give all students a basic knowledge of the capabilities and limitations of scientific inquiry and technological development. Some understanding of the process by which science discovers new knowledge, and engineering applies that knowledge to practice, is essential to functioning effectively in modern society. Courses in this area are designed to foster an understanding of scientific concepts and to develop the student's ability to use experimentation and measurement in exploring and testing ideas.

The common purpose of courses in this area is to instill in students a lasting interest in science and technology; to impart some understanding of the value of scientific thinking and its relation to societal issues; to foster an appreciation of the essential role of experimentation and measurement; and to convey the excitement of doing scientific research. The laboratory component is essential to an understanding of how scientific concepts are tested and of the limitations of the scientific method, including the concepts of error and reproducibility. Students must take at least one course in science and technology with laboratory (STL). The second course can either be a laboratory science course (STL) or a nonlaboratory science course (STN). Courses in this area are drawn largely from the Departments of Chemistry; Ecology and Evolutionary Biology; Geosciences; Molecular Biology; Physics; Psychology; and Civil and Environmental, Electrical, and Mechanical and Aerospace Engineering, as well as from the offerings of the Council on Science and Technology.

Social Analysis

The requirement in social analysis is designed to familiarize students with different approaches to the study of social life and to introduce them to modes of thinking about social institutions and cultural norms and their interconnectedness with forms of human behavior. Courses in this area examine how individuals interact with, and are shaped by, social groups and institutions, including those associated with politics, economics, religion, family, the arts, health, and education; how and why particular forms of social organization and social relations emerge within a group or culture; and the origins, characteristics, and consequences of social conflict and change.

Courses in this area introduce students to some of the central concepts and methods of the social sciences and show both the variety and the interconnectedness of social institutions. Courses are drawn primarily from the Departments of Anthropology, Economics, Politics, Religion, Sociology, and the Woodrow Wilson School. Some take a comparative approach to institutions across historical, political, social, or cultural divides; others focus on the interface of several institutions--political, economic, artistic--in a given social context; yet others analyze a single institution--be it democratic education, a free market economy, or the nuclear family structure--and assess its role in society. Courses in this category look at institutions as shaped by human behavior and at human behavior as shaped, in turn, by social institutions.
The Undergraduate Honor System

The publication Rights, Rules, Responsibilities defines policies and rules with respect to accepted standards of conduct for students. It also includes the constitution of the Honor Committee and a detailed account of standards governing academic integrity and behavioral conduct.

Jurisdiction over Undergraduates for Violations of Academic Rules and Regulations

Jurisdiction over violations of academic rules and regulations rests with two distinct committees at Princeton. All written examinations, tests, and quizzes that take place in class are conducted under the honor system. All violations of the honor system are the concern of the Undergraduate Honor Committee. Violations of rules and regulations pertaining to all other academic work, including essays, term papers, and laboratory reports, fall under the jurisdiction of the Faculty/Student Committee on Discipline. Should there be any uncertainty regarding which body is responsible for the adjudication of a particular case, clarification should be requested from the Office of the Dean of Undergraduate Students and the chair of the Honor Committee.

Introduction

Princeton’s honor system was established by the undergraduates in 1893 and has been in effect without interruption since that time. It has been successful because generations of undergraduates have respected it, and by common agreement, have given it highest place among their obligations as Princeton students.

Student obligation to the Honor Code

At Princeton all in-class written examinations, tests, and quizzes are conducted under the honor system. Its constitution is printed in full below. A letter from the chair of the Honor Committee explaining the honor system is included in the online matriculation website. Newly admitted students then signify by submitting the Honor Code statement that they understand and will abide by the conditions under which the honor system is conducted. Final entrance to the University is contingent upon the committee’s receipt of this submission. Status as a student “in good standing” and graduation from the University are contingent upon continued participation in the honor system. All students acknowledge the obligation to report any suspected violation of the honor system that they have observed. It is the common understanding among Princeton students that, where the honor system is concerned, an individual’s obligation to the undergraduate student body as a whole transcends any reluctance to report another student. Thus, under the honor system, students have a twofold obligation: individually, they must not violate the code, and as a community, they are responsible to see that suspected violations are reported.

Examination procedures set by faculty

Procedures during the course of an examination are determined by the faculty member present. Students may not leave the examination room without the specific permission of the faculty member. Such permission must be granted uniformly; that is, if one student is allowed to leave the room, no other may be denied such permission upon request. Students may not take their examinations with them outside of the examination room. Students are advised to sit one seat apart from other students, to refrain from bringing notes and books into the examination room, and if possible, to avoid sitting near those with whom they have studied. Laptop computers as well as handheld electronic communication devices (e.g., cell phones, BlackBerry devices, etc.) are forbidden in final examination rooms. Additionally, students may not wear headphones attached to audio devices during examinations. The faculty
member, who is present only briefly to answer questions and to pick up the completed examinations, has the responsibility to make sure the examinations are turned in by students at the appropriate time.

Under the honor system, the students assume full responsibility for honesty in written examinations. Examinations are not supervised. The instructor in charge distributes the examination papers, waits for a short time for any questions, and then leaves the room, returning at the end of the stated period to collect the answer books. On each examination paper, the student writes out and signs the following statement: “I pledge my honor that I have not violated the Honor Code during this examination.”

**Role of Honor Committee**

The Honor Committee consists of two current class presidents, two past class presidents, and undergraduates selected by application from the student body at large. Violations of the honor system are the concern of the Undergraduate Honor Committee. When a report of a suspected violation of the honor system is received, the Honor Committee immediately conducts an investigation. If the investigation indicates that it is warranted, the full Honor Committee is convened and a confidential hearing is held. If the student in question is acquitted, all records of the hearing are destroyed. If a student is found guilty, the committee recommends an appropriate penalty to the dean of undergraduate students. Normally, a student found guilty of violating the Honor Code can expect to be suspended from the University for one, two, or three years. A second offense will result in expulsion. Censure may be added to all penalties to underscore the seriousness of the violation.

**Current Procedure**

Much of the internal organization and virtually all of the operating procedures of the Honor Committee are determined by the committee itself. The tone and style of each year’s committee may vary, but there is continuity in procedure from year to year. Generally there are at least three members on the committee who have served previously.

All cases are conducted in accordance to the procedure outlined in the Honor Code Constitution. A typical case would be conducted as follows:

**Report and investigation of a suspected violation**

A suspected violation of the honor system is usually brought to the attention of the Honor Committee by a reporting witness. The reporting witness is typically faculty member, a student, or the violator. After receiving the report, the chair of the committee will assign two members of the committee to conduct a thorough investigation of the allegation. If necessary, the investigators will meet with the student in question. The meeting in which investigators notify the student in question of the alleged violation will be recorded to ensure fairness. The student in question may also have a witness present during the meeting with the investigators. If the chair and investigators jointly determine that the facts of the case should be evaluated by the entire committee, a hearing will be scheduled. A representative from the Office of the Dean of Undergraduate Students will serve as a procedural adviser for the student in question. The two investigators and/or the chair will inform the student in question that the case will proceed to a hearing, and the student will be given at least 24 hours notice. The committee may also ask potential witnesses to appear at the hearing. As much confidentiality as possible is maintained during the investigation in order to protect the principals from rumor.
Hearing

In the hearing, witnesses provide information about the possible violation that has been observed and are questioned by the committee. Next, the student in question is given the opportunity to respond to the allegation of a possible violation. The student in question is urged to choose a peer representative who will be present throughout the hearing. Only a current undergraduate member of the University community who is not a member of the Honor Committee may serve as the peer representative. The peer representative may ask questions of all witnesses. Investigators do not participate in deliberations or hearings, but only serve to corroborate information pertaining to the investigation following each witness’ testimony. Before the committee begins deliberations on guilt or innocence, the peer representative and the student in question will have the opportunity to make any final remarks. The identities of the student in question, student reporting witnesses and any other student witnesses are kept completely confidential. This helps to ensure that Honor Code-related cases will not lead to prejudice outside the hearing room.

Evidence for the hearing usually includes the examination(s) in question and any other relevant material which are duplicated, if necessary, for use by the individual members of the committee during the hearing. If a faculty member reports the alleged violation, or if consultation with the professor administering the examination or the preceptor or section leader of the student in question seems helpful, the committee may call that person or persons to the actual hearing to discuss the facts as then known. The committee may also have present, during the hearing, a student or faculty member who is knowledgeable in the field of the examination in question.

After a report of a suspected violation is received, the chair consults with the dean of undergraduate students or the dean’s designee concerning the general character of the suspected violation, the nature of the investigation in progress, and any questions that may arise during the course of the investigation. The chair may also, if the chair deems it necessary, consult with the dean during the course of the hearing. The chair also informs an associate dean of undergraduate students of the name of the person under investigation. The associate dean of undergraduate students provides the chair and the two investigators, prior to any scheduled hearing, whatever information is determined appropriate concerning the student in question for consideration by the committee. This might include any special or extraordinary circumstances affecting the student. While an investigation or hearing is underway, an administrative hold may, in situations where necessary, be placed on the transcript of the student in question.

The only adequate defense for a student accused of an Honor Code violation is that the actions did not, in fact, constitute a violation. In determining whether an Honor Code violation has occurred or the severity of such a violation, the committee will take into account whether the student should have reasonably understood that the actions were in violation of University policy and/or exam room procedures. Neither the defense that the student was ignorant of the regulations concerning the exam nor the defense that the student was under pressure at the time the violation was committed is considered an adequate defense.

Decision and results

The principals and witnesses may be called for testimony several times before the committee renders a judgment. The committee deliberates in private and arrives at a decision by individual vote. If the student is found to have intentionally misled the committee during the course of the hearing, the committee may take that fact into account in reaching a conclusion and assigning a penalty. When a decision is reached, the student in question is called and informed of the judgment. Then the reporting witness is informed of the judgment, thanked for the exercise of a responsibility that is difficult but necessary, and cautioned against discussion of the case.
Acquittal

If the student in question is acquitted, all written record of the student’s involvement in the case is destroyed.

Guilty verdict and consequences

If a student is found guilty, the student is informed of the penalty, which is, at the committee’s discretion, a one, two, or three year suspension, a suspension with conditions, or in the case of a second offense, permanent expulsion. The committee shall also have recourse, in the presence of extenuating circumstances, to probation up to four years, which becomes a part of the student’s permanent record. Only the dean of the college may review the final penalty.

Appeal

An appeal of a decision of the Honor Committee should be directed to the Office of the Dean of the College within one week of the committee’s decision. Such appeals can only be made on the grounds of procedural unfairness or harmful bias. The penalty levied by the Honor Committee may not be increased upon appeal. If the dean of the college determines that a penalty of the Honor Committee should be reduced, the dean will make a recommendation to the president, describing the reasons for the proposed modification, and the president will decide whether or not to implement the recommendation.

Constitution of the Honor System

Adopted by the undergraduates in 1893. Amended in 2015.

Article I - Charter and Composition of the Honor Committee

A. Charter

1. The Honor Committee consists of twelve members who will represent the student body and address all suspected violations of the Honor Code.

B. Composition

1. The members of this Committee will be the presidents of the sophomore and junior classes, formersophomore and junior class presidents, a member of the freshman class, and members to be appointed from the student body at large until the Committee consists of twelve members.

2. Appointed members.

a. The freshman class member will be appointed in the fall semester by a subcommittee comprising fourmembers of the Honor Committee and the Undergraduate Student Government president.
b. Following spring Undergraduate Student Government elections, the Honor Committee will solicit applications from the student body at large.

c. Appointed members will serve one-year terms, but may seek reappointment thereafter. Committee members seeking reappointment may not participate in the selection process. All members of the Committee excluding the members up for reappointment will reach consensus on whether to retain appointed members or to replace them with a new applicant.

d. All appointments are subject to approval by the Undergraduate Student Government.

3. Ex officio members. The newly elected sophomore and junior class presidents and the newly appointed members will normally become members of the Committee at the beginning of the fall term following their election/appointment, but, if needed, can serve on the Committee immediately after their election.

C. Dismissal and Replacement of Members

1. The Committee may dismiss a member for neglect of duty. A vote of nine of the eleven other members is required for such a dismissal. If any member becomes unable to serve for any reason, or is dismissed, a new member will be appointed by the Honor Committee as explained in Article 1, Section B, subject to approval by the Undergraduate Student Government. Any member who becomes unable to serve or is dismissed for neglect of duty must go through the same selection process as a new applicant if they wish to rejoin the committee.

D. Clerk, Chair and Chair Emeritus

1. Clerk. Every academic year, after the first of December, a subcommittee comprising the senior class members of the Honor Committee, the Undergraduate Student Government president, and the Clerk will select a sophomore member of the Committee to serve as Clerk of the Honor Committee during the following spring and fall semesters. This subcommittee will interview all interested sophomore members of the Committee and appoint one sophomore by a majority vote. This sophomore member will automatically become a member of the Committee the following year. In the event that the Clerk withdraws from the University, or is otherwise unable to serve as Chair, the subcommittee described above will convene to select a new Clerk from the Committee members in the spring semester of their sophomore year or fall semester of their junior year.

2. Chair. The Clerk will become the Chair of the Honor Committee at the beginning of the spring semester in their junior year. In the event that the Chair withdraws from the University, or is otherwise unable to serve as Chair in the spring semester of their junior year, the Chair Emeritus will serve as Chair until they graduate, at which time the Clerk will become Chair. In the event that the Chair withdraws from the University, or is otherwise unable to serve as Chair, in the fall semester of their senior year, the Clerk will become Chair.

3. Chair Emeritus. The former Chair will take on an advisory role, in addition to their responsibilities as a Committee member, as Chair Emeritus during the spring semester of their senior year, to guide the new Chair. The Chair Emeritus may serve as acting Chair if needed.
Article II - Violations

A. The Honor Pledge

1. The Honor Pledge is as follows: "I pledge my honor that I have not violated the Honor Code during this examination." This must at all times be written in full on the examination paper and signed by the student on the examination. Any undergraduate who fails to write and sign the pledge on the examination paper will be reminded to do so by the instructor. If the instructor or the Committee cannot promptly obtain the written and signed pledge, the student will be reported to the Committee for investigation. Unwillingness to sign the pledge following notification by the instructor or the Committee will be prima facie evidence of a violation of the Honor Code.

B. Violations

1. Violations of the Honor Code consist of:

a. Any attempt to gain an unfair advantage in regard to an examination, both inside and outside the examination room.

b. Any attempt to give assistance, both inside and outside the examination room, whether the student attempting to give assistance has completed his or her own work or not.

2. Specific violations include, but are not limited to:

a. Tampering with a graded exam;

b. Claiming another's work to be one's own; and

c. Obtaining or attempting to obtain, previous to any examinations, copies of the examination papers or examination questions, or any illegal knowledge of these questions.

d. Other actions in violation of the policies set forth by the professor.

C. Perjury

1. Committing perjury, defined as lying to or purposely misleading the Committee, is also a violation of the Honor Code. It will not be considered perjury for a student to maintain his or her own innocence.

D. Findings of Responsibility

1. A student will be found responsible if the Committee finds overwhelmingly convincing evidence that the student ought reasonably to have understood that his or her actions were in violation of the Honor Code.
E. Reporting Suspected Violations

1. Every student is obligated to report to the Honor Committee any suspected violation of the Honor Code that they have observed. The Committee will make every attempt to ensure the anonymity of reporting students. Students may make reports by emailing honor@princeton.edu, contacting the chair directly, or any member of the committee.

Article III - Investigations and Hearings

A. Rights for Students In Question Under Investigation

A student suspected of a possible violation of the Honor Code is referred to as the “student in question.” During the investigation and hearing process the rights of the student in question include:

1. Rights during investigation

a. The right to be informed that they are under investigation as the student in question before answering any questions.

b. The right to have a witness present during the initial interview with investigators.

c. The right to review in advance of the hearing all documents constituting direct material evidence.

d. The right to call witnesses.

e. The right to maintain innocence at all times during the process.

2. Rights during Adjudication

a. The right to have a representative from the Office of the Dean of Undergraduate Students serve as a procedural adviser prior to the hearing.

b. The right to choose a current undergraduate member of the University community to serve as a peer representative. While the student in question is expected to provide answers to questions, the peer representative may clarify or supplement their answers. The peer representative may also question witnesses. A current member of the Honor Committee may not serve as a peer representative.

c. The right, in the event of a finding of responsibility, to receive a copy of the chair’s summary of the case. This summary must outline the charge made against the student, describe the evidence and testimony provided in
support of this charge, and provide the rationale for the Committee's finding, both in terms of verdict and punishment assigned.

d. The right, in the event of a finding of responsibility, to poll the votes of the individual Committee members.

e. The right, in the event of a finding of responsibility, to listen to any recording made of the hearing.

B. Confidentiality

1. All those involved in the investigation and hearing process are expected to maintain the confidentiality of all student involved in the case.

C. Investigation Procedures

1. Upon receiving a report of a suspected violation, the Chair will appoint two members on a rotating basis to conduct a preliminary investigation.

2. If an allegation of an Honor Code violation is made over the summer, the Committee will make every reasonable attempt to investigate it in a timely manner. All cases that cannot be practically concluded over the summer will resume in the fall.

3. The appointed investigators may:

a. Meet with the student or students in question;

b. Meet with witnesses;

c. Collect any relevant documents or material evidence;

d. Obtain any other information bearing on the allegation.

4. Upon meeting with a student, the investigators will disclose what is currently known of their status as a student in question or a witness before questioning. Should the student’s status change during the course of the investigation, the investigators will inform them.

5. The investigators’ meeting with the student in question will proceed as follows:

a. The investigators will explain the rights of the student in question (see III.A. above).

b. The student in question will be asked to sign a statement prior to a hearing saying they have been informed of their rights under the Honor Constitution.
c. The student in question will be asked to provide an account of the suspected violation in question.

d. The student in question will be given a letter, describing the suspected violation in reasonable detail, from the reporting witness. The letter need not be signed.

e. The investigators will explain the nature of the suspected violation.

6. Upon the completion of the investigation, the two investigators in consultation with the Chair will determine whether or not a hearing is warranted.

a. If a hearing is not warranted, all records of the case that personally identify the student in question or any other student will be immediately destroyed.

b. If a hearing is warranted, the student may exercise his or her right of up to seven days of preparation.

D. Hearing Procedures

1. The place and time of all hearings will be determined by the Chair.

a. The Committee will make every reasonable attempt to hold and adjudicate the hearing in a timely manner. All cases that cannot be practically concluded over the summer will resume in the fall.

2. The hearing will proceed as follows.

a. The Chair will preside and will appoint six other members to hear the case.

b. The Committee will use a recording device to record the proceedings of each case.

c. The student in question will be given the opportunity to make statements, answer questions, present evidence, and question witnesses.

d. Members of the Committee may ask questions at any point, seek additional materials or testimony, visit any relevant location, recall or review evidence or testimony provided earlier, and in general seek to obtain any information bearing on the accusation.

e. It is incumbent upon the Honor Committee members to investigate all possible connections between the student in question and all witnesses protecting the confidentiality of all parties involved.

3. After testimony is concluded, the Chair and the six other Committee members who conducted the hearing will deliberate in private. Deliberations will proceed as follows.
a. The Committee will first deliberate on the question of whether to find the student in question responsible for the violation charged.

i. At least six of the seven members must be overwhelmingly convinced that the student in question is responsible for the student in question to be found responsible.

ii. Documented evidence and plausibility of method, in the absence of demonstrated intent, may be enough to convict.

b. Should the Committee find the student in question responsible, the appropriate penalty will be determined by a majority vote.

c. After deliberations have concluded, the Committee will inform the student in question of the decision.

d. If the student in question was found responsible, the Chair will write a summary directed to the dean of undergraduate students. The penalty will take effect upon imposition by the dean of undergraduate students.

4. A student will not be subjected to a second hearing for the same offense, except in light of new and important evidence, as determined by a majority vote of the Committee. The testimony of one individual, without more, will not warrant another hearing.

**Article IV - Penalties**

**A. Penalties**

Students found responsible for violating the Honor Code will receive penalties in accordance with Rights, Rules, Responsibilities as follows:

1. Normally, the first offense will result in a suspension of one year from the university. In all cases, the Committee may exercise the option of suspension for two or three years. This rule is subject to the following exceptions:
   
a. Where a student is found responsible for writing overtime on an examination or otherwise gaining a time advantage, the Committee will recommend a punishment of disciplinary probation and recommend that the student receive a zero for the examination. However, in especially egregious cases of writing overtime, the Committee will recommend a punishment of a one-year suspension.

b. Where there are extenuating circumstances, the first offense may result in a penalty of disciplinary probation. Extenuating circumstances may include, but are not limited to, situations where there was a substantial, material error on the part of an agent of the university, and situations where the Committee fails to conclude that a student should reasonably have understood that his or her actions were in violation of the Honor Code.

c. If perjury occurs, the Committee may impose a penalty of two years for the first offense.
2. Normally, a second violation of the Honor Code, or a violation of the Honor Code following a suspension for a violation of the University’s academic integrity regulations, will result in expulsion from the University.

a. Students whose first Honor Code or academic integrity violation resulted in a penalty of probation may face either suspension or expulsion should they be found responsible for a second violation of the Honor Code.

3. In cases adjudicated prior to the last day of classes, if the final decision is a separation from the University (e.g., suspension or expulsion), the student will normally not earn credit for the semester in which the infraction occurred. If the case is adjudicated during reading or exam period or if the student has essentially completed course requirements while awaiting the final disposition of the matter, obtaining credit for the semester will be at the discretion of the Committee. In such cases, the Honor Committee will normally recommend that the student receive a failing grade in the course in which the violation occurred.

B. Appeals

A student found responsible for a violation may appeal the Honor Committee’s decision as follows:

1. Only the dean of the college may review the final penalty recommended by the Honor Committee.

2. Appeals can only be made on the grounds of procedural unfairness or harmful bias.

3. An appeal of the decision of the Honor Committee must be directed to the dean of the college in writing within one week of the Committee’s decision. A student interested in appealing should first contact the associate secretary of the University to discuss the appeal process.

4. If the dean of the college determines that a penalty of the Honor Committee should be reduced, the dean will make a recommendation to the President, describing the reasons for the proposed modification, and the president will decide whether or not to implement the recommendation.

5. The penalty recommended by the Honor Committee may not be increased upon appeal.

6. In the case of a successful appeal, the Honor Committee will destroy all records of the case that personally identify the student in question or any other student.

C. Enrollment Status

1. If the student in question is found responsible, and if the appeal does not alter the Committee’s decision, the penalty will normally be considered effective as of the date of the original decision.

2. If a senior is found responsible for a violation during the spring reading or exam period, or if the senior has essentially completed all spring course requirements, the senior’s degree may be withheld in lieu of suspension. In such cases, the Honor Committee will normally recommend that the student receive a failing grade in the course in which the violation occurred.
3. Under normal circumstances, when a violation requiring suspension occurs during the fall term, the student in question will not be eligible to return until the following fall term. When a violation requiring suspension occurs during the spring term, the student in question will not be eligible to return until the following spring term.

4. Pending a hearing or the student's decision about whether to appeal a separation from the University or the withholding of the degree, and/or while an appeal is in process, an administrative hold will be placed on the student's University transcript. Should the student decide not to appeal a separation or the withholding of the degree, or should an appeal not result in an alteration of the committee's decision to dismiss the student or withhold his or her degree, the registrar will record the fact of the penalty on the student's transcript.

Article V - Publications

A. Constitution Publication

1. The Constitution will be published by the first week of each academic year. It will also be printed in Rights, Rules, Responsibilities, copies of which are issued to all students upon matriculation at the University. In addition, Article II will be circulated immediately before midterm and final examinations.

B. Publication of Committee Statistics

1. Every year, the Committee will publish aggregated, anonymous statistics for the last five years, indicating the number of students reported to the Committee, the types of violations that are reported, the number of cases that go to hearing, the respective outcomes of those cases, the number of appeals made, and the respective outcomes of those appeals.

Article VI - Amending the Constitution

A. The Constitution may be amended in the following ways:

1. Upon the initiative of ten of the twelve members of the Committee, followed by a three-fourths vote of the Undergraduate Student Government members present at a meeting of the Undergraduate Student Government; or

2. Upon the initiative by petition of 200 members of the undergraduate body, followed by a three-fourths vote in a student referendum as conducted by the Elections Committee of the Undergraduate Student Government. Article VI can be amended only by such a student referendum.
Academic Advising and Academic Resources

Academic Advising

Academic advising of undergraduates in the A.B. program is centered in the six residential colleges. The dean and director of studies in each college have primary responsibility for the academic advising of freshmen and sophomores and for the non-departmental academic advising of juniors and seniors, whether or not they continue to reside in the colleges. Every freshman in the A.B. program is assigned to a faculty adviser who assists with course selection and other academic matters throughout the year, and who normally continues as the student's adviser through the sophomore year. Freshmen in the B.S.E. program are advised by faculty members in the School of Engineering and Applied Science. Each B.S.E. sophomore is assigned an adviser whose area of specialization matches the student's area of interest. In the upperclass years, all students are advised by members of their academic departments who also supervise their junior and senior independent work.

All students are encouraged to make full use of the academic resources of the University and to seek advice on specific academic matters from professors and departmental representatives in their particular areas of interest. The heads of college, deans, directors of studies, and directors of student life in the residential colleges are available for academic advising and for counseling about matters pertaining to other aspects of undergraduate life. The staff of the Office of the Dean of the College is available for discussion of academic questions or problems, and the staff of the Office of the Dean of Undergraduate Students is available for discussion of questions about undergraduate life outside the classroom.

Residential College Advisers

Every year approximately 80 students are selected to serve as residential college advisers (RCAs) who live in each of the six colleges. Under the supervision of the heads of college and directors of student life, RCAs are responsible for advising freshmen and sophomores on many aspects of University life, including those related to diversity. RCAs are assigned approximately 12 to 15 freshman advisees, whom they assist in their adjustment to the University. They are also available to sophomores who wish to seek the counsel of an older student. While RCAs are immediately responsible for the first- and second-year students in their advising area, they also work as part of a small adviser team in order to combine advisers' strengths and give the students a choice of advisers in whom to confide. During the year, RCAs are expected to initiate a variety of activities, to facilitate friendships among advisees, and to foster a safe, inclusive, and welcoming community within the college. Through programming and counseling efforts, the RCA also promotes the community's sensitivity toward the experience of underrepresented groups, as defined by ethnicity, race, religion, disability, sexual orientation, and other personal characteristics. RCAs are familiar with University resources and can refer students to appropriate people and offices as necessary.

Peer Academic Advisers

Peer Academic Advisers (PAAs) are a select group of upperclass students who are available to advise first and second-year students about academic issues in each of the six colleges. Peer Advisers can talk with students about selecting courses, creating a balanced schedule, exploring potential majors, and taking advantage of academic resources. Peer advisers are part of the advising community at Princeton, and their student experiences complement the advising available from faculty, the residential college staff, and published materials about various courses, departments and programs. Although individual PAAs are typically paired with specific RCA groups for first-year students, they are available as a resource to all students in the college.
Curricular and Co-Curricular Resources for Learning

McGraw Center for Teaching and Learning

Princeton is a community of teachers and learners, and the McGraw Center for Teaching and Learning, located on the third floor of the Frist Campus Center, is a resource for all undergraduates (additional resources for graduate students and faculty are located on the second floor of the Lewis Library). The center offers workshops and individual consultations to support undergraduates as they make critical academic transitions, confront new academic challenges, and develop as learners. Workshops focus on processes of learning and individual consultations assist students in designing integrated sets of strategies that enable them to take full advantage of lectures, precepts, and readings.

McGraw's Group Study Hall and Individual Tutoring offer academic support in a number of introductory courses in which there is a quantitative problem-solving emphasis. Experienced, trained undergraduate tutors are available to guide students through learning strategies for course material, thinking through problem sets and the concepts underlying them, and preparing for exams. Study Hall also provides a good space for study groups to meet or for informal group work with classmates. Individual Tutoring allows for focused and individualized assistance for students who want a more personalized tutoring experience.

The Writing Center

The Writing Center offers student writers free, one-on-one conferences with experienced fellow writers trained to consult on assignments in any discipline.

Located in Lauritzen, the Writing Center welcomes all Princeton students, including: undergraduates working on essays for courses; juniors and seniors working on independent research projects; international students not used to the conventions of American academic writing; graduate students working on seminar papers or dissertations; students writing essays for graduate school applications or fellowships; and students crafting oral presentations. Writing Center Fellows can help with any part of the writing process: brainstorming ideas, developing a thesis, structuring an argument, or revising a draft. The goal of each conference is to teach strategies that will encourage students to become astute readers and critics of their own work. Although the Writing Center is not an editing or proofreading service, fellows can help students learn techniques for improving sentences and checking mechanics. Writing Center conferences complement, but do not replace, the relationships students have with their teachers and advisers.

Appointments may be scheduled online.

Study Abroad Program

The Study Abroad Program enables qualified students to spend either one term or a full academic year abroad for Princeton credit. The program is open to spring-term sophomores, juniors in either or both terms, and fall-term seniors. Students with a compelling reason and faculty support may petition to study abroad in the fall of sophomore year. To qualify, an applicant must meet the minimum grade requirement established by the Faculty Committee on Examinations and Standing, normally a grade point average of 3.00 for the fall and spring terms of the academic year prior to studying abroad, and present evidence of competence in a foreign language when applying to most programs in non-English-speaking countries. Approval to study abroad may be withheld because of an unsatisfactory
University disciplinary record. Students on financial aid at Princeton will continue to receive aid while participating in the Study Abroad Program.

Students should discuss their plans for study abroad with the staff of the Office of International Programs and, when appropriate, with their departmental representative, no later than the beginning of the term prior to the proposed period of foreign study. The Faculty Committee on Examinations and Standing approves requests for study abroad. The deadlines for submitting proposals to study abroad are April 30 for the fall term or academic year and October 31 for the spring term.

Applicants must submit a program application, a list of proposed courses, and, if an upperclass student, a plan for completing independent work. As part of the application process, the departmental representative must approve the program of study and arrangements for completing independent work.

Credit for study abroad depends on the completion of approved courses with the grade of C or better, as certified by a transcript or similar report. Independent work, if required, must also be submitted by the assigned deadline.

Study abroad for Princeton credit is also possible during the summer either through Princeton-sponsored programs or programs offered by other institutions. All courses taken through other institutions must be pre-approved for credit.

Community-Based Learning Initiative
The Community-Based Learning Initiative (CBLI) is a curricular program that connects students' academic work with their interests in and concerns for the communities around the University. CBLI's mission is to make learning a genuine form of service. Community-based learning enriches course work by encouraging students to apply the knowledge and skills learned in the classroom to the pressing issues that affect our local communities. Working with faculty members and community leaders, students develop research projects, collect and analyze data, and share their results and conclusions, not just with their professors, but also with organizations and agencies that can make use of the information. Students may do community-based research projects in courses or, in a more in-depth manner, as part of junior or senior independent work.

Preparation for Teaching

The Program in Teacher Preparation provides information and advice on the numerous pathways to enter teaching at the secondary level, in both public and private schools. Students should visit the office or consult the program's website for information about Princeton's undergraduate program and the courses required for certification to teach in the public schools.

Students considering teaching either as summer interns during college or full time after graduation should confer with a program staff member. Information on a wide range of teaching opportunities is available and the office provides workshops to help students find teaching jobs. Seniors should inquire at the office for information on job opportunities.

Advising Resources for Post-Graduate Study

Advising for Major Fellowships
Responsibility for advising for major fellowships rests with the director and assistant director of fellowship advising in the Office of International Programs. Designated faculty members and administrators are available to counsel students who are interested in applying for the Churchill, Dale, Deutscher Akademischer Austauschdienst, Fulbright, Gates, Goldwater, Hertz, Labouisse, Luce, Marshall, National Science Foundation, Rhodes, Sachs, Truman, and other scholarships or fellowships. All except a handful like the Dale, Labouisse, and Sachs, which are available only to Princeton seniors, are awarded on the basis of national competition. Many applications are submitted early in the fall of the senior year, but students are encouraged to attend information sessions and meet with a fellowship adviser in early spring of their junior years. Several awards are available to students prior to their senior year, including the Goldwater scholarships, which are available to sophomores and juniors; and the Truman scholarships, which are available only to juniors. Further information on the fellowships and eligibility requirements and the names of the advisers for each fellowship are available from the Office of International Programs.

Preparation for Graduate Study

Students intending to pursue graduate studies should seek guidance from faculty advisers and departmental representatives throughout their undergraduate careers. In general, for admission to a Ph.D. or academic master's degree program in a particular discipline, candidates must show scholarly distinction or definite promise in their undergraduate studies in that discipline or in a closely related one. Moreover, as fields of study become more interdisciplinary in nature, applicants from a relatively wide variety of disciplinary backgrounds may be encouraged to apply. (Interested students should check directly with the particular department or program.) Graduate programs normally require official transcripts of all prior undergraduate and previous graduate work, three letters of recommendation from faculty who know the applicant well, a detailed statement of academic purpose, and scores from the Graduate Record Examination General Test. Individual departments may additionally require scores from a relevant subject test. International students whose native language is not English may be asked to take and submit scores from an English language test such as TOEFL or IELTS, or may be required to submit a "proficiency in English" form. Students applying to joint Ph.D. and professional school programs may also be asked to take the GMAT or LSAT, or other similar exam. Many programs also require a reading knowledge of at least one foreign language. Increasingly, graduate admissions committees require, in the case of humanities and social science disciplines, samples of the applicant's written work and, in the case of science and engineering disciplines, evidence of prior research experience.

Preparation for Law School

The staff in the Office of Career Services maintains extensive information on law schools, including requirements for admission, scholarships, joint degree programs, and specializations. The Alumni Careers Network, a searchable, online database of alumni volunteers employed in a variety of industries (including the legal profession) is maintained by Career Services for those students who wish to speak directly with practicing lawyers about their law school experience and/or legal careers.

Admission to the better-known law schools is highly competitive, and a strong scholastic record is desirable. Because there is no specific "prelaw" course of studies, students may pursue their own academic interests. Applicants are urged to review the "Prelaw" material under the Graduate School section of the Career Services website.

Preparation for Business School
The Masters in Business Administration (MBA) is a professional degree that provides course work and training in a variety of business disciplines. Most full-time MBA programs are two years. While there are a number of institutions that offer the MBA, the more competitive universities do not commonly accept applicants without several years of relevant post-undergraduate work experience.

Business schools do not require a specific undergraduate course of study. However, they do place value on well-developed oral and written expression, and demonstration of analytical and quantitative abilities. Applicants should also possess experience gained from internships, study abroad, fellowships, or postcollege employment. Students considering an MBA should make use of the many resources that are available at Career Services and on their website.

**Preparation for Medical, Dental, and Veterinary School**

The Office of Health Professions Advising encourages all students who are considering a career in the health professions to familiarize themselves with the resources of the office as soon as possible. A strong application will demand careful planning, both of one's curriculum and one's academic year and summer activities. For detailed information about pre-health course requirements, please see "Preparing for a Career in the Health Professions," which is available as a handout in the Office of Health Professions Advising and on its website under "Pre-health Basics." Some health professional schools have unique requirements, so all pre-health students should meet with one of the advisers at HPA early on in their college years to discuss both academic and non-academic preparation.
Academic Regulations

In keeping with a liberal arts philosophy, Princeton students are expected to be fully engaged members of an intellectual community, immersing themselves in the simultaneous study of a variety of disciplines before concentrating in one academic department. A Princeton undergraduate degree is grounded in a common experience of full-time residential study. The curriculum is designed in such a way that all students carry a similar course load and make adequate progress toward the degree (as described herein). The first two years of study prepare students for the required independent work in the department of concentration, which is the hallmark of a Princeton education. Undergraduates pursuing an A.B. degree must complete all required junior independent work and a minimum of 24 courses before beginning senior year and embarking on the senior thesis; all B.S.E. students must complete a minimum of 26 courses, to include any independent work, before beginning senior year.

Students are expected to be active participants in their education; the development of critical study and life skills, such as working independently, managing competing obligations, and completing work in a timely fashion, is an essential educational goal. Students are expected to observe all University deadlines (as described herein) and may not carry incomplete courses into a subsequent term.

The Faculty Committee on Examinations and Standing administers these academic regulations on behalf of the faculty. Requests made under the following provisions, as well as petitions for exceptions to them, should first be discussed with a student’s residential college dean or director of studies. The final request or petition should be delivered in writing to Dean Claire Fowler, secretary to the Faculty Committee on Examinations and Standing, 406 West College, for presentation to the committee. Students do not appear in person before the committee.

The following provisions provide the basic framework for undergraduate academic life at Princeton. Students are responsible for knowing these regulations and for observing them in the planning and completion of their programs of study.

Princeton University is committed to ensuring equal access to its educational programs for students with disabilities. The Office of Disability Services (ODS) utilizes an interactive process including an intake interview to understand a student's disability and explore reasonable academic accommodations. The term "disability" may include learning, physical, sensory, psychological, medical, and certain temporary disabilities. The Americans with Disabilities Act (ADA) of 1990 as amended, Section 504 of the Rehabilitation Act of 1973 (504), and the New Jersey Law Against Discrimination (NJLAD) prohibit discrimination against individuals with disabilities and entitle individuals with disabilities to reasonable accommodations. Such students may, with the support of ODS, petition the Committee on Examinations and Standing for a modification of academic regulations.
The Academic Year

All undergraduates who plan to matriculate for either the fall term or the full academic year are required to complete Academic Year Sign-In online at the beginning of the fall term at a time determined by the registrar. Students who plan to resume their studies in the spring term after a leave of absence or academic required withdrawal must complete Academic Year Sign-In at the beginning of the spring term. A student who, without an approved excuse, fails to register at the designated time incurs a fine of $75.

Structure of the Program of Study

Instruction is offered at Princeton during the fall and spring terms. Each term is 15 weeks and consists of 12 weeks of scheduled classes; a 10-day reading period for preparation of final course work and, by the instructor's choice, continued instruction; and an 11-day final exam period.

Structure of Courses

Most social science and humanities courses feature two hours of class lectures and an hour-long preceptorial each week. Alternatively, courses meet for two 90-minute sessions, which incorporate significant class discussion. The weekly preceptorial supplements the lectures and is intended to provide an opportunity for wide-ranging exploration of the subject matter of the course in a small-group setting. The role of the preceptor is neither to lecture nor to test the student's ability to marshal facts but rather to encourage each member of the group to grasp and evaluate the subject and its implications. Members of the faculty of all ranks serve as preceptors, as do selected graduate students. Precept participation is regarded as an integral component of a course and, as such, can influence a student's grade to a significant extent.

Many courses in the sciences and engineering also feature laboratory work. Laboratory meetings provide an opportunity for the interchange of ideas between the students and the instructor. Working in small groups and under faculty supervision, students investigate the underlying principles of the subject they are studying and gain firsthand experimental knowledge of scientific methods.

Seminars are offered in numerous departments and interdisciplinary programs. They have limited enrollment, sometimes by application, and they emphasize active participation by students in the investigation of a particular topic or problem. Seminars are most commonly offered as upper-level courses, except for the freshman seminars and the writing seminars, designed specifically for entering students. The Program of Freshman Seminars in the Residential Colleges offers approximately 75 seminars a year in the humanities, the social sciences, the natural sciences, and engineering.

Selecting Courses

Each term, at a time specified by the registrar, all enrolled students submit their course choices online for the following term. To assist in this selection, Course Offerings indicates the courses available and the meeting times. Students are expected to discuss their course selection with their academic advisers prior to submitting final course choices. A student may not select a course that conflicts with the meeting times of any other course in which the student is enrolled.

There is a fine of $10 for each day of lateness in submitting an approved set of courses.
Advanced Placement

The advanced placement policy at Princeton is designed to give recognition to college-level academic achievement prior to matriculation and to allow students to pursue their studies at a level appropriate to their preparation.

There are two bases on which individual departments may award advanced placement: (1) official score reports from Advanced Placement Examinations, College Board SAT Reasoning Test and SAT Subject Tests, the International Baccalaureate (higher level), or British A-level examinations. (Please note: No student test scores will be recorded post-graduation.) (2) Results of placement tests offered by departments at Princeton. Departmental placement tests are offered in foreign languages, physics, and chemistry prior to course registration in September.

Students normally will not receive advanced placement for college courses taken prior to matriculation unless they take an approved standardized examination or a placement test offered by the appropriate department at Princeton. The Mathematics department has its own placement procedures.

The advanced placement policy for most departments appears in the departmental information sections of this catalog.

The principal features of advanced placement are:

1. A student who has been granted advanced placement by Princeton may enroll in appropriate advanced courses. The advanced placement is granted whether or not the student decides to enroll in such courses. If a student takes a course deemed equivalent to one for which advanced placement was granted, the student forfeits the use of the advanced placement unit(s) for advanced standing at Princeton.

2. Advanced placement in a foreign language, that is, placement in a 200-level course, satisfies the A.B. foreign language requirement.

3. Advanced placement cannot be used to fulfill the University writing or distribution requirements.

4. Advanced placement cannot be used to make up course deficiencies or to reduce the course load during a given term; however, in appropriate circumstances, advanced placement can be used to reduce the number of terms needed for graduation, provided that the student is eligible for advanced standing.

Dropping and Adding Courses

Except under very unusual circumstances, the last date on which a student may add a course is the last day of the second week of classes. A fee of $45 is assessed for each course change beginning in the third week of classes.

A student who wishes to drop a course must request permission from their residential college dean or director of studies no later than the end of the ninth week of classes. No course, including courses taken in excess of the normal course load, may be dropped after that point. After the end of the ninth week of classes, students are held responsible for completing all courses in which they are enrolled and are assigned final grades in those courses. An upperclass student wishing to drop a departmental course after the second week of the term also must obtain permission from their departmental representative.
Normal Course Load

A.B. Program. The normal course load for freshmen, sophomores, and juniors is four courses each term, with the exception of one term in freshman or sophomore year when a student typically will need to take five courses in order to meet the expectation that 17 courses will have been completed by the start of junior year.

Regardless of the number of courses completed prior to entering senior year, all seniors must, with the exception of the two programs listed below, complete a minimum of six courses in senior year. This is most often accomplished by enrolling in three courses each term but students may take four courses in one term and two courses in the other. Students in the Program in Teacher Preparation who have taken an extra course in an earlier year or a student who is participating in the University Scholar Program may be permitted to reduce their course load by one course in the senior year.

B.S.E. Program. Students in the B.S.E. program normally enroll in four courses in the fall of freshman year and in four or five courses in each succeeding term, in a sequence appropriate to their individual programs of study.

Minimum Course Load

Under exceptional circumstances and in consultation with an academic adviser and either a residential college dean or director of studies, a student may be allowed to fall one course short of the normal course load for a term, subject to the following guidelines:

A.B. Program. All freshmen, sophomores, and juniors must complete a minimum of three courses each term.

Seniors may enroll in two courses in one term, as long as they complete four courses in the other term and have no course deficiencies entering senior year.

B.S.E. Program. A freshman may, with special permission, complete a minimum of seven courses in the academic year and a summer school course to meet the minimum of eight successfully completed courses needed to start sophomore year. Sophomores, juniors, and seniors must complete at least four courses each term.

Attendance

Students are expected to attend all scheduled course meetings and exercises and to be present promptly at the start of instruction, unless prevented from doing so by illness or another compelling cause. An unexcused absence from class may adversely affect a student's grade and may lead to failure in a course; a student is expected to notify the course instructor of any absence and to arrange to make up any missed work.

Participation in a regularly scheduled varsity athletic contest constitutes an excused absence. This does not, however, include practices, team meetings, or other team functions. Students are required to notify course professors of these absences in advance of the scheduled dates and to make arrangements to make up any missed work.

Students who will miss a class or any course requirement because of religious observance will be excused that absence. However, students must notify their course professors of these conflicts and make arrangements to complete any missed work.
Tests and Other Work Scheduled during the Term

Students are expected to take all tests and quizzes at the scheduled times during the term. A student who is absent from a test because of illness or an equally compelling reason must inform the course instructor of the reason for the absence at the first opportunity. The instructor then decides whether the test is to be waived or a make-up test is to be given. An unauthorized absence from a test or quiz will normally result in a failing grade for that portion of the course. Course professors typically assign other written work to be completed prior to the end of classes. Students are required to submit this work by the date assigned by the professor. While professors may extend these deadlines to the last day of reading period (dean's date), extensions are not permitted beyond that date. Failure to submit required work will result in the assignment of a failing grade for that component of the course.

Selecting a Department

At times designated by the registrar, all students select a departmental concentration. Unless granted special permission by the departmental representative, a student may enter a department only if the courses designated as prerequisites for the concentration have been successfully completed. Prerequisites normally must be taken as graded courses.

All A.B. students must select a departmental concentration prior to enrolling for the fall term of junior year. This choice is made in consultation with the departmental representative and most often occurs when signing up for fall term courses in the spring of sophomore year.

All B.S.E. students must select a departmental concentration prior to enrolling for the fall term of sophomore year. The selection process takes place late in the spring of freshman year, following conversations with the designated departmental adviser.

Students are required to meet all of the stated requirements of the concentration existing at the time they enter the department. Those students requesting exceptions to any departmental requirement must obtain the written permission of the departmental representative.

A student may transfer from one department to another only with the approval of the new department and the student's residential college dean or director of studies, acting for the Faculty Committee on Examinations and Standing. While some exceptions do exist, such transfers must normally be made by the start of the second term of junior year. A junior transferring to a new department must complete all required junior independent work by the start of senior year and must be capable of completing all departmental and University requirements within the normal eight-term program. The grades for any independent work completed prior to transferring to a new department will remain on the student's transcript.

While students are encouraged to explore diverse academic interests through a wide range of course choices and interdisciplinary certificate programs, the undergraduate degree is offered in just one academic department. Put another way, Princeton does not offer a double major.

Independent Work

Junior and senior independent work are defining features of undergraduate education at Princeton. Junior independent work in the A.B. program varies by department and may include a single long paper or project or a
series of essays or projects. The junior paper is a valuable preliminary exercise for the senior thesis since it provides most students with their first experience of significant independent or original research in a specialized field. Several B.S.E. departments also offer opportunities for independent work in the junior year.

In the senior year, each A.B. student and most B.S.E. students complete a senior thesis or a substantial independent research project. The thesis gives students the opportunity to pursue original scholarship on topics of their own choice under the guidance of faculty advisers.

Electronic copies of senior theses are deposited in the Princeton University Archives at the Seeley G. Mudd Manuscript Library and, subject to the limitations of copyright law, made widely accessible for research purposes. Students may embargo or otherwise limit access to their senior theses provided they receive permission from the Office of the Dean of the College.

The Rule of 12

A student in the A.B. program is limited to 12 one-term courses (plus independent work) in a given department, plus up to two departmental prerequisites taken during freshman or sophomore year. Students concentrating in departments without specific prerequisites may add up to two departmental courses taken during freshman or sophomore year to their total of 12 departmental courses. Foreign language courses at the 100-level do not count toward the departmental course limit of 12. Any student who exceeds the 31 courses required for graduation will be permitted to take extra departmentals. Exceptions to departmental course limits will be made on a case-by-case basis for students studying abroad, with the approval of Dean Nancy Kanach. Please note that for accounting purposes, cross-listed courses should be identified with the home department, which is the first department listed in the course identification number.

Completion of Academic Work

Undergraduate courses are offered on a term basis. Required written work is subject to deadlines set by course instructors, departments, and the Faculty Committee on Examinations and Standing. Final examinations are scheduled by the registrar at the conclusion of each term. Failure to submit work or complete examinations by published deadlines will normally result in a failing grade for the missing work. Course professors may, at their discretion, require that a student earn a passing grade in each component of a course to earn an overall passing grade in the course. Certain exceptions to these practices are allowed under special provisions described below.

Reading Period, Dean's Date, and End-of-Term Work

A period of approximately 10 days immediately preceding final examinations in each term is set apart to give students time in which to consolidate course work or to extend reading and investigation in accordance with their interests. Individual faculty members may choose to continue instruction during reading period. All written course work, including term papers, homework assignments, lab reports, and projects, is due on the date set by the instructor, but in no case later than the date set by the Faculty Committee on Examinations and Standing for the submission of written work, normally the last day of reading period, which is known as "dean's date". In the absence of an authorized extension (see below), a failing grade will be assigned to any work not completed by this deadline.
A student who is unable to complete written work by dean's date because of illness or another equally compelling reason beyond the student's control may apply for permission to submit the work late. This application must be made to the appropriate residential college dean or director of studies. The application must be made on or before the due date, and the endorsement of the course professor is required. Course professors may not independently grant extensions beyond dean's date.

If the request for an extension of the deadline is approved, the student and the course professor will be notified of the new due date. Normally, only short-term extensions are granted, and the new deadline will not extend past the last date of the examination period. In exceptional cases, a longer-term extension may be granted at the discretion of the residential college dean.

A student whose request for an extension is approved may receive the symbol of Incomplete (INC), which is converted to the appropriate grade on submission of the written work on or before the new deadline. Failure to submit work by the extended deadline will result in a failing grade for that component of the course.

A student whose request is denied must submit the written work by the University deadline or receive a failing grade for that component of the course.

**Final Examination Periods**

Each term, the registrar schedules final examinations during an 11-day final examination period. Examinations must be taken at the assigned times, so students should be prepared to be available throughout the examination period and should not schedule personal travel until the examination schedule has been published. The registrar, acting for the Faculty Committee on Examinations and Standing, may authorize a student to take an examination up to 24 hours before or after the scheduled examination time.

Appropriate reasons for granting such requests are religious days, personal emergencies, and more than one examination scheduled in a single calendar day. Examinations will normally be rescheduled during the 24 hours after the scheduled examination time; examinations will be rescheduled during the 24-hour period before the regularly scheduled time only in the most unusual and compelling circumstances.

A student who, because of illness or another compelling reason outside of their control, wishes to postpone a final examination more than 24 hours beyond the scheduled time may apply for authorization of a postponed examination. The request must be made prior to the scheduled examination time and must include the endorsement of the course professor. Students apply through their residential college deans or directors of studies. Faculty are required to write new exams for students given a postponement.

Rescheduled fall-term examinations are administered only during the third week of spring term classes; rescheduled spring-term examinations are given during the first week of the next fall term.

A student who has received authorization for a postponed final examination will receive the symbol of Incomplete (INC) until the examination has been completed and a final grade reported.

A student who fails to take a scheduled examination or a rescheduled examination will receive a failing grade for that portion of the course.
A student who becomes ill or otherwise incapacitated at the time of a scheduled examination should report immediately to University Health Services and then notify the deputy registrar, as well as his or her residential college dean or director of studies, as soon as possible. If a student elects to take the examination at the scheduled time, the student's grade will not subsequently be altered on the grounds of poor health or other problems.

A student who arrives late at an examination but within 30 minutes of the scheduled start time will be given the examination and permitted to complete as much work as possible during the remaining time.

A student who arrives at an examination more than 30 minutes late must notify the deputy registrar immediately. A student who misses an examination entirely, for any reason, must notify the deputy registrar as soon as possible. In these cases, upon review of the circumstances, the student may be allowed to make up the examination in the next available examination period. Such a make-up examination is permitted only once in a student's undergraduate years. Failure to report a missed examination within 24 hours of the scheduled examination time will result in a failing grade for the exam.

**Take-Home Final Exams**

Faculty may elect to assign a take-home examination rather than a final examination scheduled by the registrar. Take-home examinations must be scheduled for completion during the first six days of the final examination period; they may not be scheduled for completion before dean's date. Students who have a conflict between a regularly scheduled exam and a take-home exam should consult with their residential college dean or director of studies.

**Deadlines for the Submission of Independent Work**

The Faculty Committee on Examinations and Standing establishes deadlines each term for the submission of junior independent work and in the spring for submission of the senior thesis. While individual departments may set earlier deadlines for this work, departmental deadlines may not be later than those set by the committee. A student who will not be able to meet a departmental deadline may request an extension within the department to submit work no later than the University deadline.

Students who are unable to complete independent work by the University deadline because of illness or another compelling reason essentially outside their control may apply for permission to submit their work late. Students should apply to their residential college dean on or before the due date and must include the endorsement of the adviser. An unauthorized failure to submit independent work by the University deadline or by an extended due date established by a residential college dean or director of studies will result in the assignment of a failing grade. In such cases, a second grade is added to the transcript when the late work is submitted. Both grades remain on the transcript.

No student will be permitted to enroll as a senior unless junior independent work has been successfully completed.

A senior who fails to submit an acceptable senior thesis will not be permitted to graduate until that requirement has been met.

**Grading**

Princeton University is committed to fairness and transparency in assessment of students' work and grading practices. This approach emphasizes well-defined evaluative criteria and meaningful feedback as the most important
pedagogical components of the grading system. Faculty shall use grades and substantive feedback to give students clear and detailed information about the quality of their work. Each department and program shall articulate well-defined and meaningful grading standards for work within its discipline.

The same standards for judging academic performance apply to all students in a course, whether it is taken by an upperclass or underclass student, as a departmental or an elective course, or as an undergraduate or graduate course. A student may not, for example, submit extra work or revised work unless this opportunity is explicitly extended to all students in the course.

A student who wishes to appeal a course grade should begin by discussing the grade with the course professor. If necessary, the appeal may then be pursued with the chair or departmental representative of the department in which the course is offered. Finally, if the student believes that the grade was reached unfairly or in a manner not consistent with the stated grading policies of the course, an appeal should be brought to Dean Claire Fowler, acting for the Faculty Committee on Examinations and Standing. It is important to note that the committee judges only the fairness or consistency of the grading process; it does not make an independent assessment of the quality of the course work.

**Grading Symbols**

Final grades for undergraduate courses and independent work are reported at the end of each term in the following way:

A+ Exceptional; significantly exceeds the highest expectations for undergraduate work

A Outstanding; meets the highest standards for the assignment or course

A- Excellent; meets very high standards for the assignment or course

B+ Very good; meets high standards for the assignment or course

B Good; meets most of the standards for the assignment or course

B- More than adequate; shows some reasonable command of the material

C+ Acceptable; meets basic standards for the assignment or course

C Acceptable; meets some of the basic standards for the assignment or course

C- Acceptable, while falling short of meeting basic standards in several ways

D Minimally acceptable; lowest passing grade

F Failing; very poor performance

P Grades of A+ through C– in courses taken on pass/D/fail basis
Audit  Satisfactory completion of required work in a course taken on an audit basis

INC  Course not completed at end of term (late completion authorized)

W  Student withdrew from a course after completing the ninth week of the term

YR  Completion of required work in the first semester of a year-long course

A small number of courses offer students one unit of credit spread across two consecutive semesters. In these year-long courses, students receive one unit of course credit at the conclusion of the second semester. For the first semester, the student receives the grade notation of YR for the course. This notation remains on the student’s transcript, although the student’s grade in the course is determined by work completed across both semesters. For students who take the first semester of a year-long course, but do not complete the second semester, no letter grade will be recorded and no course credit awarded.

A grade of D is the minimum acceptable passing grade in all courses. There are five exceptions to this general rule: (1) most departments require at least a C average in departmental courses, and therefore a D in a departmental course or courses may lead to failure in the area of concentration; (2) the accumulation of two or more Ds in a term is regarded by the Faculty Committee on Examinations and Standing as evidence of serious academic difficulty, for which letters of academic warning or academic probation may be issued; (3) a student may be required to withdraw if the student receives two Ds while on academic probation; (4) a student who is required to repeat a term for academic reasons will not receive credit for a course in the repeated term in which the student received a D; (5) a student taking a preapproved course outside Princeton must earn at least a C to receive credit for the course.

Pass/D/Fail Option (also known as "PDF" option)

The intent of the pass/D/fail option is to encourage exploration and experimentation in curricular areas in which the student may have had little or no previous experience. The pass/D/fail option also may be used by the student in completing distribution courses. Students are permitted to elect the pass/D/fail option between the beginning of the seventh and the end of the ninth week of classes.

At the point of declaring a concentration or enrolling in a certificate, students may appeal to have the grade uncovered in a course for which they received a “P” in a previous semester in order to meet a requirement for that department or program. Students who wish to make such an appeal should consult with their residential college dean.

1. As part of the regular academic program, each undergraduate may elect pass/D/fail grading in as many as four courses. Courses designated pass/D/fail only ("pdfo") do not count against this total. A spring semester senior who has completed 31 (AB) or 36 (BSE) courses at the end of the preceding fall term may be permitted to take one additional elected PDF during the spring term, with permission of the residential college dean.
2. A student may elect only one pass/D/fail course per term, regardless of the number of courses in which the student is enrolled or how many pass/D/fail options the student has remaining; courses designated pass/D/fail only ("pdfo") do not count against this limitation.

3. Any course, including courses to fulfill distribution requirements, may be taken pass/D/fail, with the following exceptions:

   a) A student's own departmental courses, as well as technical course requirements in the School of Engineering and Applied Science, may ordinarily not be taken on a pass/D/fail basis.

   b) Courses designated "No pass/D/fail" by the instructor may not be taken on a pass/D/fail basis.

   c) Courses taken outside Princeton may not be taken on a pass/D/fail basis.

4. A student must declare a pass/D/fail election between the beginning of the seventh and the end of the ninth week of classes. No further changes in grading options will be permitted after 11:59 p.m. on the Friday of the ninth week of classes.

**Recording Grades for Independent Work in More than One Department**

Students may have only one concentration at Princeton. The degree and departmental honors are granted in one department only. Under special circumstances, however, a student may receive permission to complete independent work in more than one department. A student hoping to pursue this option must have completed the prerequisites for entry into the second department, and must have both the permission of the departmental representative in the second department and the permission of the Office of the Dean of the College. Such a student may then write junior papers and a senior thesis in the second department and have that work recorded on the transcript. Such additional independent work will not count toward a student's graduation requirements. Independent work written to fulfill the requirements of a certificate program is not recorded on the transcript.
Graduation and Honors

The degree of bachelor of arts is awarded to undergraduates who have completed the A.B. program of study, including departmental concentration. The degree of bachelor of science in engineering is awarded to students who have completed the requirements of the B.S.E. program of study, including departmental concentration.

Honors

Honors are awarded at graduation by the departments of concentration. Departments determine honors on the basis of the grades received by the student in departmental studies (including junior independent work, the senior thesis, and, for students in the A.B. program, the senior departmental examination). Each department chooses the weight to be assigned to the various components in the honors calculation. The degree may be awarded with honors, high honors, or highest honors.

Phi Beta Kappa

The Phi Beta Kappa Society, founded in 1776 and the oldest of all national honorary scholastic societies, has a chapter at Princeton. Election to this chapter is based on scholastic standing and is open to candidates for the A.B. and B.S.E. degrees in their senior year. The chapter generally includes in its membership the highest-ranking tenth of each graduating class. A small group is elected in the fall of the senior year based on their academic record in the first three years; a larger group is elected at the end of the senior year and is inducted at a ceremony on Class Day.

Sigma Xi

The Society of Sigma Xi was founded in 1866 to encourage scientific research. The society has a chapter at Princeton, to which members and associate members are elected annually. Election to associate membership is based on promise of marked achievement in scientific research, as judged not on the basis of classroom work but by actual research attempted. Each year a number of seniors meet this requirement in their thesis work. Election to full membership is based upon positive accomplishment in research, as evidenced, for example, by published work.

Tau Beta Pi

The Tau Beta Pi Association, a national engineering honor society founded in 1885 to offer appropriate recognition for superior scholarship and exemplary character to technical students and professional persons, has a chapter at Princeton. Engineering students whose academic standing is in the upper eighth of the junior class or the upper fifth of the senior class are considered for membership.

Commencement Speakers

The Valedictory and the Latin Salutatory are awarded by vote of the faculty to two of the highest-ranking members of the graduating class. The special qualifications of a student as valedictorian or salutatorian are taken into account as well as scholastic standing.
Academic Standing, Leaves of Absence, and Reinstatement

The Faculty Committee on Examinations and Standing reviews the academic records of all students at the end of each term. A student is considered to be making satisfactory progress if the program of study for the degree of bachelor of arts or the program of study for the degree of bachelor of science in engineering has been followed and if the student is eligible to continue in the University. A student making satisfactory progress will advance subject to the following qualifications:

1. A student who has not successfully completed the writing requirement by the end of the fall term of sophomore year will be placed on a special form of academic probation called writing probation (see below). If such a student fails to complete the writing seminar in the spring of sophomore year, the student will be required to withdraw from the University and must apply to repeat the spring term of sophomore year. Failure to complete the requirement in the repeated term will result in a second, and final, academic required withdrawal.

2. A candidate for the A.B. degree who has not completed the foreign language requirement by the end of junior year may be required to withdraw from the University. If permitted to remain in school, the student must present a plan for completion of the requirement in senior year.

3. A student who is absent from the University or unable to attend classes for a substantial period of time, as determined by the Office of the Dean of the College, must take a leave of absence from the University and apply for reinstatement to repeat the term.

4. A student must have successfully completed all of the degree requirements by the end of the spring term of senior year to be eligible to graduate.

Advanced Standing

Eligibility for advanced standing depends upon the number and the subject areas of the advanced placement units presented by the student. An advanced placement unit is the equivalent of one Princeton course, except in foreign language, where the maximum number of advanced placement units is two, regardless of the number of Princeton courses that are replaced. Students may apply for advanced standing under the following conditions:

a) Candidates for the A.B. degree who have eight advanced placement units (equivalent to eight Princeton courses) will be eligible to apply for one year of advanced standing. These eight units must be distributed in at least three subject areas. (Subject areas are defined as foreign languages; historical analysis; literature and the arts; quantitative reasoning; science and technology; social analysis.)

b) Candidates for the A.B. degree who have four advanced placement units (equivalent to four Princeton courses) in at least two subject areas will be eligible to apply for one term of advanced standing.

c) Candidates for the B.S.E. degree who have eight advanced placement units, among them two in physics, two in mathematics, and one in chemistry, will be eligible for a full year of advanced standing.

d) Candidates for the B.S.E. degree who have four advanced placement units, including two in physics, one in mathematics, and one in chemistry, will be eligible for one term of advanced standing.
Students who have been granted sufficient advanced placement to qualify for advanced standing may apply to the Faculty Committee on Examinations and Standing for graduation in either three years or with three and one-half years of study. Students must submit applications for a year of advanced standing no later than the beginning of spring term of the freshman year and must use the advanced standing prior to the start of the junior year.

Students eligible for one year of advanced standing may apply to become second-semester sophomores in the spring of their first year of residence, or first-term juniors in the fall of their second year of residence. The Faculty Committee on Examinations and Standing will review the academic records of all applicants to determine the appropriateness of graduating in three years and to verify that the minimum grade requirement established by the committee has been met. The committee may rescind advanced standing if, in its judgment, the student has not made satisfactory academic progress. Students who apply for one year of advanced standing normally will have completed the writing requirement, the foreign language requirement, and all prerequisites for concentration in a department before the start of their second year of residence.

Students eligible for one term of advanced standing may apply to spend one term of their sophomore year away from the University. The Faculty Committee on Examinations and Standing will review the academic records of all applicants to determine the appropriateness of completing the degree requirements in three and one-half years of residence and to verify that the minimum grade requirement established by the committee has been met. Freshmen who expect to be away in the fall term of the sophomore year should meet with their residential college dean or director of studies by April 1 to discuss their plans; those who expect to be away in the spring of the sophomore year should discuss their plans with their residential college dean or director of studies by December 1 of the sophomore year.

**Course Deficiencies**

A student who is making normal academic progress and who has not taken any extra courses incurs a course deficiency by failing a course, by dropping below the normal course load, by repeating a course in which the student previously had earned a passing grade, or by failing to take the second course in an introductory-level foreign language sequence.

Course deficiencies may result in academic required withdrawal, failure to qualify for graduation, or inability to progress to the next year of study.

A student may remove a course deficiency either by taking an extra Princeton course in a subsequent semester or by successfully completing a pre-approved course at another school.

Advanced placement or college-level work completed prior to entering Princeton cannot be used to make up a course deficiency.

**Failed Courses**

A failed course does not count toward the number of courses needed for graduation or advancement with one's class, nor can it be used to satisfy any of the University requirements.
A failed course may result in a course deficiency if the student does not have an extra course to offset the failure. A course deficiency must be made up by taking an extra Princeton course in a subsequent term or by successfully completing a pre-approved course at another school.

While the grade of F in a course normally does not mean that the particular course must be repeated, there are several instances in which a failed course must be retaken and successfully completed. This is the case for a foreign language course taken to complete the language requirement; for the courses in mathematics, physics, chemistry, and computer programming that are part of the B.S.E. degree requirements; for specific courses needed as prerequisites to enter a department or program; and for any course the successful completion of which is required of the concentrators in a given department. If a student chooses or is required to repeat a failed course, the failing grade remains on the transcript.

Failing grades may result in academic required withdrawal, failure to qualify for graduation, academic probation, or academic warning.

Minimum Progress Required for Advancement

Any student who, by the start of the fall term, has not completed the minimum number of courses required for advancement must withdraw from the University and either successfully complete a sufficient number of pre-approved courses at another four-year college or university or, when mandated by the Faculty Committee on Examinations and Standing, repeat a semester at Princeton.

**A.B. Program.** In order to advance to sophomore year, all A.B. students must have successfully completed a minimum of seven courses. Sixteen courses are required to achieve junior standing, while 24 courses are required to begin senior year.

**B.S.E. Program.** A freshman may, with special permission, enroll in a minimum of seven courses during the academic year. However, in such a case, the student must, through a combination of Princeton courses and pre-approved summer school courses, successfully complete a minimum of eight courses to begin sophomore year. Seventeen courses are required to begin junior year, and 26 are required to begin senior year. A student who has not completed the stated minimum number of courses required for advancement will not be permitted to remain in the B.S.E. program and may be required to leave school.

**Academic Probation and Academic Warning**

The Faculty Committee on Examinations and Standing reviews the records of all students at the end of each term and, when appropriate, places students on academic probation or issues letters of academic warning.

1. Those students whose records indicate either poor overall standing or poor departmental performance (although not sufficiently weak to require withdrawal) are placed on academic probation. Eligibility for intercollegiate athletic participation may be withheld for a student on academic probation.

2. A student will be placed on writing probation at the end of the third term of enrollment for failure to complete the writing requirement regardless of overall performance, and may be placed on writing probation in addition to
academic probation for poor overall standing. A student on writing probation who fails to complete the writing requirement by the end of sophomore year will be required to withdraw from the University.

3. The committee reviews the records of all students on academic probation at the end of the following term and reports its judgment to those students. A student whose record does not improve substantially while on academic probation may be required to withdraw. A single failing grade or a record with two or more Ds while on academic probation will normally result in academic required withdrawal.

4. Letters of academic warning are issued to students whose records for the preceding term, while not warranting academic probation, indicate weak academic performance. Academic warning letters are intended to alert students to the need for improvement and to suggest ways in which performance might be improved.

5. Additionally, letters may be sent during the term to students who are reported to be absent without excuse from portions of a course, or who are performing below expectations in any aspect of a course.

**Academic Required Withdrawal**

1. A student ordinarily will be required by the Faculty Committee on Examinations and Standing to withdraw from the University at the end of a term or year on the basis of the following provisions:

   a) A freshman who receives the grade of F in three or more courses or incurs three deficiencies in one term or incurs a total of four deficiencies during the year.

   b) A student who receives a grade of F in two or more courses in any term of sophomore, junior, or senior year; or the grade of F in three consecutive terms in sophomore, junior, and senior years; or the grade of F in a total of four or more courses in sophomore, junior, and senior years.

   c) A student who has been placed on academic probation (see above) and whose record fails to improve substantially during the term.

   d) A student on writing probation during the spring of sophomore year who, regardless of performance in other courses, fails to complete the writing requirement.

   e) A student who, prior to the start of any given academic year, has not successfully completed the minimum number of courses needed for advancement.

2. Students may be required to withdraw at the end of a term if they receive a grade of F in one or more courses and the grade of F in independent work for the term. A student whose overall departmental performance has been only marginal ordinarily will be required to withdraw if withdrawal is recommended by the department.

3. A student who has been required to withdraw is normally required by the Faculty Committee on Examinations and Standing to apply for readmission to repeat the unsuccessful term at Princeton. All grades received during the failed term will be recorded on the Princeton transcript.
4. Readmission to Princeton is never guaranteed to a student who has been required to withdraw, but the Faculty Committee on Examinations and Standing will normally grant a second opportunity after a student has demonstrated readiness to resume academic work. Specific requirements may be established by the committee.

5. A student who has left the University twice for academic reasons should not expect a third opportunity to qualify for a degree.

**Failure to Qualify for Graduation**

A senior will be considered to have failed to qualify for the bachelor's degree unless the senior has completed all of the stated requirements for graduation in the relevant degree program. Such a failure may result from the failure to complete the number of courses required for graduation, failure to satisfy all departmental and general education requirements, failure to meet the minimum departmental grade point average, failure to submit an acceptable senior thesis, any grade of Incomplete on the transcript, and, depending on departmental policy, failure to complete successfully the departmental examination.

A senior who fails to qualify for graduation may attend the Commencement ceremony with the graduating class. However, only the names of those students who have successfully completed all of the degree requirements will appear in the Commencement program. Diplomas will be issued only to those students who have completed all graduation requirements.

The Faculty Committee on Examinations and Standing will notify any student who has failed to qualify for the degree and indicate what must be done to satisfy any remaining degree requirements.

**Rights of Rehearing and Appeals**

A student concerning whom the Faculty Committee on Examinations and Standing has taken any action has the right to request a second consideration of the case by that committee in the light of any new evidence that can be submitted.

An action of the Faculty Committee on Examinations and Standing may be appealed on procedural grounds to the faculty. Review and final determination of an appeal is assigned to the Faculty Advisory Committee on Policy. A student who decides to appeal a decision with respect to academic standing must promptly notify the dean of the faculty in writing. A student may continue to attend classes and use other University facilities while a rehearing or appeal is being considered. However, during the appeal period the student is not considered to be a student in good standing.

**Taking a Leave of Absence**

Students may choose to take a leave of absence during their Princeton career. They may choose not to return after a successfully completed semester, or they may choose to take a leave during a semester in progress. If they choose to withdraw from a semester in progress before the end of the ninth week of classes, no courses will appear on their transcript. If they withdraw from a semester between the ninth week and dean’s date in that semester, they will
receive the notation of W for courses on their transcript to reflect their late withdrawal from the semester. The deadline for withdrawing from a semester in progress is dean’s date. Any student wishing to take a leave of absence should consult with his or her residential college dean.

Typically, students take a leave for two consecutive terms because the sequential nature of Princeton’s course of study and the structure of independent work may make it difficult to resume a particular course of study after only one term away. Students who take a leave of absence remain eligible for financial aid after reinstatement.

**Reinstatement**

Students on leave are eligible for reinstatement of their enrollment for a three-year period, and many students who take a leave will have no requirements attached to their reinstatement. In some cases the dean of the college or the dean of undergraduate students may establish specific requirements for reinstatement if the circumstances of the student’s departure warrant it. The goal of such conditions is to prepare the student for a successful return to the University; for example, a student may be asked to complete pre-approved coursework at an outside institution in order to demonstrate readiness to return to rigorous academic work or to participate in a reinstatement consultation with University Health Services to facilitate a successful return. If the leave is health-related, any conditions or requirements for reinstatement will be based on an individualized assessment of each student including consideration of current medical knowledge and/or the best available objective evidence. Careful consideration will be given to the opinions and recommendations of the student’s treating physician or mental health professional, if available.

Students eligible for reinstatement can expect to receive instructions for completing the online reinstatement forms from their residential college dean. The process begins in March for the fall term and in November for the spring term.

Students on probation for disciplinary or academic reasons will resume their probationary status upon their return for the duration of the assigned probationary period.

**Exceptional Circumstances**

*One-Term Leave of Absence*

Students who have completed at least one year of study and have joined an academic department may petition to take a one-semester leave if they can demonstrate that returning out of the normal sequence would not unreasonably impact their regular progress to degree. The request for a one-semester leave and the plan for returning out of phase must be approved by the student’s residential college dean and academic department before being submitted to the Faculty Committee on Examinations and Standing for final approval.

*Repeated or Extended Leaves of Absence*

A student who has taken three leaves from the University, including any academic required withdrawal or mandatory leave of absence, or who has taken a leave of absence in excess of three years, may no longer be eligible for the regular reinstatement process. A student in these circumstances who wishes to return to Princeton should petition for readmission by the Faculty Committee on Examinations and Standing. The more extensive process of a petition for readmission asks the student to document in some detail their readiness to return to Princeton’s rigorous academic
environment, including, as appropriate, how the student’s situation has changed or developed, to support a successful return.

Mandatory Leave of Absence

Princeton provides a range of support services to address the medical needs of students, including mental health needs, within the context of the campus community. On occasion, students may experience health needs requiring a level of care that exceeds what the University can appropriately provide. In such circumstances, students may take a voluntary leave of absence. In situations where a student is unable or unwilling to carry out substantial self-care obligations, or where current medical knowledge and/or the best available objective evidence indicates that a student presents a significant risk of self-harm or harm to others, and the student does not want to take a leave voluntarily, the Dean of Undergraduate Students has the authority to place the student on a mandatory leave of absence. Before placing any student with a disability on a mandatory leave of absence, Princeton will do an individualized assessment to determine if there are reasonable accommodations that would permit the student to continue to participate in Princeton’s campus community without taking a leave of absence. Such decision may be appealed in writing to the Vice President of Campus Life.

Appealing denial of reinstatement

In the rare circumstance that a student’s request for reinstatement is denied on grounds of health and safety, the decision may be appealed in writing to the Vice President of Campus Life. If the denial is based on academic grounds, the decision may be appealed in writing to the Dean of the College.

Requests for Reasonable Accommodation

Princeton University is committed to ensuring equal access to its educational programs for students with disabilities. The Office of Disability Services (ODS) utilizes an interactive process including an intake interview to understand a student's disability and explore reasonable academic accommodations. The term "disability" may include learning, physical, sensory, psychological, medical, and certain temporary disabilities. The Americans with Disabilities Act (ADA) of 1990 as amended, Section 504 of the Rehabilitation Act of 1973 (504), and the New Jersey Law Against Discrimination (NJLAD) prohibit discrimination against individuals with disabilities and entitle individuals with disabilities to reasonable accommodations. To establish that an individual requires accommodations, documentation must be submitted that confirms the existence of a specific disability and current functional limitations caused by the disability, in relation to most people. A diagnosis of a disorder or submission of documentation does not automatically qualify an individual for accommodations. Documentation must meet the University's requirements, available on the ODS website, including a current evaluation conducted by a qualified professional that provides information about diagnosis and functional limitations, and supports the requested accommodation(s). The process may include a review of the documentation by an outside consultant engaged by Princeton University. All requests are reviewed on an individual basis.

Students with disabilities who seek accommodations must register with ODS (242 Frist Campus Center, 609-258-8840). Registration through self-identification is a voluntary process that is treated confidentially and may occur at any time during the student's course of study. Such students may, with the support of ODS, petition the Faculty Committee on Examinations and Standing for a modification of the academic regulations set forth herein.
Special Features of the Undergraduate Program

In addition to the more standard courses offerings described earlier, students may also participate in specially designed courses and programs that offer a variety of different formats. These include:

Reading Courses

With the support and guidance of a faculty member, a student may propose a reading course in an area not normally offered as a regular part of the curriculum if it complements the student's academic program. Such courses are set up as tutorials and count as regular courses. Students develop syllabi for such courses in consultation with the instructor, and are expected to meet weekly with the instructor--generally for two to three hours per week. Such courses are not a rubric for departmental independent work. They do not satisfy distribution requirements but may be counted as departmental courses. Students are normally limited to one per term. Students interested in applying for a Reading Course must do so through the Office of the Dean of the College.

Student-Initiated Seminars

Students may propose seminars on topics of special interest to them to the Committee on the Course of Study. In making such applications, the initiators develop reading lists and formal structures for the course and solicit the participation of a member or members of the faculty. If approved, student-initiated seminars count as regular courses within an individual's program of study. They do not satisfy distribution requirements. Inquiries should be directed to the Office of the Dean of the College.

Recent student-initiated seminars have included Computer Graphics and Rendering, The History of Welfare, Contemporary American Indians, Transition in the Caribbean, and Concept Design.

Graduate Courses

Undergraduates of high academic standing are encouraged to enroll in graduate courses that are well suited to their programs of study. A student wishing to enroll in a graduate course should obtain approval from the instructor of the course, as well as from the appropriate departmental representative and residential college dean. Undergraduates must submit written graded work for graduate courses, and all assignments must be completed by dean's date unless prior approval for an extension is granted by a residential college dean. Graduate courses do not satisfy undergraduate distribution area requirements.

Auditing a Course

A student is permitted to audit a single course in any term. Prior to enrolling in a course on an audit basis, a student should discuss with the course professor the requirements for receiving audit credit. This typically involves writing a course paper or successfully completing the final examination, but requirements vary from course to course. If the requirements are satisfied, the course will appear on the transcript with the grade of "Audit." If a student fails to meet the audit credit requirements, the course is automatically dropped from the student's academic record. Courses completed in this way may not be included in the basic departmental program of study, may not be used to satisfy University distribution requirements, and do not count toward the number of courses required for graduation, for advancement to the next year of study, or for the minimum number of courses needed in a term.
Off-Campus Study--Individual Courses at Other U.S. or Foreign Schools

Students may, with prior approval, take courses at other accredited four-year colleges and universities in the U.S. to remove course deficiencies, satisfy certain distribution area requirements, and, with special permission, satisfy departmental or program requirements. These courses may be taken either during the summer or in terms when the student is not enrolled at Princeton. Except for students participating in special programs, such as study abroad, an A.B. student may take no more than three of the 31 courses required for graduation at another school, while a B.S.E. student may take no more than four of the required 36 at another school. All such courses must be approved by a residential college dean or a director of studies prior to enrollment. Courses taken at other schools under these provisions will not under any circumstances reduce the number of terms of study needed to graduate from Princeton. A student may not take more than two such courses in a given summer and may not enroll in such courses while simultaneously taking courses at Princeton. Applications for course approvals are available in the residential college offices.

Students may, subject to these same provisions, enroll in courses in foreign countries for Princeton credit. Students taking courses in other countries must obtain the prior approval of their departmental representative and Dean Nancy Kanach in the Office of International Programs.

Off-Campus Study--Rutgers/Princeton Theological Seminary/Westminster Choir

On recommendation of the dean of the college, students may take courses during the academic year at any of these three schools for Princeton credit and free of charge if such courses are not offered at Princeton. Courses taken at these schools do not satisfy distribution area requirements, but they may be used to satisfy departmental requirements and do count toward the number of courses needed in a term, to advance to the next year of study, and to meet the overall number of courses needed to graduate. Princeton students do not receive course credit for piano, organ or vocal instruction taken through Westminster Choir College.

Off-Campus Study--Full-Time Study at Other U.S. Colleges and Universities

In exceptional circumstances, one term of academic study in the junior year or the fall term of senior year at another college or university in the United States may be counted toward the Princeton degree. Such approval is rarely granted and is restricted to those situations in which a student's program of study cannot be met by Princeton courses. Students wishing to explore this option must obtain the approval of their departmental representative and present a proposal to the Faculty Committee on Examinations and Standing prior to enrolling at another school. Under no circumstances will permission be granted retroactively.

Early Departmental Concentration

A student may begin to concentrate in a department in the sophomore year. Early concentrators who are qualified to do so engage in independent work during the second term of the sophomore year in addition to the usual four courses. Participation in early concentration does not bind students to a department, and they are free as juniors to enter any other department for which they may be qualified. A grade for the junior paper written in the sophomore year will appear on the transcript. This grade will remain on the transcript even if the student ultimately enters a different department. A student interested in this option should discuss course selection and independent work topics with the appropriate departmental representative and the residential college dean or director of studies.
Independent Concentration

Students with academic interests that cannot adequately be served by existing departmental concentrations and interdepartmental programs may apply to the Independent Concentration Program. An independent concentrator designs a rigorous and coherent program of studies with the support of at least two faculty advisers, choosing eight or more upper-level courses in the major field. In order to ensure continuity of the student’s academic experience, at least one of the two supporting faculty advisers must be a member of the regular, permanent faculty.

Most importantly, applicants must make a compelling case for why the proposed plan of study could not reasonably be pursued within one of Princeton’s existing departments, or in combination with an established certificate program. For this reason, proposals to major in a certificate program or to orient one’s studies around a particular senior thesis topic are rarely approved.

In light of Princeton’s demanding independent work requirements, successful independent concentrators must demonstrate that their proposed plan of study coheres around a defined methodology and that ample courses and faculty resources exist to support the student for two years. Successful proposals are focused, specific, and built on the promise of interdisciplinary productivity rather than replacing particular departmental requirements. An applicant for the program must have a strong overall academic record (including a minimum 3.0 GPA) and demonstrate the high levels of motivation and self-reliance that are essential for completing two years of coursework without the structure of an academic department. Due to the highly individualized nature of all of these factors, approval for an independent concentration in one particular area does not ensure the same outcome for other applicants in subsequent years. Independent concentrators must still fulfill the writing, foreign language, and distribution requirements.

Proposals for an independent concentration should be developed in consultation with the student’s residential college dean and are submitted to the Deputy Dean of the College by December 15 of the applicant’s sophomore year. Proposals will be reviewed by a subcommittee of the Faculty Committee on Course of Study and the Faculty Committee on Examinations and Standing for consideration for approval. Students will be notified of the subcommittee’s decision no later than February 1.

Field Study

The Field Study Program allows a very small number of students either to work full time or conduct full-time research in areas closely related to their academic interests. Field study substitutes for one term at Princeton. Students accepted in the program who wish to pursue a work experience are expected to hold responsible positions in a government agency or private firm or organization; they must secure the position themselves and may undertake nonpaying as well as salaried work. Individual projects differ widely; recent ones have included campaigning in local elections, conducting biological research in a private laboratory, and interning in a congressional office. The academic component of a field study proposal is as important as the job assignment. Students are expected to work closely with an academic adviser, both in preparing proposals and while engaged in the program, and will normally complete several papers or projects analyzing their experiences and demonstrating their knowledge of the relevant theoretical literature.

Field study applications are available from the Office of the Dean of the College. Proposals should be developed in consultation with the academic adviser and the academic dean responsible for the program. Admission to the program is granted by the Faculty Committee on Examinations and Standing. Applications are due by May 15 for fall-term proposals and by December 1 for spring-term proposals.
University Scholar Program

The University Scholar Program is designed for a very small group of students with outstanding and demonstrated talent in a creative field that requires a substantial commitment of time away from campus and that cannot be pursued within regular curricular or co-curricular structures. Applicants must first receive the approval of the Deputy Dean of the College, after which they may apply to the Faculty Committee on Examinations and Standing to be considered for formal admission to the program. In order to ensure that students are making adequate degree progress, students are typically admitted to the program only after they have declared a concentration, and usually in the junior or senior year. In order to apply for the University Scholar Program, students must demonstrate the following:

1. A strong academic record at Princeton, including a minimum GPA of 3.0.

2. Exceptional talent and accomplishment in a creative field. University scholars are typically considered for the program only after receiving a highly selective or competitive award, such as a professional engagement in a musical or theatrical performance.

3. A plan of study or professional development that does not fit within the requirements of the normal curriculum. In order to qualify for a reduced course load, prospective applicants must demonstrate that they cannot reasonably pursue their creative commitments without a modification of their course load during a particular term.

4. Strong support of the student's program by three faculty members, one of whom will serve as the student’s adviser. The student’s adviser should normally be a member of the regular faculty and have expertise in the student’s field of accomplishment.

Students are first admitted to the University Scholar Program for a single term in order to pursue special projects while carrying a reduced course load; students may apply to renew their admission to the program on a term-to-term basis. Although University scholars carry a reduced course load to accommodate their additional work and studies, they must complete all requirements for their departmental concentration, and students will be exempt from some distribution requirements only in exceptional circumstances.

A University scholar must complete a minimum of 25 Princeton courses (with a minimum of three courses in each term of the sophomore and junior year and a minimum of five courses in the senior year). A University scholar who is eligible for advanced standing may take only one term away from Princeton and must complete a minimum of 22 courses at Princeton.

Other Resources

Career Services

The Office of Career Services seeks to engage, educate and empower students as they define and pursue their future career direction. Its mission is to "help students define a unique career and life vision, and then connect them in multi-dimensional, personalized ways to the resources, people, organizations and opportunities that will enable them to make their visions a reality." The office assists undergraduate and graduate students with all aspects of career planning and decision-making including self-assessment; choice of major/career field; exploration of career-related interests; pursuit of internships and other types of employment; and application to graduate/professional school. In
addition to individual counseling, the staff conducts and hosts professional development workshops and industry panels/guest speakers to prepare students with the information and skills needed to effectively pursue their post-college goals. Additional services include: self-assessment inventories; the hosting of business, law, and other graduate school admissions visits to campus; online employment listings from a wide range of corporate and nonprofit organizations as well as an on-campus recruiting program for current undergraduate and graduate students seeking fellowships, internships and permanent employment; and access to alumni through the Princeternship career exploration program, the online Alumni Careers Network and student-alumni networking events. Additional resources and guides for a variety of post-graduation options are available through the Career Services website.

Counseling and Psychological Services

Counseling and Psychological Services (CPS) provides a full spectrum of mental health care and outreach services for students (and their eligible dependents) so that they may fulfill their learning goals and developmental aspirations. Such care and services are offered to our diverse community in a responsive, welcoming, and confidential setting. CPS clinicians provide support, facilitate growth and creative expression, help identify and solve problems, and enhance academic and athletic accomplishment through the alleviation of psychological and emotional distress and the development of greater self-understanding. In so doing, CPS supports the University's goal of creating conditions that promote intellectual curiosity, active citizenship, ethical leadership, and respect for differences.

CPS offers a range of confidential, time-sensitive psychological and psychiatric services that attempt to balance the unique needs of individual students with the broader demands of a diverse campus community. Service offerings include psychological evaluations; short-term psychotherapy and referrals; psychopharmacological assessment and medication follow-up; on-call services; campus psychoeducation and community consultation; and urgent care assessment and intervention. In addition to direct clinical services, CPS also seeks to promote mental health and well-being through outreach activities, partnerships, and consultations with faculty, staff, parents, and many campus agencies. CPS is part of University Health Services (UHS) and is located on the third floor of McCosh Health Center, (609) 258-3285. More information is available at the CPS website and on the CPS facebook page.

Davis International Center

Princeton welcomes students from around the globe. Currently, students from more than 95 countries are enrolled at the University. The Davis International Center (Davis IC) is the primary resource for International students and offers specialized support including immigration advising and resources to assist with cultural and practical adjustment issues. Davis IC programs and events offer opportunities to develop social connections and gather information that will help students as they settle into life at Princeton. The Davis IC also coordinates the annual international student orientation designed for first-year students from abroad. After matriculation, the staff of the Davis International Center works closely with academic advisers, the residential college staff, the Financial Aid Office, and other related University offices to continue to provide support for students as they transition into the University community. For more information, visit the Davis IC.

Office of Disability Services

Princeton University is committed to ensuring equal access to its educational programs for students with disabilities. The Office of Disability Services (ODS) utilizes an interactive process including an intake interview to understand a student's disability and explore reasonable academic accommodations. The term "disability" may include learning,
physical, sensory, psychological, medical, and certain temporary disabilities. The Americans with Disabilities Act (ADA) of 1990 as amended, Section 504 of the Rehabilitation Act of 1973 (504), and the New Jersey Law Against Discrimination (NJLAD) prohibit discrimination against individuals with disabilities and entitle individuals with disabilities to reasonable accommodations. To establish that an individual requires accommodations, documentation must be submitted that confirms the existence of a specific disability and current functional limitations caused by the disability, in relation to most people. A diagnosis of a disorder or submission of documentation does not automatically qualify an individual for accommodations. Documentation must meet the University's requirements, available on the ODS website, including a current evaluation conducted by a qualified professional that provides information about diagnosis and functional limitations, and supports the requested accommodation(s). The process may include a review of the documentation by an outside consultant engaged by Princeton University. All requests are reviewed on an individual basis.

Students with disabilities who seek accommodations must register with ODS (242 Frist Campus Center, 609-258-8840). Registration through self-identification is a voluntary process that is treated confidentially and may occur at any time during the student's course of study. Such students may, with the support of ODS, petition the Faculty Committee on Examinations and Standing for a modification of the academic regulations set forth herein.

**Office of Information Technology**

Princeton students are given access to a varied and powerful computing environment supported by the Office of Information Technology (OIT). The cornerstone of student computing is Dormnet, a fiber-optic-based network that brings a high-speed data connection into every undergraduate dorm room on campus; wireless service provides access to the network throughout the campus. All undergraduates residing on campus are able to take advantage of this connection to Princeton and Internet resources.

The University, working with strategic computer vendors, offers a Student Computer Initiative (SCI), a program that provides students the opportunity to purchase a specially-configured laptop computer at competitive prices. SCI computers are configured for the Princeton environment and are fully supported by OIT's support services, providing the quickest resolution to problems and warranty repair when needed.

All students can take advantage of a full range of OIT support services. The Support and Operations Center offers technology help 24 hours a day, seven days a week, by telephone, online chat, and e-mail. Student Technology Consultants (STC) provide assistance in campus dorms. The Solutions Center, located in the Frist Campus Center, offers a variety of technology-related services. It includes the Tech Clinic, where students may receive in-person software and hardware support for their computers and selected mobile devices. The Tech Clinic also arranges for computer repair from the hardware repair center. Across the hall is the OIT Store, where students may purchase specially-priced software and computer accessories, and Student Telephone Services.

Students have access to many computers in more than 40 OIT-supported campus clusters. High-quality printing is also available at the clusters, and over the campus network from students' own computers. Software on cluster computers includes basic productivity tools such as word processors, special software needed for the many classes in which computing is integral to learning, and sophisticated programs for use in research, and specialized media editing software.
Each student receives a netID, an identifier that allows the use of Princeton e-mail and access to the campus network for central printing service and specialized resources such as the online library systems. Multiple high-speed connections to the Internet permit students to take full advantage of the wide range of networked resources.

Additional OIT services include support in the use of selected software packages, maintenance of the University Humanities Resource Center (HRC) and video library, and support for instructional technologies in classrooms and over the campus network. Clusters around campus provide students with access to high-speed resources, such as streaming video, for use in language and other courses.

A course management system server (Blackboard) provides a web page for every University course. OIT provides a number of information-access servers, including web servers, on which students can have their own web pages.

Foreign language and educational programming and selected cable TV channels are broadcast over the campus network to dorm rooms on a subscription basis, and to public viewing rooms, classrooms, and the Humanities Resource Center.

OIT also provides Tiger Voice, a service that unifies student voicemail and e-mail allowing students to forward Princeton calls to their mobile phones and receive voicemail in their e-mail inboxes.

For information about campus and network resources, contact OIT's Support and Operations Center at (609) 258-4357 (258-HELP) or visit the OIT website.

Survey Research Center

The Survey Research Center (SRC) is a resource for Princeton students, faculty, and administration. The center has 12 telephone interviewing stations; a library of questionnaires, books, and journals; and an advanced self-service utility for designing and managing web-based surveys and online experiments. The SRC provides guidance on study design, sampling, and project management for students who are completing senior theses, junior papers, or class projects that require collection of original survey data. SRC was established in 1992 with a grant from the Andrew W. Mellon Foundation. The center's main facility is at 169 Nassau Street.

University Art Museum

With origins dating to the 1750s, the Princeton University Art Museum is one of the world's leading university art museums with collections of more than 80,000 works of art that range from ancient to contemporary art and concentrate geographically on the Mediterranean regions, Western Europe, China, the United States, and Latin America. Committed to advancing Princeton's teaching and research missions, the Art Museum also serves as a gateway to the University for visitors from around the world. Intimate in scale yet expansive in scope, the Art Museum offers a respite from the rush of daily life, a revitalizing experience of extraordinary works of art, and an opportunity to delve deeply into the study of art and culture.

Special exhibitions are presented throughout the year and include many coordinated with the curriculum of the Department of Art and Archaeology. The Art Museum encourages faculty from all disciplines to take advantage of self-guided tours and other opportunities to interact directly with works from the collections. Undergraduate and
graduate students can become actively involved in the Museum through internships, the student guide program, work study, and volunteer opportunities.

The Art Museum hosts weekly events ranging from lectures and exhibition openings to live music and sketching in the galleries. For a current schedule of events, please see our events calendar.

On view throughout the University campus is the John B. Putnam Jr. Memorial Collection of modern and contemporary sculpture, including works by Alexander Calder, Henry Moore, Louise Nevelson, Isamu Noguchi, and Pablo Picasso. Visit the mobile-friendly website to explore the collection through interactive maps, artist biographies, and audio recordings by curators and conservators.

University Library

Princeton undergraduates have access to a world-class academic research library with millions of books, journals, manuscripts, and microforms; tens of thousands of electronic journals, digital texts, sound recordings, musical scores, DVDs, and videos; and over a thousand online databases covering all fields of human knowledge. The Library's website is a 24/7 gateway to information resources and services. More importantly, librarians are always available in person, or by phone, e-mail, or IM to help students find relevant information and reliable print or online sources among this wealth of materials.

The Princeton University Library includes a central building, the Harvey S. Firestone Memorial Library, the Lewis Science Library, and eight other branch libraries, plus two off-campus storage facilities. Most of the humanities and social science collections are in Firestone, one of the largest open-stack libraries in the world. The Lewis Science Library consolidates research collections and expert staff for the physical, life, and behavioral sciences. Except for materials that need special protection due to rarity or fragility, books and journals in all Princeton libraries are housed on open shelves, allowing users to browse and discover sources on their own.

Staff throughout the library system, including subject specialists representing all the major academic disciplines, are available to guide students through the various phases of the library research process. Within Firestone, staff at the central reference desk provide on-the-spot help or in-depth research consultations by appointment. This major service point is the best place for beginning undergraduates to start any library project. Other areas within Firestone house periodical and reserve collections, data and statistical support services, microforms, and depository collections for New Jersey, the United States, United Nations, and European Union official documents.

The Department of Rare Books and Special Collections, whose holdings are available to undergraduates for their research, is also within Firestone. Among its special strengths are early printed and rare books; children's illustrated books (plus games, puzzles, and educational toys); a graphic arts collection; historic maps; prints and photographs; and the correspondence and literary manuscripts of a wide array of 19th- and 20th-century English, American, and Latin American authors. The Public Policy Papers and University Archives, located in the Seeley G. Mudd Manuscript Library, include the collections of major figures and organizations devoted to 20th-century American domestic and foreign policy, as well as memorabilia and material related to University history.
Department of African American Studies

Chair
Eddie S. Glaude Jr.
Assistant Professor

Departmental Representative
Tera W. Hunter

Director of Graduate Studies
Wendy L. Belcher

Professor
Wallace D. Best, also Religion
Anne A. Cheng, also English
Eddie S. Glaude Jr., also Religion
Tera W. Hunter, also History
Imani Perry
Stacey Sinclair, also Psychology

Visiting Professor
Cassandra Jackson

Associate Professor
Wendy L. Belcher, also Comparative Literature

Joshua B. Guild, also History
Naomi Murakawa
Chika Okeke-Agulu, also Art and Archaeology

Assistant Professor
Anna Arabindan-Kesson, Aslo Art and Archaeology
Ruha Benjamin
Kinohi Nishikawa, also English
Keeanga Y. Taylor

Lecturer
Nijah N. Cunningham, also Council of the Humanities, English

Associated Faculty
Bruno M. Carvalho, Spanish and Portuguese
Jacob S. Dlamini, History
Paul Frymer, Politics
William A. Gleason, English
J. Nichole Shelton, Psychology
Leonard Wantchekon, Politics, Woodrow Wilson School
Judith L. Weisenfeld, Religion

The Department of African American Studies offers the African American studies concentration for undergraduates with a strong interest in studying the complex interplay between political, economic, and cultural forces shaping the historic achievements and struggles of African-descended people in the United States and their relationship to others around the world.

Information and Departmental Plan of Study

Students in this field are expected to understand the basic themes and ideas that structure interdisciplinary work in African American studies. The concentration provides students an opportunity to focus their studies in one of three subfields:

1) Global Race and Ethnicity: In this track, students use the prevailing analytical tools and critical perspectives of African American studies to consider comparative approaches to groups, broadly defined. Students will examine the intellectual traditions, socio-political contexts, expressive forms, and modes of belonging of people who are understood to share common boundaries/experiences as either: (1) Africans and the African Diaspora outside of the United States and (2) non-African-descended people of color within the United States.

2) African American Culture and Life: In this track, students encounter the theoretical canon and keywords, which shape the contemporary discipline of African American studies. Accessing a range of interdisciplinary areas, situated primarily in the United States, students will learn to take a critical posture in examining the patterns and practices that order and transform black subjects and black life.
3) Race and Public Policy: In this track, students use and interrogate social science methodologies in examining the condition of the American state and American institutions and practices. With an analysis of race and ethnicity at the center, students will examine the development of institutions and practices, with the growth and formation of racial and ethnic identities, including changing perceptions, measures, and reproduction of inequality.

The program's curriculum reflects the complex interplay between political, economic, and cultural forces that shape our understanding of the historic achievements and struggles of African-descended people in this country and their relation to others around the world. With a combination of courses and interdisciplinary research opportunities, students who complete the African American studies concentration will be equipped with the critical and analytical skills that will prepare them for a range of professions. They will be highly qualified to pursue graduate work in the field or its cognate disciplines, and prepared to enter a society in which race continues to be salient.

Early Concentration

Early concentration is open to spring semester sophomores who have completed the prerequisite for entry into the department by the end of the fall semester of sophomore year. It allows students to make an early start on independent work and is especially useful for students planning to study abroad junior year.

Admission to the Program

Prerequisite for entry into the African American studies concentration is the successful completion on a graded basis of the core course, AAS 201 Introduction to the Study of African American Cultural Practices.

Program of Study

Concentrators are required to complete 10 courses: AAS 201; a junior seminar; and eight additional African American Studies courses. Of the eight African American Studies courses, students are required to take two survey courses, one with pre-20th century emphasis (AAS 353, AAS 366), the other with emphasis on the 20th century to the present (AAS 359, AAS 367). All students are required to complete four courses in their chosen subfield and one course in each of the two remaining subfields. See the departmental website for the lists of courses by subfield. Students are permitted to take two approved cognate courses in other departments. Concentrators will complete the junior and senior independent work and a departmental comprehensive examination.

Independent Work

Junior Year. During the fall term all juniors will participate in a colloquium with a member or members of the faculty. Students are expected to produce a research paper at the conclusion of the colloquium. The paper should be related to the topic of the junior seminar. In the spring term, juniors will complete independent work that includes independent reading and the writing of the junior paper working with a faculty adviser.

Senior Year. During the senior year each student, with the guidance of a faculty adviser, must complete independent work, which consists of writing a thesis. The senior thesis will then serve as the basis of the senior comprehensive exam.
Senior Departmental Examination

The comprehensive examination in the department consists of an oral examination based on the senior thesis and related topics.

AAS Program Certificate

The Department for African American Studies offers students concentrating in another department the opportunity to earn a certificate in African American studies. Undergraduate students may apply for formal admission to the certificate program at any time once they have taken and achieved a satisfactory standing in the core course, AAS 201, Introduction to the Study of African American Cultural Practices.

In addition to taking AAS 201, students seeking a certificate will be required to take two courses in the African American Culture and Life subfield. These two survey courses must be selected from the history (AAS 366, AAS 367) and literature (AAS 353, AAS 359) series, one of which must be a pre-20th-century course. Students will take two additional courses in AAS or approved cognates for a total of five courses required. They are strongly urged to choose additional courses either in the Race and Public Policy subfield, or in the Global Race and Ethnicity subfield. Students are encouraged to make race central to their senior theses. Please consult the listing for the Program in African American Studies for additional information.

Courses

AAS 201 Introduction to the Study of African American Cultural Practices  Spring  SA
An interdisciplinary examination of the complex array of African American cultural practices from slavery to postmodern times. Close readings of classic texts will seek to provide a profound grasp of the dynamics of African American thought and practices. Two lectures, one preceptorial. I. Perry

AAS 202 Introductory Research Methods in African American Studies (also SOC 202 )  Not offered this year  SA
The purposes of this course are to assist the student in developing the ability to critically evaluate social science research on the black experience and to do research in African studies. To accomplish these goals, the course will acquaint students with the processes of conceptualization and basic research techniques, and some of the unique issues in conducting research on the black experience. A variety of appropriate studies will be utilized. One three-hour seminar. Staff

AAS 211 The American Dance Experience and Africanist Dance Practices (See DAN 211)

AAS 221 Inequality: Class, Race, and Gender (See SOC 221)

AAS 230 Topics in African American Studies (also ENG 231 )  Fall  LA
This course examines the selected non-fiction writings of one of America's most influential essayists and public intellectuals: James Baldwin. Attention will be given to his views on ethics, art, and politics - with particular consideration given to his critical reflections on race and democracy. E. Glaude Jr.

AAS 262 Introduction to the Evolution of Jazz Styles (See MUS 262)

AAS 312 Special Topics In Urban Dance (See DAN 322)

AAS 317 Race and Public Policy (See WWS 331)
AAS 321 Black Power and Its Theology of Liberation (also REL 321) Not offered this year HA
This course examines the various pieties of the Black Power era. We chart the explicit and implicit utopian visions of the politics of the period that, at once, criticized established black religious institutions and articulated alternative ways of imagining salvation. We also explore the attempt by black theologians to translate the prophetic black church tradition into the idiom of black power. Our aim is to keep in view the significance of the Black Power era for understanding the changing role and place of black religion in black public life. E. Glaude Jr.

AAS 325 African American Autobiography (also ENG 393 / REL 366) Not offered this year LA
Highlights the autobiographical tradition of African Americans from the antebellum period to the present as symbolic representations of African American material, social, and intellectual history and as narrative quests of self-development. Students will be introduced to basic methods of literary analysis and criticism, specifically focusing on cultural criticism and psychoanalytic theory on the constructed self. One three-hour seminar. Staff

AAS 327 20th Century Master (also ENG 379 / GSS 368) Fall LA
This special topics course will focus on artists and intellectuals whose corpus reflects and illuminates 20th century African American life. Lorraine Hansberry, the first African American female playwright to have a play open on Broadway, explored a series of critical themes in her work, including: race, migration, colonialism, gender and social class. In addition to having a distinguished career as a playwright, Hansberry was an activist and advocate for gender and racial justice. Students will study her published and unpublished plays, essays and poetry, as well as relevant social and cultural history and literary criticism. I. Perry

AAS 340 Shades of Passing (also ENG 391 / AMS 340) Not offered this year LA
This course studies the trope of passing in 20th century American literary and cinematic narratives in an effort to re-examine the crisis of identity that both produces and confounds acts of passing. We will examine how American novelists and filmmakers have portrayed and responded to this social phenomenon, not as merely a social performance but as a profound intersubjective process embedded within history, law, and culture. We will focus on narratives of passing across axes of difference, invoking questions such as: To what extent does the act of passing reinforce or unhinge seemingly natural categories of race, gender, and sexuality? A. Cheng

AAS 346 The American Jeremiad and Social Criticism in the United States (See REL 367)

AAS 351 Law, Social Policy, and African American Women (also GSS 351) Spring SA
Journeying from enslavement and Jim Crow to the post-civil rights era, this course will learn how law and social policy have shaped, constrained, and been resisted by black women's experience and thought. Using a wide breadth of materials including legal scholarship, social science research, visual arts, and literature, we will also develop an understanding of how property, the body, and the structure and interpretation of domestic relations have been frameworks through which black female subjectivity in the United States was and is mediated. I. Perry

AAS 353 African American Literature: Origins to 1910 (also ENG 352) Fall LA
A survey of literary materials produced within the African American experience, from the 18th century through the contemporary period, with special emphasis on genre, theme, and context. The course will investigate dominant and marginalized literary histories and the importance of gender, region, and sensibility. Two lectures, one preceptorial. C. Jackson

AAS 359 African American Literature: Harlem Renaissance to Present (also ENG 366) Spring LA
This course explores the relationship between cultural production and historical phenomena (such as the Great Migration, the Harlem Renaissance, and the Civil Rights Movement, for example) in 20th- and 21st-century African American literature. Additionally, we will consider the place of African American literature and cultural production
in a diasporic context that encompasses decolonization, multiculturalism and globalization. Primary texts include novels, short fiction, drama, essays, poetry and performance culture. Staff

AAS 362 Race and the American Legal Process: Emancipation to the Voting Rights Act (also WWS 386 / POL 338) Fall SA
This course examines the dynamic and often conflicted relationships between African American struggles for inclusion, and the legislative, administrative, and judicial decision-making responding to or rejecting those struggles, from Reconstruction to the passage of the Voting Rights Act. In tracing these relationships we will cover issues such as property, criminal law, suffrage, education, and immigration, with a focus on the following theoretical frameworks: equal protection, due process, civic participation and engagement, and political recognition. I. Perry

AAS 364 Race, Drugs, and Drug Policy in America (See HIS 393)

AAS 366 African American History to 1863 (also HIS 386) Spring HA
An examination of the history of African Americans from 1619 to 1863. Issues to be discussed include the African origins of African Americans, the slave trade, slavery, the construction of black culture and institutions, free blacks, resistance, the abolitionist movement, and emancipation. Two lectures, one preceptorial. T. Hunter

AAS 367 African American History from Reconstruction to the Present (also HIS 387) Not offered this year HA
An analysis of the social, political, legal, and cultural dimensions of the African American experience in the United States throughout critical historical moments such as Reconstruction, suffrage, the Great Migration, war, the Great Depression, the New Deal, the Civil Rights era, the black power movement, and contemporary racial politics. Two lectures, one preceptorial. J. Guild

AAS 368 Topics in African American Religion (also REL 368 / POL 424) Not offered this year EM
Assesses the value of religion and its impartations of the historical, ethical, and political in African American life. Courses will also critique African American religion from a broader contextual basis by establishing commonalities and differences across historical and cultural boundaries. Two lectures, one preceptorial. Staff

AAS 373 History of African American Art (See ART 373)

AAS 389 Women Writers of the African Diaspora (See ENG 389)

AAS 392 Topics in African American Literature (also ENG 392) Not offered this year EM
A historical overview of black literary expression from the 19th century to present day. Will emphasize a critical and analytical approach to considering the social, cultural, and political dimensions of African American literature. Two lectures, one preceptorial. Staff

AAS 397 New Diasporas (See ENG 397)

AAS 454 Seminar. History of Photography (See ART 454)

AAS 477 The Civil Rights Movement (also HIS 477) Not offered this year HA
This interdisciplinary course examines the evolution of African American social and political mobilization from World War II through the 1970s. Through an analysis of historical scholarship, oral history, sermons, works of literature, film and music, it explores the various ways that African Americans articulated their political demands and affirmed their citizenship using the church, grassroots organizations, workers' rights, feminism, education, war, the federal bureaucracy, and the law as tools for political action. The course also considers the ways these movements have been remembered, memorialized, and appropriated in more recent times. J. Guild, I. Perry

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Program in African American Studies

Director
Eddie S. Glaude Jr.

Professor
Wallace D. Best, also Religion
Anne A. Cheng, also English
Eddie S. Glaude Jr., also Religion
Tera W. Hunter, also History
Imani Perry
Stacey Sinclair, also Psychology

Visiting Professor
Cassandra Jackson

Associate Professor
Wendy L. Belcher, also Comparative Literature
Joshua B. Guild, also History
Naomi Murakawa
Chika Okeke-Agulu, also Art and Archaeology

Assistant Professor
Anna Arabindan-Kesson, also Art and Archaeology
Ruha Benjamin
Kinohi Nishikawa, also English
Keeanga Y. Taylor

Lecturer
Nijah N. Cunningham, also Council of the Humanities, English

Associated Faculty
Bruno M. Carvalho, Spanish and Portuguese
Jacob S. Dlamini, History
Paul Frymer, Politics
William A. Gleason, English
J. Nicole Shelton, Psychology
Leonard Wantchekon, Politics
Judith L. Weisenfeld, Religion

Sits with Committee
Monica Y. Youn, Lewis Center for the Arts, Creative Writing
The Program in African American Studies was founded on the assumption that the study of African American history and culture and of the role that race has played in shaping the life and the institutions of the United States is central to an American liberal education. Given the continuing and evolving centrality of race in American political, economic, social, and cultural life, and indeed, in every region of the world, reflection on race and on the distinctive experiences of black people is indispensable for all Princeton students as global citizens. Drawing on a core of distinguished faculty in areas such as anthropology, art and archaeology, English, history, philosophy, psychology, religion, and sociology, the program promotes teaching and research of race with a focus on the experience of African Americans in the United States.

The program's curriculum reflects the complex interplay between political, economic, and cultural forces that shape our understanding of the historic achievements and struggles of African-descended people in this country and their relation to others around the world. Toward that end, the certificate is organized into three thematic subfields:

1) Global Race and Ethnicity: In this track, students use the prevailing analytical tools and critical perspectives of African American studies to consider comparative approaches to groups, broadly defined. Students will examine the intellectual traditions, socio-political contexts, expressive forms, and modes of belonging of people who are understood to share common boundaries/experiences as either: (1) Africans and the African Diaspora outside of the United States and (2) non-African-descended people of color within the United States.

2) African American Culture and Life: In this track, students encounter the theoretical canon and keywords, which shape the contemporary discipline of African American studies. Accessing a range of interdisciplinary areas, situated primarily in the United States, students will learn to take a critical posture in examining the patterns and practices that order and transform black subjects and black life.

3) Race and Public Policy: In this track, students use and interrogate social science methodologies in examining the condition of the American state and American institutions and practices. With an analysis of race and ethnicity at the center, students will examine the development of institutions and practices, with the growth and formation of racial and ethnic identities, including changing perceptions, measures, and reproduction of inequality.

Admission to the Program

The Program in African American Studies offers students concentrating in another department the opportunity to earn a certificate in African American studies. Undergraduate students may apply for formal admission to the certificate program at any time once they have taken and achieved a satisfactory standing in the core course, AAS 201, Introduction to the Study of African American Cultural Practices.

Program Requirements

In addition to taking AAS 201, students seeking a certificate are required to take two courses in the African American Culture and Life subfield. These two survey courses must be selected from the history and literature series, one of which must be a pre-20th-century course (marked with an *below). Qualifying courses include:

AAS 353/ENG 352 African American Literature: Origins to 1910*

AAS 359/ENG 366 African American Literature: Harlem Renaissance to Present
AAS 366/HIS 386 African American History to 1863*

AAS 367/HIS 387 African American History from Reconstruction to the Present

Students will take two additional courses in AAS or approved cognates for a total of five courses required. They are strongly urged to choose additional courses from either the Race and Public Policy subfield or the Global Race and Ethnicity subfield. Students are encouraged to make race central to their senior thesis.

Certificate of Proficiency

Students who fulfill all the requirements of the program will receive a certificate in African American studies upon graduation.

Interested students are advised to contact the program office. For the most current information see the program's website.

Courses

AAS 201 Introduction to the Study of African American Cultural Practices Spring SA
An interdisciplinary examination of the complex array of African American cultural practices from slavery to postmodern times. Close readings of classic texts will seek to provide a profound grasp of the dynamics of African American thought and practices. Two lectures, one preceptorial. I. Perry

AAS 202 Introductory Research Methods in African American Studies (also SOC 202) Not offered this year SA
The purposes of this course are to assist the student in developing the ability to critically evaluate social science research on the black experience and to do research in African studies. To accomplish these goals, the course will acquaint students with the processes of conceptualization and basic research techniques, and some of the unique issues in conducting research on the black experience. A variety of appropriate studies will be utilized. One three-hour seminar. Staff

AAS 211 The American Dance Experience and Africanist Dance Practices (See DAN 211)

AAS 221 Inequality: Class, Race, and Gender (See SOC 221)

AAS 222 Introduction to Hip-Hop Dance (See DAN 222)

AAS 230 Topics in African American Studies (also ENG 231) Fall LA
This course examines the selected non-fiction writings of one of America's most influential essayists and public intellectuals: James Baldwin. Attention will be given to his views on ethics, art, and politics - with particular consideration given to his critical reflections on race and democracy. E. Glaude Jr.
AAS 236 Muslims in America (See NES 238)

AAS 239 Introduction to African Literature and Film (See COM 239)

AAS 242 Other Futures: An Introduction to Modern Caribbean Literature (also ENG 242 / GSS 242) Fall LA
This course introduces students to major theories and debates within the study of Caribbean literature and culture with a particular focus on the idea of catastrophe. Reading novels and poetry that address the historical loss and injustices that have given shape to the modern Caribbean, we will explore questions of race, gender, and sexuality and pay considerable attention to the figure of the black body caught in the crosscurrents of a catastrophic history. We will analyze how writers and artists attempted to construct alternative images of the future from the histories of slavery and colonialism that haunt the Caribbean and its diasporas. N. Cunningham

AAS 256 African American Religious History (See REL 256)

AAS 260 Introduction to African Art (See ART 260)

AAS 261 Art and Politics in Postcolonial Africa (See ART 261)

AAS 262 Introduction to the Evolution of Jazz Styles (See MUS 262)

AAS 304 Introduction to Global Pentecostalism (See REL 310)

AAS 310 Policing Racial Order: The History of U.S. Police Power from Slave Patrols to Drones Fall SA
This course investigates the role of police power in reinforcing or challenging racial order in all of its economic, spatial, and gendered manifestations. We pay particular attention to the ways in which commonplace notions of safety and security develop in relation to the history of territorial expansion, war, wealth accumulation, and the racialized distribution of private property. N. Murakawa

AAS 312 Special Topics In Urban Dance (See DAN 322)

AAS 315 Race, Ethnicity, and Nationalism in Latin America (See SOC 315)

AAS 317 Race and Public Policy (See WWS 331)

AAS 319 What Was African American Literature? Reading Black Literature in the 21st Century (See ENG 319)

AAS 321 Black Power and Its Theology of Liberation (also REL 321) Not offered this year HA
This course examines the various pieties of the Black Power era. We chart the explicit and implicit utopian visions of the politics of the period that, at once, criticized established black religious institutions and articulated alternative ways of imagining salvation. We also explore the attempt by black theologians to translate the prophetic black
church tradition into the idiom of black power. Our aim is to keep in view the significance of the Black Power era for understanding the changing role and place of black religion in black public life. E. Glaude Jr.

AAS 325 African American Autobiography (also ENG 393 / REL 366) Not offered this year LA
Highlights the autobiographical tradition of African Americans from the antebellum period to the present as symbolic representations of African American material, social, and intellectual history and as narrative quests of self-development. Students will be introduced to basic methods of literary analysis and criticism, specifically focusing on cultural criticism and psychoanalytic theory on the constructed self. One three-hour seminar. Staff

AAS 327 20th Century Master (also ENG 379 / GSS 368) Fall LA
This special topics course will focus on artists and intellectuals whose corpus reflects and illuminates 20th century African American life. Lorraine Hansberry, the first African American female playwright to have a play open on Broadway, explored a series of critical themes in her work, including: race, migration, colonialism, gender and social class. In addition to having a distinguished career as a playwright, Hansberry was an activist and advocate for gender and racial justice. Students will study her published and unpublished plays, essays and poetry, as well as relevant social and cultural history and literary criticism. I.
Perry

AAS 336 Special Topics in Poetry: Race, Identity and Innovation (See CWR 316)

AAS 340 Shades of Passing (also ENG 391 / AMS 340) Not offered this year LA
This course studies the trope of passing in 20th century American literary and cinematic narratives in an effort to re-examine the crisis of identity that both produces and confounds acts of passing. We will examine how American novelists and filmmakers have portrayed and responded to this social phenomenon, not as merely a social performance but as a profound intersubjective process embedded within history, law, and culture. We will focus on narratives of passing across axes of difference, invoking questions such as: To what extent does the act of passing reinforce or unhinge seemingly natural categories of race, gender, and sexuality? A. Cheng

AAS 341 Enter the New Negro: Black Atlantic Aesthetics (also ART 375) Fall LA
This course traces the development of artistic modernisms in the African diaspora from the second half of the nineteenth-century into the mid twentieth century. Incorporating visits to art collections, the course examines the aesthetic theories of Black artists and writers, their subjects and the expressive forms they sought to describe. Tracing the ways these artists engaged with the emerging debates and dialogues of Western modernism, the course uses these cross cultural dynamics, what Kobena Mercer has termed "cosmopolitan modernisms," to centralize the visionary, transnational, modernity of artists in the African diaspora. A. Kesson

AAS 343 African American Politics (See POL 343)

AAS 345 Sonic Fugitivities: The Soundscapes of the African-American Literary Tradition (also ENG 358) Spring LA
This course will explore the rich interplay between sound and literature in nineteenth and twentieth-century African-American letters. Historically denied the right to literacy and education, African-Americans have utilized sound, primarily in the form of music and orature, as a mode of protest and an expression of freedom, subjectivity, citizenship, and national belonging. In this course we will explore the ways in which African-American writers
have drawn on this rich sonic tradition to make political claims about race, gender, class, region, nation, and cultural identity. J. McInnis

AAS 346 The American Jeremiad and Social Criticism in the United States (See REL 367)

AAS 351 Law, Social Policy, and African American Women (also GSS 351) Spring SA
Journeying from enslavement and Jim Crow to the post-civil rights era, this course will learn how law and social policy have shaped, constrained, and been resisted by black women's experience and thought. Using a wide breadth of materials including legal scholarship, social science research, visual arts, and literature, we will also develop an understanding of how property, the body, and the structure and interpretation of domestic relations have been frameworks through which black female subjectivity in the United States was and is mediated. I. Perry

AAS 353 African American Literature: Origins to 1910 (also ENG 352) Fall LA
A survey of literary materials produced within the African American experience, from the 18th century through the contemporary period, with special emphasis on genre, theme, and context. The course will investigate dominant and marginalized literary histories and the importance of gender, region, and sensibility. Two lectures, one preceptorial. C. Jackson

AAS 355 Pleasure, Power and Profit: Race and Sexualities in a Global Era (See GSS 345)

AAS 359 African American Literature: Harlem Renaissance to Present (also ENG 366) Spring LA
This course explores the relationship between cultural production and historical phenomena (such as the Great Migration, the Harlem Renaissance, and the Civil Rights Movement, for example) in 20th- and 21stcentury African American literature. Additionally, we will consider the place of African American literature and cultural production in a diasporic context that encompasses decolonization, multiculturalism and globalization. Primary texts include novels, short fiction, drama, essays, poetry and performance culture.
Staff

AAS 362 Race and the American Legal Process: Emancipation to the Voting Rights Act (also WWS 386 / POL 338) Fall SA
This course examines the dynamic and often conflicted relationships between African American struggles for inclusion, and the legislative, administrative, and judicial decision-making responding to or rejecting those struggles, from Reconstruction to the passage of the Voting Rights Act. In tracing these relationships we will cover issues such as property, criminal law, suffrage, education, and immigration, with a focus on the following theoretical frameworks: equal protection, due process, civic participation and engagement, and political recognition. I. Perry

AAS 364 Race, Drugs, and Drug Policy in America (See HIS 393)

AAS 366 African American History to 1863 (also HIS 386) Spring HA
An examination of the history of African Americans from 1619 to 1863. Issues to be discussed include the African origins of African Americans, the slave trade, slavery, the construction of black culture and institutions, free blacks, resistance, the abolitionist movement, and emancipation. Two lectures, one preceptorial. T. Hunter
AAS 367 African American History from Reconstruction to the Present (also HIS 387) Not offered this year HA
An analysis of the social, political, legal, and cultural dimensions of the African American experience in the United States throughout critical historical moments such as Reconstruction, suffrage, the Great Migration, war, the Great Depression, the New Deal, the Civil Rights era, the black power movement, and contemporary racial politics. Two lectures, one preceptorial. J. Guild

AAS 368 Topics in African American Religion (also REL 368 / POL 424) Not offered this year EM
Assesses the value of religion and its impartations of the historical, ethical, and political in African American life. Courses will also critique African American religion from a broader contextual basis by establishing commonalities and differences across historical and cultural boundaries. Two lectures, one preceptorial. Staff

AAS 372 Postblack - Contemporary African American Art (also ART 374 / AMS 372) Fall LA
As articulated by Thelma Golden, postblack refers to the work of African American artists who emerged in the 1990s with ambitious, irreverent, and sassy work. Postblack suggests the emergence of a generation of artists removed from the long tradition of black affirmation of the Harlem Renaissance, black empowerment of the Black Arts movement, and identity politics of the 1980s and early 90s. This seminar involves critical and theoretical readings on multiculturalism, race, identity, and contemporary art, and will provide an opportunity for a deep engagement with the work of African American artists of the past decade. One three-hour seminar. C. Okeke-Agulu

AAS 373 History of African American Art (See ART 373)
AAS 376 Race and Religion in America (See REL 377)

AAS 380 Public Policy in the American Racial State (also AMS 382) Spring HA
In the context of de facto equality but persistent racial inequality, how do we identify race's role in public policy? This course addresses this question by drawing on a range of interdisciplinary texts. We begin by exploring different theoretical perspectives of race, seeking to define "the racial state" in historical and comparative terms. We then consider how race interacts with a variety of American political institutions, including the welfare state, immigration regulation, and the criminal justice state. We give particular attention to the complexities of racial construction and race's intersection with other forms of hierarchy. N. Murakawa

AAS 382 Race, Religion, and the Harlem Renaissance (See REL 372)

AAS 384 Prejudice: Its Causes, Consequences, and Cures (also PSY 384 / WWS 345) Fall SA
Prejudice is one of the most contentious topics in modern American society. There is debate regarding its causes, pervasiveness, and impact. This goal of this course is to familiarize students with the psychological research relevant to these questions. We will review theoretical perspectives on prejudice to develop an understanding of its cognitive, affective, and motivational underpinnings. We will also discuss how these psychological biases relate to evaluations of, and behavior toward, members of targeted groups. In addition, research-based strategies for reducing prejudice will be discussed. S. Sinclair

AAS 389 Women Writers of the African Diaspora (See ENG 389)

AAS 392 Topics in African American Literature (also ENG 392) Not offered this year EM
A historical overview of black literary expression from the 19th century to present day. Will emphasize a critical and analytical approach to considering the social, cultural, and political dimensions of African American literature. Two lectures, one preceptorial. Staff

AAS 394 African American Women's History (See HIS 390)

AAS 397 New Diasporas (See ENG 397)

AAS 402 Princeton and Slavery (See HIS 402)

AAS 410 Mortality at the Margins: Race, Inequality and Health Policy in the United States (See GHP 409)

AAS 412 Human Trafficking and its Demise: African and European Slaves in Modern Islam (16th-21st century) (See NES 411)

AAS 442 Radical African Thought and Revolutionary Youth Culture (also AFS 442 / COM 425) Fall LA
African thought continues to be marginalized, even though radical black intellectuals have shaped a number of social movements and global intellectual history. African youths are innovating new models that are revolutionizing the sciences, law, social and visual media, fashion, etc. In this class, we read classics of African thought and study contemporary African youth culture together to theorize what is happening in Africa today. This includes reading such African theorists as Frantz Fanon, V. Y. Mudimbe, and Achille Mbembe, and researching innovations in contemporary African urban popular culture. W. Belcher

AAS 454 Seminar. History of Photography (See ART 454)

AAS 456 History of New Orleans: Invention & Reinvention in an American City (See HIS 456)

AAS 462 Representing Race in American Art (See ART 462)

AAS 472 Igbo and Yoruba Art (See ART 472)

AAS 477 The Civil Rights Movement (also HIS 477) Not offered this year HA
This interdisciplinary course examines the evolution of African American social and political mobilization from World War II through the 1970s. Through an analysis of historical scholarship, oral history, sermons, works of literature, film and music, it explores the various ways that African Americans articulated their political demands and affirmed their citizenship using the church, grassroots organizations, workers' rights, feminism, education, war, the federal bureaucracy, and the law as tools for political action. The course also considers the ways these movements have been remembered, memorialized, and appropriated in more recent times. J. Guild, I. Perry
Program in African Studies

Director
Carolyn M. Rouse

Executive Committee
V. Kofi Agawu, Music
Wendy L. Belcher, Comparative Literature, African American Studies
André Benhaïm, French and Italian
Anne C. Case, Woodrow Wilson School, Economics
Jacob Dlamini, History
Andrew P. Dobson, Ecology and Evolutionary Biology
Simon E. Gikandi, English
Emmanuel H. Kreike, History
F. Nick Nesbitt, French and Italian
Chika O. Okeke-Agulu, Art and Archaeology, African American Studies
Tullis C. Onstott, Geosciences
S. George H. Philander, Geosciences
Carolyn M. Rouse, Anthropology
Daniel I. Rubenstein, Ecology and Evolutionary Biology
Leonard Wantchekon, Politics, Woodrow Wilson School
Jennifer A. Widner, Woodrow Wilson School, Politics

Sits with Committee
Lauren Coyle, Anthropology
Hannah Essien, Princeton Institute for International and Regional Studies
Lyndon Estes, Woodrow Wilson School
Sara Lopus, Princeton Institute for International and Regional Studies
Mahiri Mwita, Princeton Institute for International and Regional Studies
James W. Weinberger, Library

Princeton's Certificate in African Studies, offered by the Program in African Studies, provides opportunities to all Princeton students, regardless of major, to learn about the continent. The program offers classes in Africa's political, economic, and social history; built environments and urban geographies; ecology, genetic diversity, and epidemiological concerns. The program also offers classes in Africa's vibrant art scenes, past and present, where literature, music, and art have come to define a new post-colonial African cosmopolitanism. Certificate students can also learn Swahili and Twi in preparation for either a PIIRS global seminar or summer internship in Africa.

Admission to the Program

Students seeking admission to the certificate program should contact the program manager.

Program of Study

To obtain the certificate of proficiency, students must complete the normal requirements in their major department as well as the following requirements of the program:

1. One foundational course from a list of designated courses that serves as an Introduction to Africa. Please see the program website for listings and visit TigerHub to see what courses are currently being offered. If a foundational course is not offered when needed please contact the Director of African Studies to determine possible substitutions.
2. Three AFS cross-listed courses. Students can substitute a cross-listed course with another course with prior approval from the director of the Program in African Studies. Students who study abroad must submit courses for certificate credit to the program manager for director approval prior to taking the course abroad and preferably prior to leaving for study abroad.

3. One capstone semester-long seminar in a student's junior or senior year. The seminar will focus on independent research, methods, and will incorporate the AFS lecture series as part of the curriculum.

N.B. The capstone course is required for members of the Class of 2019 and beyond, and strongly encouraged for the Class of 2018. If not enrolled in the capstone course, students in the Class of 2018 pursuing the certificate in African Studies must take one additional elective course – such as an approved advanced-topics seminar offered by Africanists in a variety of departments, or the year-long sequence in Swahili offered on campus.

4. A senior thesis or junior paper on Africa.

**Study Abroad**

The Program in African Studies strongly encourages concentrators to study in Africa. The Program in African Studies and the Princeton Institute for International and Regional Studies list a number of excellent programs on their websites.

**Certificate of Proficiency**

Students who have met the requirements of the program and their department will receive a certificate of proficiency in African studies upon graduation.

**Courses in African Studies.** A list of courses in African studies offered by other departments and programs may be found on TigerHub and the program website. If other courses on Africa are offered, these may be added with the permission of the director.

The Program in African Studies sponsors conferences, seminars, and lectures throughout the year that bring to the University distinguished scholars, government officials, and other experts with diverse points of view and interests in Africa. Students in the program are encouraged to participate in African Studies events around campus.

**Program in Swahili and Twi.** The Program in African Studies offers four-terms of language instruction in Swahili and Twi. Completion of all four terms of either sequence will satisfy the University language requirement. Occasionally, more advanced courses will be offered. Note: Normally students electing a beginner's course in any language will receive credit only if two terms are completed.

**Princeton in Africa.** Students interested in working in Africa after graduation can apply to the Princeton in Africa (PiAF) program for fellowships. Princeton in Africa seeks to develop young leaders who understand Africa's important past and who are committed to the continent's vibrant future. To accomplish this, PiAF offers year-long, post-graduate internships with a variety of organizations that work across the African continent.
Courses

**AFS 200 Introduction to African Studies** Not offered this year SA
An exploration of the past, present, and future of Africa in a multidisciplinary setting. A dozen Africanist faculty members collaborate in an effort to shed light on both the huge potential of Africa and its peoples and the enormous challenges the continent faces. Topics vary from politics, economics, conservation, biodiversity, climate change, the environment, health and disease, and written and oral literature, to the impact of the world on Africa as well as Africa's contributions to and place in worlds present and past. Two lectures, one preceptorial. *Staff*

**AFS 239 Introduction to African Literature and Film** (See COM 239)

**AFS 258 Music of Africa** (See MUS 258)

**AFS 260 Introduction to African Art** (See ART 260)

**AFS 261 Art and Politics in Postcolonial Africa** (See ART 261)

**AFS 303 Social Structure in Africa: Responses to Socio-Political and Economic Forces** Spring SA The seminar addresses the structural consequences and responses that African nations and communities developed upon their insertion into global political and economic practice and discourse. Africa's character prior to modern nationhood forms the backdrop to discussions of the development and utilization of social, political, and economic strategies for continued participation in global political and economic intercourse. Themes include: traditional religious practice and the church; global economic interactions; African interstate relations; governance, regime change, and elections; wars and displacement; and women in society. *C. Agawu*

**AFS 330 Landmarks of French Culture** (See FRE 330)

**AFS 354 Contemporary Issues in African Societies** (See SOC 354)

**AFS 366 Politics in Africa** (See POL 366)

**AFS 394 Colonialism, Post-Colonialism and Islam: North Africa (1830-2011)** (See NES 394)

**AFS 400 Topics in African Studies** Not offered this year Designed to allow juniors and seniors enrolled in the program to examine significant problems in Africa in an interdisciplinary manner. Topics vary from year to year, reflecting faculty research interests. Prerequisite: one core course and one cognate course, or instructor's permission. Required of all program concentrators; open to others by permission of program director and course instructor. *Staff*

**AFS 401 Global Health in Africa** (See GHP 401)

**AFS 407 Africa's Food and Conservation Challenge** (See ENV 407)

**AFS 412 Human Trafficking and its Demise: African and European Slaves in Modern Islam (16th21st century)** (See NES 411)
AFS 416 Topics in Postcolonial Literature (See ENG 417)

AFS 427 Conflict in Africa Fall
Examines selected aspects on conflict in Africa. The concept "conflict" is used to mean organized and/or collective political violence that causes the death of about 1,000 people per year. The course will focus on the following issues: analytical debates about conflicts in Africa; actors/participants such as guerrillas, warlords, and child soldiers; continental politics about conflict; the politics of humanitarian intervention; wars in the Great Lakes Region; the war and warlords of West Africa; the genocide in Rwanda, and the aftermath of wars, especially those of Southern Africa. One three-hour seminar. A. Seegers

AFS 442 Radical African Thought and Revolutionary Youth Culture (See AAS 442)

SWA 101 Elementary Swahili I Fall
An introduction to Kiswahili language and culture. Focuses on the development of the communication skills students need to interact with Swahili speakers. Instruction emphasizes cultural themes and experiential activities that enhance the four components of speaking, writing, listening, and reading. Students will also gain some insight into the cultures of East Africa. Four classes. No credit is given for SWA 101 unless followed by SWA 102. M. Mwita

SWA 102 Elementary Swahili II Spring
Continuation of SWA 101. Emphasis is on increasing proficiency in reading and listening comprehension, speaking, and writing. Cultural contexts of the East African societies where Swahili is spoken are incorporated in classroom activities in order to enhance communication and cultural proficiency. Prerequisite: SWA 101. Four classes. M. Mwita

SWA 105 Intermediate Swahili I Fall
This second-year Swahili course focuses on enhancing the communicative skills acquired in the first year. Instruction emphasizes reading, writing, speaking, and listening. The course infuses cultural and sociopolitical aspects of life in East Africa with more complex grammatical concepts such as the subjunctive, grammar infixes, and relative clauses. Prerequisites: SWA 101 and 102, or instructor's permission. Four classes. M. Mwita

SWA 105T Intermediate Swahili I in Tanzania
This intensive four-week course offered at the University of Dar es Salaam will cover similar content as the regular 105 offered at Princeton in the fall semester. Content will continue from 101 and 102, focusing on enhancing the communicative skills acquired in the previous semesters, through reading, writing, speaking, and listening activities on cultural content that review and consolidate already acquired language skills. Special emphasis will be placed on East African content and classroom/out-of-class activities/exercises will require frequent day-to-day interaction with native speakers of Kiswahili. M. Mwita, A. Mutembei

SWA 107 Intermediate Swahili II Spring
Emphasizes conversational fluency and increased facility in reading and writing skills while introducing students to Swahili literature. This literature forms the basis for a survey of cultural issues and more advanced grammar. Students will be able to understand and analyze the main ideas and significant details of materials in Swahili such as media articles, short stories, poetry, short novels, films, and plays. Covers advanced-level Swahili grammar, as
well as the development of expository writing skills. Prerequisite: SWA 105, or instructor's permission. Four classes. *M. Mwita*

**SWA 107T Intermediate Swahili II in Tanzania**
This is a continuation of the 105T (Intermediate Swahili I) intensive summer course offered at the University of Dar es Salaam. It will cover similar content as the regular 107 offered at Princeton in the spring semester. Communicative skills acquired in the previous semesters will be enhanced through reading, writing, speaking, and listening activities on cultural content that review and consolidate already acquired language skills. Special emphasis will be placed on East African content and classroom/out-of-class activities/exercises will require frequent day-to-day interaction with native speakers of Kiswahili. *M.

*Mwita, A. Mutembei*

**TWI 101 Elementary Twi I Fall**
An introduction to Twi language and culture of the Akan-Twi-speaking people of West Africa. The course is taught in Twi and focuses on acquiring novice-level skills to perform basic communication functions in the culture of Akan-Twi speakers of West Africa. Students will be introduced to basic grammar, communicative skills and cultural activities that will be reinforced through role plays, conversations, dialogues and songs. By the end of the course, students will have acquired basic grammar competence to perform in everyday situations with an understanding and appreciation of the culture of the Akan people in Ghana, West Africa. *H. Essien*

**TWI 102 Elementary Twi II Spring**
This course is a continuation of Twi 101 and continues to focus on the communicative approach to studying the language. It includes specific socio-cultural settings and events. Speaking, reading, writing and listening continue to form an integral part of the course and students will build on their grammatical skills. By the end of the course, learners are expected to reach proficiency level ranging between Novice High and Intermediate Low. *H. Essien*

**TWI 105 Intermediate Twi I Fall**
This course is a continuation of TWI 102. It builds on the basic Twi structures acquired in TWI 101 and TWI 102 through oral and listening activities. Students will continue to build on their vocabulary through readings of short stories. It continues to focus on communicative skills and cultural awareness. By the end of the course, learners are expected to reach proficiency level ranging between Intermediate Low and Intermediate Mid. *H. Essien*

**TWI 107 Intermediate Twi II Spring**
This course expands on the language skills acquired from TWI 105 and continues to focus on the communicative approach to studying the language. It includes specific socio-cultural settings and events. Speaking, reading, writing and listening continue to form an integral part of the course and students will build on their grammatical skills. By the end of the course, learners are expected to reach proficiency level ranging between Novice High and Intermediate Low. *H. Essien*
Program in American Studies

Director
Anne A. Cheng

Acting Director
Hendrik A. Hartog (fall/spring)

Executive Committee
M. Christine Boyer, Architecture
Margot Canaday, History
Vera S. Candiani, History
Anne A. Cheng, English, African American Studies
Rachael Z. DeLue, Art and Archaeology
Mitchell Duneier, Sociology
Yaacob Dweck, History
Paul Frymer, Politics
William A. Gleason, English
Carol J. Greenhouse, Anthropology
Eric S. Gregory, Religion, ex officio
Judith Hamera, Lewis Center for the Arts, Dance
Hendrik A. Hartog, History
Brian E. Herrera, Lewis Center for the Arts, Theater
Alison E. Isenberg, History
Desmond D. Jagmohan, Politics

Stanley N. Katz, Woodrow Wilson School
Regina Kunzel, History, Gender and Sexuality Studies
Beth Lew-Williams, History
Rosina A. Lozano, History
Naomi Murakawa, African American Studies
Kinohi Nishikawa, English, African American Studies
Sarah Rivett, English
Carolyn M. Rouse, Anthropology
Martha A. Sandweiss, History
Kim Lane Scheppelle, Woodrow Wilson School,
University Center for Human Values, Sociology
Paul E. Starr, Sociology, Woodrow Wilson School
Dara Z. Strolovitch, Gender and Sexuality Studies
Emily A. Thompson, History
Marta Tienda, Woodrow Wilson School, Sociology
Judith L. Weisenfeld, Religion
R. Sean Wilentz, History
Stacy E. Wolf, Lewis Center for the Arts, Theater

Visiting Professor
Henry Yu, Stanley Kelley, Jr., Visiting Professor for Distinguished Teaching

The Program in American Studies is an interdepartmental plan of study. Combining a wide range of disciplines, the Program aims to give students an understanding of American society--its culture, its institutions, its intellectual traditions, and the relationships among its diverse people. We encourage study and debate about America’s place in the world and the world in America, as well as what it means to grapple with the horizons and limits of its democratic aspirations. The Princeton Program in American Studies, founded in 1942, is one of the oldest interdisciplinary programs at Princeton and continues to be an innovator in curricular development in the 21st century. By bringing together students and faculty from the arts, the humanities, and social sciences to explore questions that cross disciplinary boundaries, the Program reflects a generative field of intellectual curiosity and creativity, a nexus of energy and engagement. American Studies scholars share a dynamic commitment to democratic inquiry rather than a universally agreed upon canon of required methods or venerated works. The field encompasses an eclectic array of practices and pedagogies that cohere around openness to studying diverse research objects, asking a broad range of research questions, and engaging with a wide range of scholarly approaches, methods and theories. We strive to gain a deeper and broader perspective on issues which profoundly affect contemporary life and scholarship, including questions of migration, colonization, race, borders, and diaspora; art, culture, and language; law and public policy; environment and health; gender and sexuality, and more.
The cooperating departments from which the program draws faculty and other resources include African American Studies, Anthropology, Architecture, Art and Archaeology, Economics, English, History, Music, Philosophy, Politics, Psychology, Religion, Sociology, and the Woodrow Wilson School of Public and International Affairs. We also enjoy intimate relationships with other interdisciplinary programs such as the Program in Gender and Sexuality and the Program in Law and Public Affairs.

Admission to the Program

Students from all departments are welcome to apply for admission. The program accepts up to 45 students each year. Criteria for admission are a strong academic record and particular interest in the multidisciplinary work of the program. Before applying for admission, students must take American Studies 101, preferably during the sophomore year, and achieve a satisfactory standing in the course.

Program of Study

In addition to 101 students must complete two 300- or 400-level American studies courses. The work of AMS courses involves cooperative study of a major topic in American history or culture and its relation to other aspects of American life. Usually, the course operates as a seminar, with emphasis on independent research and writing. Lectures and discussions led by outside specialists, as well as films or field trips, frequently supplement the work.

Students must also complete three American studies electives, which are courses in the American field offered by departments throughout the University and approved by the program director (pass/D/fail not acceptable).

Students are expected to complete a normal departmental course of study with such emphasis on the American field as that department permits. The senior thesis must be on a topic related to American culture or history.

Certificate of Proficiency

Students who fulfill all requirements of the program will receive a certificate of proficiency in American studies upon graduation.

Courses

AMS 101 America Then and Now Spring EC
This course introduces a selection of signature ideas and debates that made the nation what it is today and what it is becoming. Objects of study range across multiple media, including texts, images, works of art, music, performance, and film, and draw from the diverse fields of literature, history, political science, art history, economics, law, cultural studies, and the history of science. The course attends to how knowledge about America has and continues to be produced, disseminated, and consumed, emphasizing the cognitive processes associated with the invention and delineation of America. E. Bergman, V. Candiani, H. Hartog

AMS 304 Asian American Literature and Cultures (See ENG 224)

AMS 306 Issues in American Public Health Fall SA
The study of public health is an interdisciplinary inquiry involving issues of politics, policy, history, science, law, philosophy, ethics, geography, sociology, environmental studies, and economics, among others. Students will examine the government's role in assuring and promoting health, through the exploration of issues on America's "public health agenda," such as epidemic response, tobacco use, the impact of weight on health, mandatory vaccination, disease prevention, and violence. In doing so, they will consider the impact of race, income, gender, place and environment, education, capitalism and democracy on health outcomes. *L. Gerwin*

**AMS 311 Education and Inequality  Fall SA**
In Education and Inequality, students examine the relationship between inequality and public schooling in the United States. Students explore the educational practices and organizational structures through which inequality is produced and reproduced inside schools and how social class, race, ethnicity, gender, and other social differences shape educational outcomes. Additionally, we consider students' different experiences in schools and the ways in which individuals and groups respond to inequality. With a few exceptions, the focus is on K-12 public education with emphasis on urban schools in low-income communities. *K. Nolan*

**AMS 320 U.S. Women Writers (See GSS 319)**

**AMS 330 Ethnographic Playwriting (See THR 303)**

**AMS 340 Shades of Passing (See AAS 340)**

**AMS 350 Civil Society and Public Policy (See WWS 385)**

**AMS 356 Asian Wars, American Politics, Hollywood Cinema (See EAS 338)**

**AMS 359 Topics in American Literature (See ENG 356)**

**AMS 361 Special Topics in Dance History, Criticism, and Aesthetics (See DAN 321)**

**AMS 363 Gender, Sexuality, and Contemporary U.S. Theatre and Performance (See GSS 363)**

**AMS 364 Environmental and Social Crisis (also ENV 365)  Fall EM**
In recent years, global public discourse has stressed the urgency of unfolding environmental crisis. The course will start with the premise that a "crisis" marks a moment when a previous set of relations is markedly upset, and when state institutions aim to manage instability and consolidate power. Our entry point will be apocalyptic texts, which are reflections and exaggerations of existing realities. We will ask: What is crisis? Is crisis actually the norm? Then we'll focus on environmental justice, examining how environmentalism intersects with race and class. Third, we will examine capitalist crisis and its articulation with war. *Staff*

**AMS 365 Isn't It Romantic? The Broadway Musical from Rodgers and Hammerstein to Sondheim (See GSS 365)**

**AMS 366 Queer Boyhoods (See GSS 316)**
AMS 370 Asian American History (See HIS 270)

AMS 371 The Art of Narrative Nonfiction (also JRN 371) Fall LA
Study of the art of narrative nonfiction through reading and writing. Narrative nonfiction is a form of "creative nonfiction" in which narrative--a story--supplies the structure and energy for the text, and the work is crafted with literary art. Narrative nonfiction is distinct from expository nonfiction and the lyrical essay, and is also very different from daily journalism. We'll focus on American writers and writings between World War II and today. We'll do reverse engineering on the texts, reading with a sharp eye for professional techniques, and we'll put the techniques to work in creative writing assignments. R. Preston

AMS 372 Postblack - Contemporary African American Art (See AAS 372)

AMS 373 Pleasure, Power and Profit: Race and Sexualities in a Global Era (See GSS 345)

AMS 378 Race and Religion in America (See REL 377)

AMS 379 Race and Living Laboratories (also GSS 349) Fall SA
In this course we will trace the intersecting discourses of race, nation, and disease throughout US history. We will examine various "living laboratories" or sites of state-sanctioned medical experimentation on populations such as Asian American, African American and Latinx, deemed to harbor disease. In doing so, we will consider the ways in which science has shaped the meaning of race as well as other categories of social difference. Staff

AMS 382 Public Policy in the American Racial State (See AAS 390)

AMS 385 Comics, the Graphic Novel and the American Jew (also JDS 385) Fall LA
How did comic books seize upon and express the Jewish bicultural experience in twentieth century America? How did the ambitions of comics' greatest Jewish creators shape the medium's fantasy traditions and drive artistic self-expression in the graphic novel? This seminar combines literary and historical approaches to investigate the tension between comics' genre storytelling and its creators' self-expression.
We will examine the evolution of the comic into its mature form, the graphic novel, through Jewish and American social, political and sexual perspectives. Staff

AMS 387 Education Policy in the United States (See WWS 387)

AMS 393 Jewish Identity and Performance in the US (See ENG 410)

AMS 395 Special Topics in Creative Writing (See CWR 345)

AMS 396 Special Topics in Poetry: Race, Identity and Innovation (See CWR 316)

AMS 398 FAT: The F-Word and the Public Body (See DAN 312)
AMS 399 In the Groove: Technology and Music in American History, From Edison to the iPod  
(also HIS 399)  Spring  HA

When Thomas Edison invented the phonograph in 1877, no one, including Edison, knew what to do with the device. Over the next century Americans would engage in an ongoing dialogue with this talking machine, defining and redefining its purpose. This course will track that trajectory, from business tool to scientific instrument to music recorder to musical instrument. By listening to the history of the phonograph, and by examining the desires and experiences of phonograph users, students will perceive more generally the complex relationships that exist between a technology and the people who produce, consume, and transform it. E. Thompson

AMS 408 Women in American Theater: Doing Gender, Race, Sexuality Onstage and Off (See ENG 408)
AMS 412 Princeton and Slavery (See HIS 402)
AMS 436 Crime, Gender, and American Culture (See GSS 336)
AMS 454 We Out Here: An Introduction to Latino Literature (See ENG 354)
AMS 457 Empire of the Ark: The Animal Question in Film, Photography and Popular Culture (See ENV 357)
AMS 479 Society, Politics, and Ideas in 1980s America (See HIS 479)
AMS 481 History of the American Workplace (See HIS 481)
Andlinger Center for Energy and the Environment

Director
Lynn Loo

Associate Director
Peter R. Jaffé (Research)
Niraj K. Jha (Education)
Mark A. Zondlo (External Partnerships)

Executive Committee
Craig B. Arnold, Mechanical and Aerospace Engineering
Rene A. Carmona, Operations Research and Financial Engineering
Mung Chiang, Electrical Engineering
Paul J. Chirik, Chemistry
Peter R. Jaffé, Civil and Environmental Engineering
Niraj K. Jha, Electrical Engineering
Antoine Kahn, School of Engineering and Applied Science, ex officio
Lynn Loo, Chemical and Biological Engineering
François Morel, Geosciences, Princeton Environmental Institute
Michael Oppenheimer, Woodrow Wilson School, Geosciences, Princeton Environmental Institute
Athanassios Z. Panagiotopoulos, Chemical and Biological Engineering
Monica Ponce de Leon, Architecture, ex officio
Stewart C. Prager, Astrophysical Sciences
Cecilia E. Rouse, Woodrow Wilson School, Economics, ex officio
David S. Wilcove, Woodrow Wilson School, Ecology and Evolutionary Biology, Princeton Environmental Institute
Mark A. Zondlo, Civil and Environmental Engineering

Professor
Lynn Loo, Chemical and Biological Engineering

Assistant Professor
José L. Avalos, also Chemical and Biological Engineering
Egemen Kolemen, also Mechanical and Aerospace Engineering
Forrest M. Meggers, also Architecture
Barry P. Rand, also Electrical Engineering
Daniel A. Steingart, also Mechanical and Aerospace Engineering
Claire E. White, also Civil and Environmental Engineering

Associated Faculty
Jay B. Benziger, Chemical and Biological Engineering
Emily A. Carter, Mechanical and Aerospace Engineering, Applied and Computational Mathematics
Michael A. Celia, Civil and Environmental Engineering
Christopher F. Chyba, Woodrow Wilson School, Astrophysical Sciences
Pablo G. Debenedetti, Chemical and Biological Engineering
Alexander Glaser, Woodrow Wilson School, Mechanical and Aerospace Engineering
Mikko Haataja, Mechanical and Aerospace Engineering
Yiguang Ju, Mechanical and Aerospace Engineering
Bruce E. Koel, Chemical and Biological Engineering
Chung K. Law, Mechanical and Aerospace Engineering
A. James Link, Chemical and Biological Engineering
Margaret R. Martonosi, Computer Science
Denise L. Mauzerall, Woodrow Wilson School, Civil and Environmental Engineering
Guy J.P. Nordenson, Architecture
Stephen W. Pacala, Ecology and Evolutionary Biology
Catherine A. Peters, Civil and Environmental Engineering
Addressing the ever-increasing worldwide demand for energy, while minimizing impact on the environment, is the primary key to a sustainable future. The Andlinger Center brings together researchers and educators in the interdisciplinary fields of engineering, architecture, the social and natural sciences, and public policy to address this fundamental challenge of the 21st century. It draws upon several fields of study including, but not limited to, energy efficiency, renewable energy, pollutant detection and remediation, energy storage, electricity transmission, sustainable manufacturing/chemistry, carbon capture and storage, and the social science of energy and the environment.

An important goal of the center is to provide Princeton undergraduates with the opportunity to explore issues related to energy and the environment in a multi-dimensional fashion. These dimensions include generation and deployment of energy systems, quantitative analysis of their impact on economic growth and society, and evaluation of their impact on climate change and the environment. The center aims to produce future leaders who will place us on a sustainable trajectory with their work on science, engineering, architecture, economics, public policy, and environmental issues related to energy systems.

The center offers two certificate programs.

The Program in Technology & Society: Energy Track is designed to explore the intersection of technology and society, and how their co-evolution affects the implementation of innovations in energy technologies. In order to successfully engage practical and effective energy solutions, an appreciation for different points of view on these issues is critical. Students in all disciplines—humanities, social sciences, physical and natural sciences, and engineering—who are interested in understanding and working on energy solutions can benefit from gaining such perspectives outside their particular area of focus. The Energy Track certificate, which showcases and emphasizes a broad array of energy issues and societal concerns, helps provide such perspectives.

The Program in Sustainable Energy focuses on studies of current energy resources, the development of energy systems that support sustainable economic growth, the nexus of energy security and environmental harmony, and an understanding of global climate and environmental change. Science and engineering students interested in pursuing graduate studies or careers in fields related to energy, as well as humanities and policy students who desire a more technical grasp of the world’s energy landscape, will be exposed to a broad spectrum of energy technologies.

Further information about both programs is available at the center's website: http://acee.princeton.edu/education.

Courses

EN 202 Designing Sustainable Systems (also ARC 208 / EGR 208 / ENV 206) Spring STN
The course presents anthropogenic global changes and their impact on sustainable design. The course focuses on the mechanistic understanding of the underlying principles based in simple concepts from natural and applied sciences. Based on a reflection of successes and failures, it indicates the feasibility of the necessary changes and critically discusses alternatives. The material is presented in 2 parts: 1) Global Change and Environmental Impacts: studying our influences on basic natural systems and cycles, and 2) Designing Sustainable Systems: studying potential solutions to these challenges through an applied design project. F. Meggers

ENE 203 Fundamentals of Solid Earth Science (See GEO 203)

ENE 221 Thermodynamics (See MAE 221)
ENE 228 Energy Technologies in the 21st Century (See MAE 228)
ENE 267 Materials for Energy Technologies and Efficiency (also MSE 287 / CEE 267)

An introductory course focusing on new materials that are mitigating worldwide anthropogenic CO2 emissions and associated greenhouse gases. Emphasis will be placed on how materials science is used in energy technologies and energy efficiency; including solar power, cements and natural materials, sustainable buildings, batteries, water filtration, and wind and ocean energy. Topics include: nanomaterials; composites; energy conversion processes; cost implications; life-cycle analysis; material degradation. C.

White

ENE 304 Environmental Engineering and Energy (See CEE 304)
ENE 305 Environmental Fluid Mechanics (See CEE 305)
ENE 308 Engineering the Climate: Technical & Policy Challenges (also MAE 308 / GEO 308)

This seminar focuses on the science, engineering, policy and ethics of climate engineering -- the deliberate human intervention in the world climate in order to reduce global warming. Climate/ocean models and control theory are introduced. The technology, economics, and climate response for the most favorable climate engineering methods (carbon dioxide removal, solar radiation management) are reviewed. Policy and ethics challenges are discussed. E. Kolemen

ENE 309 Science and Technology of Nuclear Energy: Fission and Fusion (See AST 309)
ENE 311 Global Air Pollution (See CEE 311)
ENE 328 Energy for a Greenhouse-Constrained World (See MAE 328)
ENE 334 Global Environmental Issues (See CEE 334)
ENE 335 The Energy Water Nexus (See CBE 335)
ENE 366 Climate Change: Impacts, Adaptation, Policy (See GEO 366)
ENE 414 Renewable Energy Systems

A thorough introduction to renewable energy systems. Students will learn the physical, chemical, and engineering principles underlying renewable energy (RE) technologies: principles of operation of RE systems and technical challenges in planning and installing them; environmental and social impacts of energy technologies; challenges of integrating RE sources into existing energy systems; energy technology innovation systems; and economics of RE systems. Implications of transition to RE-dominated systems will be evaluated. The national and international policy context for RE will also be discussed. Staff
This course defines biofuels, and explains why we should make them. It presents the challenges and opportunities of sustainable biofuels, addressing issues of land use, and competition with food production. It describes production processes of first generation, and cellulosic ethanol. It covers microbial engineering to improve production, or make new advanced biofuels. It describes the use of photosynthetic organisms such as algae, which fix carbon directly from the atmosphere to make biofuels. It addresses the environmental, economic and societal impact of biofuels, and how they can fulfill their promise as a renewable source of energy. J. Avalos

ENE 421 Catalytic Chemistry (See CBE 421)
ENE 423 Heat Transfer (See MAE 423)
ENE 424 Energy Storage Systems (See MAE 424)
ENE 425 Introductory Seismology (See GEO 424)
ENE 427 Energy Conversion and the Environment: Transportation Applications (See MAE 427)
ENE 431 Solar Energy Conversion (also ELE 431 / ENV 431 / EGR 431 ) QR
Principles, designs, and economics of solar conversion systems. Quantity and availability of solar energy. Physics and chemistry of solar energy conversion: solar optics; quantum processes; optical excitation; and transport of excitations, electronic, and ionic charge. Methods for conversion: photovoltaics; photoelectrochemistry; photocatalysis; photosynthesis; and solar thermal conversion. Energy collection, transport and storage. Economics: life cycle costing; and societal value of renewable energy. Two 1.5 hour lectures, one laboratory. Prerequisites: MAT 104, PHY 104, and CHM 207. Staff
ENE 441 Solid-State Physics I (See ELE 441)
ENE 442 Solid-State Physics II (See ELE 442)
ENE 453 Wind Turbine Aerodynamics and Technology (also MAE 453 )
The course addresses basic wind turbine technology such as aerodynamics, control and structural aspects. Theory will be provided that can be used to predict the aerodynamic loads on the wind turbine blades and their impact on the structure with respect to internal loads and deflections. The influence of the stochastic loads from atmospheric turbulence will be addressed and the structural dynamics of a wind turbine and possible instabilities will also be covered. Small computer programs will be written based on the lectured theory and verified in some papers. Staff
ENE 477 Engineering Design for Sustainable Development (See CEE 477)
ENE 490 Mathematical Modeling of Energy and Environmental Systems (See CEE 490)
Department of Anthropology

Chair
Carolyn M. Rouse

Associate Professor
Janet M. Monge

Departmental Representative
Elizabeth A. Davis

Julia Elyachar, also Princeton Institute for
International and Regional Studies

Director of Graduate Studies
Rena S. Lederman

Serguei A. Oushakine, also Slavic Languages and
Literatures

Professor
João G. Biehl
John W. Borneman
Isabelle R. Clark-Decès
Carol J. Greenhouse
Rena S. Lederman
Lawrence Rosen
Carolyn M. Rouse

Assistant Professor
Lauren Coyle
Andrew A. Johnson

Lecturer
Bridget Purcell

Visiting Professor
Didier Fassin

Associated Faculty
Amy B. Borovoy, East Asian Studies

Information and Departmental Plan of Study Prerequisites

Students who wish to concentrate in anthropology must take one anthropology course (any level) prior to junior year or have permission from the departmental representative.

Early Concentration

A sophomore may apply for early concentration through consultation with the departmental representative.

Program of Study

Anthropology concentrators must take nine departmental courses: two courses at the 200-level (normally completed prior to senior year), three core courses (described below), and four elective courses (at least one of which should be at the 300-level and one at the 400-level).

The core courses ensure that students will have a systematic understanding of the scope, methods and theories of anthropology associated with cultural inquiry and its implications for an understanding of human experience. They are:

ANT 300 (Ethnography, Evidence and Experience, normally taken as 300B in junior fall unless a student is studying abroad)

ANT 301 (The Ethnographer's Craft, normally taken as 301B in junior spring unless studying abroad) ANT 390 (History of Anthropological Theory, normally taken as 390B in the fall of the student's senior year)
Required junior and senior seminars support students' independent work. To prepare for independent senior thesis research, students should plan to complete *Ethnography, Evidence and Experience* and *The Ethnographer's Craft* by the end of their junior year.

The departmental electives may be chosen in accordance with each student's special interests while satisfying departmental requirements as explained in the first paragraph above. Up to two courses outside the anthropology department may be taken as cognates to satisfy departmental electives. These may be courses taken during study abroad, or courses in other departments at Princeton. Any proposed cognates must be approved by the departmental representative. Cognates taken at Princeton may be counted so long as they are judged by the departmental representative to be relevant to a student's junior or senior independent work. Well prepared undergraduates may take graduate seminars for departmental credit. To enroll in a graduate seminar, the student must have the approval of the departmental representative and the instructor of the course. Actual course offerings every year are more extensive than what is listed in the Undergraduate Announcement, so students should always check Course Offerings.

**Independent Work**

**Junior Independent Work.** Independent work in the junior year involves an original paper, usually based on library research. The junior seminar is designed to support juniors' independent work. In the fall, students work through the junior seminar as well as individually with a faculty adviser to develop a detailed problem statement and annotated bibliography on a subject relevant to the student's interests, as a research proposal for approval by the department. In the spring, students write a paper based on the research initiated in the fall, in consultation with their adviser and with the support of the junior seminar's writing workshops. Students enrolled in ANT 300B and ANT 301B during their junior year are automatically enrolled in the junior seminar; students not taking ANT 300B or ANT 301B during junior year will also enroll in the junior seminar by individual arrangement with the departmental representative.

**Senior Independent Work.** In the senior year, the independent work consists of a thesis, or a comparable project including a substantial written component, on a subject relevant to the student's interests and approved by the department. Field work is encouraged but not required. The senior seminar is designed to support seniors' independent work during the fall term. Students enrolled in ANT 390B during their senior year are automatically enrolled in the senior seminar; students not taking ANT 390B during senior year will also enroll in the senior seminar by individual arrangement with the departmental representative.

**Senior Departmental Examination**

In the spring of senior year, after the thesis deadline, all concentrators must complete a departmental examination designed to test their knowledge of anthropology.

**Special University Programs.** Students who choose to concentrate in the department are encouraged to take advantage of opportunities for individual study under special University programs. For example, under the Study Abroad Program, students may enrich their programs at Princeton with a term or a year of anthropological study abroad. Under the Field Study Program it is possible for concentrators to conduct intensive field study in the United States. The International Internship Program organizes internships for students abroad, usually during a summer term. The Community-Based Learning Initiative also provides opportunities for independent research. Students should consult with the departmental representative about these and other possibilities.
Interdepartmental Programs. Students concentrating in the department may participate in programs such as: African American studies, African studies, American studies, East Asian studies, environmental studies, European cultural studies, gender and sexuality studies, global health and health policy, Hellenic studies, humanistic studies, Latin American studies, Near Eastern studies, South Asian studies, creative and performing arts, various languages and cultures programs, and the Program in Law and Public Affairs.

Ethnographic Studies Certificate Program. The Department of Anthropology offers students concentrating in other departments the opportunity to earn a certificate in Ethnographic Studies. Please consult the listing for the Program in Ethnographic Studies for additional information.

Courses

ANT 201 Foundational Concepts in Anthropology SA
An introduction to anthropology's concept of culture and its relevance to the comparative study of societies. The focus is on the ways in which cultural communities express knowledge, values and commitments through relationships. Themes include culture and cultural identity, race and ethnicity, the organization of social life, the importance of language and symbols, the cultural embeddedness of gender and sexuality, the interrelationship of institutions and value systems, cultural varieties of power and authority, and the relevance of sociocultural inquiry to contemporary issues. Two lectures, one preceptorial. Staff

ANT 206A Human Evolution Spring EC
An investigation of the evidence and background of human evolution. Emphasis will be placed on the examination of the fossil and genetic evidence for human evolution and its functional and behavioral implications. Two lectures, one preceptorial. J. Monge

ANT 206B Human Evolution (also EEB 306) Spring EC
An investigation of the evidence and background of human evolution. Emphasis will be placed on the examination of the fossil and genetic evidence for human evolution and its functional and behavioral implications. Two lectures, one preceptorial, one 90-minute laboratory. J. Monge

ANT 215 Human Adaptation (also EEB 315) Fall STL
Human adaptation focuses on human anatomy and behavior from an evolutionary perspective. Lectures and weekly laboratory sessions focus on the evolution of the human brain, dentition, and skeleton to provide students with a practical understanding of the anatomy and function of the human body and its evolution, as well as some of its biological limitations. No science background required. Two 90-minute lectures, one three-hour laboratory. J. Monge

ANT 232 Social Lives, Social Forces SA
Examining "social forces" through social relationships provides a way to examine some key assumptions behind such everyday distinctions as altruism/self-interest, public/private, rules/ norms, regulation/free market, kinship/citizenship, friend/foe. This seminar untangles these binaries by exploring various settings--of family, community, law, and business--where they have been put into practice as organizing principles, and thus into contention. It also follows them beyond the United States into postcolonial and post-socialist environments, so as to further hone our comparative and interpretive questions. One three-hour seminar. C. Greenhouse
ANT 300A Ethnography, Evidence and Experience  Fall SA
This course relates key concepts in anthropology (e.g., culture, society, power, meaning) to everyday experience, with the aim of fostering students' ability to think analytically across diverse cultural fields. We alternate between classic theoretical texts and "dossiers" of highly current readings about issues both familiar to students (from experiences at home or abroad) and relevant to ethnographic research and writing. For example: digital media, embodied knowledge, language, ritual and symbols, textual interpretation, and modern forms of power and inequality. Staff

ANT 300B Ethnography, Evidence and Experience  Fall SA
This course relates key concepts in anthropology (e.g., culture, society, power, meaning) to everyday experience, with the aim of fostering students' ability to think analytically across diverse cultural fields. We alternate between classic theoretical texts and "dossiers" of highly current readings about issues both familiar to students (from experiences at home or abroad) and relevant to ethnographic research and writing. For example: digital media, embodied knowledge, language, ritual and symbols, textual interpretation, and modern forms of power and inequality. Anthropology juniors enroll in ANT300B; all others should enroll in ANT300A. Staff

ANT 301A The Ethnographer's Craft  Spring SA
What are social and cultural facts? And how do we identify these facts using anthropological research methods? This field methods course is for students interested in learning how to work with complex and often contradictory qualitative data. Students will examine how biases and beliefs affect the questions we ask, the data we collect, and our interpretations. Key topics include objectivism, interpretation, reflexivity, participant-observation, translation, and comparison. Staff

ANT 301B The Ethnographer's Craft  Spring SA
What are social and cultural facts? And how do we identify these facts using anthropological research methods? This field methods course is for students interested in learning how to work with complex and often contradictory qualitative data. Students will examine how biases and beliefs affect the questions we ask, the data we collect, and our interpretations. Key topics include objectivism, interpretation, reflexivity, participant-observation, translation, and comparison. Anthropology juniors enroll in ANT301B; all others should enroll in ANT301A. Staff

ANT 303 Economic Experience in Cultural Context  SA
This course explores the social and cultural contexts of economic experience in the US and around the world. It considers how the consumption, production, and circulation of goods--today and in times past--become invested with personal and collective meanings. It pays special attention to symbolic and political dimensions of work, property (material, intellectual, and cultural), wealth, and "taste" (i.e., needs and wants). Additionally, course participants do a bit of anthropological fieldwork by learning to draw everyday experiences systematically into conversation with academic sources. R. Lederman

ANT 304 Political Anthropology  SA
A cross-cultural examination of collective action, power, authority and legitimacy. Topics will include the diversity of systems of leadership and decision making, the sociocultural contexts of egalitarianism and hierarchy, contemporary contests over power-sharing and state legitimacy, forms of power outside the state, and human rights struggles. One three-hour seminar. Staff

ANT 306 Current Issues in Anthropology  SA
A course taught by different members of the department and visiting faculty on various subjects not normally taught in regular courses. *Staff*

**ANT 308 Forensic Anthropology SA**
An introduction to the analytical techniques that biological anthropologists apply to forensic (legal) cases. Topics include human osteology, the recovery of bodies, the analysis of life history, the reconstruction of causes of death, and various case studies where anthropologists have contributed significantly to solving forensic cases. Discussions will cover the limitations of forensic anthropology and the application of DNA recovery to skeletal/mummified materials. One three-hour seminar. *J. Monge*

**ANT 310 Fundamentals of Biological Anthropology EC**
A survey of current data and debates in evolutionary theory, molecular anthropology, primate biology and behavior, primate and human evolution, and modern human biology and adaptation. One three-hour seminar. *Staff*

**ANT 311 Cultural Analysis and International Development Dilemmas SA**
Designed to give students the anthropological tools to analyze concrete development dilemmas. Specific instances of violent ethnic conflict, international food relief, refugee rights, the global factory, and culturally diverse regional blocs will be considered. *Staff*

**ANT 316 Cultural Diversity: Money, Sex, Nation SA**
This course explores the use of money, sex, and national belonging in processes of cultural diversification. Its focus is anthropological: making and understanding difference in space and time. Its method is primarily ethnographic: relating face-to-face or personal encounters to macro-political factors and to contemporary issues. Drawing from film, music, and selected readings, it examines how money, sex, and national form create value and interact to create people. Students will be asked to examine critically and reflexively their own prejudices as they influence the perception and evaluation of cultural differences. One three-hour seminar. *J. Borneman*

**ANT 318 Understanding Muslim Social and Political Movements SA**
Introduces students to a number of contemporary movements claiming to restore Islam as the central norm for practice in the social, economic, and political life of Muslim communities and societies. These movements are studied from an anthropological perspective, using anthropological studies as well as writings by orientalists and others. The course is centered on the reconfiguration of religion, self, community, identity, and power. Emphasis on the Arab world and Iran. One three-hour seminar. *Staff*

**ANT 321 Ritual, Myth, and Worldview SA**
An exploration of classic and modern theories of religion (belief, ritual, myth, worldview) as they pertain to a cross-cultural understanding of these phenomena. One 90-minute lecture, one 90-minute class. *I. Clark-Deces*

**ANT 322 Cross-Cultural Texts HA**
This seminar closely reads descriptive and fictive works replete with cross-cultural representations and juxtaposed histories. What makes a given comparative account—whether colonialist or postcolonialist—compelling? Various genres—ethnographic essays, intense travel narratives, translated tales and myths, and novels—receive concerted attention. One three-hour seminar. *Staff*

**ANT 323 Japanese Society and Culture (See EAS 225)**
ANT 330 The Rights of Indigenous Peoples EM
Using American Indian sovereignty, Australian Aborigine land claims, the Canadian Bill of Rights, the Maori Treaty of Waitangi, and various international conventions, students will consider whether there is a fundamental right to cultural integrity, and the historical, legal, and ethical implications posed by the relations between modern states and their indigenous populations. One 90-minute lecture, one 90-minute class. L. Rosen

ANT 335 Medical Anthropology EM
Exploration of cross-cultural constructions of sickness, disease, health, and healing interrogates our basic ethical, moral, and political positions. Our healing and disease models derive from specific cultural assumptions about society, gender, class, age, ethnicity, and race. Categories of disease from one culture can compromise ethical positions held by another. We pursue the moral implications of a critique of medical development and the political and ethical implications of treating Western medicine as ethnoscience as well as universal truth. One 90-minute lecture, one 90-minute class. J. Biehl

ANT 336 The Anthropology of Selected Regions SA
The significant impact of peoples of particular regions on the development of anthropological theory, method, and sensibility. Special attention to the dynamic precolonial history of the region and to political and religious movements in the contemporary context of rapid socioeconomic change. Staff

ANT 337 Social Change in Contemporary India (also SAS 337 ) SA
This course introduces students to the debates that have defined the anthropological study of India. It explores classic and recent theories of caste and hierarchy, focusing in particular on the ethnography of change in everyday Indian life. The course also considers the emergence of identity politics in India. Communal identities and power relations in India are often expressed and challenged in popular religious practices. The course will explore everyday Indian religiosity with reference to debates about Hindu reformism and nationalism. One three-hour class. I. Clark-Deces

ANT 341 The Anthropology of Gender SA
Comparative perspectives on sexual divisions of labor, sex-based equality and inequality, and the cultural construction of "male" and "female." Analysis of gender symbolism in myth and ritual, and of patterns of change in the political participation and power of the sexes. Two 90-minute lectures with discussion. Staff

ANT 342 The Anthropology of Law EM
Study of the relation between formal legal institutions and the social and cultural factors influencing their development. Western and non-Western systems compared in terms of their forms of judicial reasoning, implementation through law of moral precepts, fact-finding procedures, and dispute settlement mechanisms. Two 90-minute lectures. Staff

ANT 352 Pacific Islanders: Histories, Cultures, and Change SA
This course concerns histories of Pacific Islanders from the first settlements through colonial rule. It will also look at the diversity of cultures and their sociocultural transformation in more recent times. Throughout the semester, we will also use Pacific ethnography to shed light on general questions concerning cultural difference, inequality, and issues of interpretation/translation. Two 90-minute classes. R. Lederman

ANT 359 Acting, Being, Doing, and Making: Introduction to Performance Studies (See THR 300)
ANT 360 Ethics in Context: Uses and Abuses of Deception and Disclosure EM
Stage magic delights us with expert illusions; biomedicine and other fields use deception as a research tool (e.g., placebos); and everyday politeness may obscure painful truths. With deception and disclosure as springboards, this course explores the contextual complexity of personal and professional ethical judgment, with special but not exclusive attention to knowledge circulation. Topics include: social fictions in daily life across cultures; the tangled histories of science and stage magic; ethically controversial cases from popular culture ("reality" TV, journalism), the arts (fictive memoirs), academia (sharing/plagiarizing), and more. R. Lederman

ANT 363 Islamic Social and Political Movements (See NES 363)

ANT 366 Mesoamerican Art (See ART 267)

ANT 375 Culture and International Order (also GSS 374 ) SA
This course focuses on the relation of local and global cultural processes to international orders and regimes. After colonialism and after the Cold War, there is a fundamental reorganizing of "peoples" and "cultures." Emphasis on the increased intensity and scale of interaction between local and global processes, on changes in group identifications, on the transformation of ideologies (cultural, economic, religious, political), and on alternative ways of imagining and managing life. One three-hour seminar. J. Borneman

ANT 380 Critical Perspectives in Global Health (See GHP 350)

ANT 390A History of Anthropological Theory Fall HA
A review of the main currents in anthropological theory with particular emphasis on major issues in American and European anthropology and the intellectual climate within which they developed. Staff

ANT 390B History of Anthropological Theory Fall HA
A review of the main currents in anthropological theory with particular emphasis on major issues in American and European anthropology and the intellectual climate within which they developed. Anthropology seniors enroll in ANT 390B; all others should enroll in ANT 390A. Staff

ANT 404 Special Topics in Regional Studies (also NES 404 ) SA
Analysis of a major world region stressing the issues of cultural diversity, history, and social change. Attention will be given to the theoretical contributions of regional study, the history of regional approaches, and the internationalization of the production of anthropological research. Staff

ANT 405 Topics in Anthropology SA
Study of a selected topic in anthropology; the particular choice will vary from year to year. Staff

ANT 406 Theoretical Orientations in Cultural Anthropology EC
Analysis of classical and contemporary sources of cultural anthropology, with particular emphasis on those writers dealing with meaning and representation. The topical focus of the course will vary with the instructor. One three-hour seminar. Staff
ANT 412 Anthropological Approaches to the Study of Religion (also REL 412) SA
Classic and modern theories of religion relevant to anthropologists. Students will familiarize themselves with anthropological monographs dealing with a particular aspect of religion: shamanism, witchcraft, possession and ecstasy, healing. Prerequisite: instructor's permission. Staff

ANT 413 Cultures and Critical Translation EC
Approaches to language and culture by Sapir, Saussure, and their forerunners and successors. The seminar draws on anthropology, linguistics, and other disciplines alert to critical theories of translation. Topics include fieldwork encounters, standardized nationalist and colonialist languages, philosophies of translation, ritual languages, marketplace discourse, and orality/literacy. One three-hour seminar. Staff

ANT 415 The Anthropology of Science EC
This course considers how the sciences can be studied ethnographically, how they vary culturally one from another, and how scientific knowledge is generated. It develops an understanding of the values and social contexts of Western scientific practice through the comparative study of Western and non-Western systems of knowledge, and explores the implications and validity of the assumption that the sciences are culturally produced rather than objective standards transcending culture. One three-hour seminar. Staff

ANT 425 Post-War French Social Theory SA
Using the works of thinkers such as Sartre, Merleau-Ponty, Aron, Ricoeur, Levi-Strauss, Foucault, and Bourdieu, the course will present students with some conflicting images of Western society. It will introduce students to these authors, with emphasis on their departure from traditional schools of thought and the consequences of their ideas on the production of knowledge and societies. One three-hour seminar. Staff

ANT 427 Democracy and Ethnography in the United States SA
Ethnography is a mode of research, a creative literary genre, and a democratic discourse. This seminar focuses on these different ways of reading in relation to the ethnography of the United States--to consider how ideas about personhood, gender, citizenship, community, identity, and power "work" simultaneously as theory and practice. Drawing on close readings of ethnographies, fiction, and public policy debates, the seminar gives particular attention to the (often uneasy) connections among anthropological theories of cultural identity, political struggles over rights, and literary experiments in social analysis. One three-hour seminar. C. Greenhouse

ANT 432 Memory, Trauma, Accountability SA
Explores issues surrounding the relation of individual memory to collective trauma, the social forms of redress to trauma, and attempts to establish accountability for harm. Takes up three major approaches to memory: social organization (Halbwachs), psychoanalysis (Freud), and associative temporalities (Sebald). Examines various genres in which the memory of loss is retained or displaced, and the landscapes and histories in which such memories are recalled and losses repaired. A better understanding of such memories will improve our approaches to cultural observation, documentation, analysis, and interpretation. One three-hour seminar. J. Borneman

ANT 441 Gender: Contested Categories, Shifting Frames SA
An exploration of the reciprocal influences of anthropology and gender studies, considering both classic and recent contributions; an evaluation of key interpretive categories (for example, "nature," "domestic," "woman") specifically
in the context of cross-cultural translation; and comparison of various approaches to questions about the universality of gendered power hierarchies. One three-hour seminar. R. Lederman

ANT 451 Visual Anthropology LA
Explores the theories and methods of ethnographic filmmaking. This seminar introduces students to the pioneering work of filmmakers including Robert Flaherty, Jean Rouch, and Fred Wiseman in order to address questions of documentary authenticity, knowledge, methods, ethics, and audience. One three-hour seminar. C. Rouse
The Program in Applications of Computing (PAC) is an interdisciplinary program designed for students who want to combine the study of computing and computers beyond an introductory level with another academic concentration, but who are not concentrating in computer science. The program welcomes students in all disciplines, including both areas traditionally making heavy use of computation (such as engineering, the physical sciences, economics, and mathematics) and emerging application areas (such as biology, cognitive science, graphic arts, music, history, philosophy, politics, sociology, literature, and so on). Many students have found this program an effective way to apply computer science to their own specialties, and to understand how computing concepts and technology are changing our world.

Admission to the Program

The program is open to sophomores, juniors, and seniors who are concentrating in a department other than Computer Science. To be admitted to the program, students must complete one of the following prerequisites: successful completion of COS 126 or ISC 231-234, permission from the COS placement officer, or the instructor's permission to take COS 217 or 226. Students enrolling in the program must fill out the on-line worksheet to be admitted to the program. Students will not be admitted if they have not filled out the worksheet, and later will not be awarded a certificate if they have not completed the worksheet in a timley way showing all requirements satisfied. Seniors must be enrolled in the Applications of Computing Program no later than March 1, 2017, and by that date must have shown the completion of all requirements.

Program of Study

A certificate candidate's courses and thesis must form a coherent plan of study that fulfills both the program requirements and the requirements of the candidate's department of concentration. This planning is done in consultation with the program adviser and the student's academic adviser in the department of concentration. The following are the requirements:

1. COS 126 or permission from the COS placement officer.
2. Two courses from among the following three: COS 217, COS 226, and/or COS 323, which is cross-listed with ORF 363. (If placement is granted beyond the 217/226 level, then additional COS departmentals must be taken instead).

3. One COS departmental at the 300 or 400 level, not including 397, 398, 497, or 498.

4. One additional 300- or 400-level course with substantial computing content. This may be either a second COS departmental, or an outside course. See the PAC Course & Requirements for additional information.

5. A senior thesis on a topic that makes significant use of some aspect of computer science. The intent is that the thesis satisfy the requirements of both the program and the student's department of concentration and is thus necessarily interdisciplinary. A wide range of thesis topics is possible. In the last few years of the program, students have earned certificates with a variety of concentrations, including anthropology, chemistry, classics, economics, electrical engineering, history, philosophy, and psychology.

The thesis work is coordinated through the student's thesis adviser in the department of concentration and an assigned program adviser (who may be, in routine cases, the program director). When doing a thesis that includes a significant element of computer science is not possible, the student may instead complete one additional 300- or 400-level computer science departmental.

Pass/D/Fail policy: Students may use no more than one course taken on a Pass/D/Fail basis to satisfy program requirements.

Concentrators in departments with computer-related concentrations: Students in these departments who are doing a computer-related concentration are not eligible for PAC. Students in these departments who are not in a computer-related concentration are eligible. For example, ELE majors who want to receive the PAC certificate must concentrate in a noncomputational area of ELE (such as circuit design or photonics).

Courses used to satisfy departmental requirements: No courses used for a departmental concentration requirement may satisfy PAC requirements. For example, ELE students may not use ELE 206/COS 306 to satisfy PAC requirements.

Courses used to satisfy other certificate program requirements: No more than one course that is used to satisfy any other certificate or certificates can be used to satisfy PAC requirements.

Certificate of Proficiency

Students who fulfill the program requirements receive a certificate upon graduation.
Program in Applied and Computational Mathematics

**Director**
Peter Constantin

**Executive Committee**
Emmanuel A. Abbe, also Electrical Engineering
René A. Carmona, Operations Research and Financial Engineering
Maria Chudnovsky, also Mathematics
Peter Constantin, also Mathematics
Weinan E, also Mathematics
Yannis G. Kevrekidis, Chemical and Biological Engineering
Adam Marcus, also Mathematics
Paul D. Seymour, also Mathematics
Amit Singer, also Mathematics
Howard A. Stone, also Mechanical and Aerospace Engineering
James M. Stone, also Astrophysical Sciences
Jeroen Tromp, also Geosciences
Sergio Verdú, Electrical Engineering

**Associated Faculty**
Yacine Aït-Sahalia, Economics
Michael Aizenman, Physics, Mathematics
William Bialek, Physics, Lewis-Sigler Institute for Integrative Genomics
Mark Braverman, Computer Science
Carlos D. Brody, Molecular Biology, Princeton Neuroscience Institute
Adam S. Burrows, Astrophysical Sciences
Roberto Car, Chemistry
Bernard Chazelle, Computer Science
Mung Chiang, Electrical Engineering
David P. Dobkin, Computer Science
Oceanic Sciences
Sergiu Klainerman, Mathematics
Naomi E. Leonard, Mechanical and Aerospace Engineering
Simon A. Levin, Ecology and Evolutionary Biology
Elliott H. Lieb, Mathematics, Physics

Luigi Martinelli, Mechanical and Aerospace Engineering
William A. Massey, Operations Research and Financial Engineering
Assaf Naor, Mathematics
H. Vincent Poor, Electrical Engineering
Frans Pretorius, Physics
Jean-Hervé Prévost, Civil and Environmental Engineering
Herschel A. Rabitz, Chemistry
Peter J. Ramadge, Electrical Engineering
Jennifer L. Rexford, Computer Science
Clarence W. Rowley, Mechanical and Aerospace Engineering
Szymon M. Rusinkiewicz, Computer Science
Frederik J. Simons, Geosciences
Yakov G. Sinai, Mathematics
Jaswinder P. Singh, Computer Science
K. Ronnie Sircar, Operations Research and Financial Engineering
John D. Storey, Lewis-Sigler Institute for Integrative Genomics
Sankaran Sundaresan, Chemical and Biological Engineering
Corina E. Tarnita, Ecology and Evolutionary Biology
Salvatore Torquato, Chemistry
Jianqing Fan, Operations Research and Financial Engineering
Jason W. Fleischer, Electrical Engineering
Mikko P. Haataja, Mechanical and Aerospace Engineering
Gregory W. Hammett, Plasma Physics Lab, Astrophysical Sciences
Isaac M. Held, Geosciences, Atmospheric and Olga G. Troyanskaya, Computer Science, Lewis-Sigler Institute for Integrative Genomics
Ramon van Handel, Operations Research and Financial Engineering
Robert J. Vanderbei, Operations Research and Financial Engineering
**Applied Mathematics at Princeton.** There has never been a better time to be a mathematician. The combination of mathematics and computer modeling has transformed science and engineering and is changing the nature of research in the biological sciences. The requirements for the mathematics major are a minimum of eight upperclass courses in mathematics or applied mathematics, including three basic courses on real analysis, complex analysis, and algebra. It is possible to design a course of undergraduate study aimed more strongly toward applications. Applied and computational mathematics/mathematics faculty have developed core courses in applied mathematics and several courses where the emphasis is mathematical modeling. The latter is central to applied mathematics where it is not only necessary to acquire mathematical techniques and skills, but also important to learn about the application domain.

**The Undergraduate Certificate.** The certificate is designed for students from engineering and from the physical, biological, and social sciences who are looking to broaden their mathematical and computational skills. It is also an opportunity for mathematically oriented students to discover the challenges presented by applications from the natural sciences and engineering. Students interested in the undergraduate certificate contact the program's undergraduate representative in the spring semester of their sophomore year to discuss their interests, and to lay out a plan for their course selection and research component.

**Program of Study**

The requirements for the undergraduate certificate in applied and computational mathematics consist of:

1. A total of five courses normally 300 level or higher (requires letter grade; pass/D/fail not accepted), atleast two of which are not included in the usual requirements for the candidate's major concentration; and

2. Independent work consisting of a paper in one of the following formats: (a) a courseproject/computational laboratory (possibly in the context of a course offered by Program in Applied and Computational Mathematics [PACM] faculty); (b) a project that you are working on with a professor; or (c) a summer research project that you are planning on undertaking. However, you may not use your junior paper or senior thesis to satisfy the independent work for the certificate program. Your paper should have a significant applied mathematics component (subject to approval of the PACM undergraduate representative). The independent work may not be used to satisfy the requirements of any other certificate.

Students interested in the PACM certificate program must apply on or before December 31 of their junior year. Regardless of which option is selected in (2), students will also be required to participate during their junior and senior years in a not-for-credit colloquium offered by PACM. This will provide a forum for presentation and discussion of independent work among all certificate students and will introduce them to other areas of applied mathematics.

The five required courses may vary widely from department to department in order to include a broad spectrum of science and engineering students throughout the University. These courses should fit readily within the degree requirements of the respective departments of the engineering school or the economics, mathematics, physics, chemistry, molecular biology, and ecology and evolutionary biology, or other relevant departments, but will require a particular emphasis in applied mathematics.
The five required courses must be distributed between the following two areas, with at least two from each area:

1. Mathematical foundations and techniques, including differential equations, real and complex analysis, discrete mathematics, probability, and statistics, typically offered by the Department of Mathematics.

2. Mathematical applications, including signal processing, control theory, and optimization, mathematical economics, typically offered by the economics, science, and engineering departments.

Specific choices must be approved by the PACM undergraduate representative.

The paper/course project/computational laboratories can be done as part of a course offered by applied and computational mathematics faculty or associated faculty on a wide range of topics of current interest in applied mathematics. Such courses vary from year to year and are designated to satisfy automatically the independent work requirement. These courses should be taken in your junior year if you intend to use them as a paper for your independent work. Four courses developed and staffed by applied and computational mathematics faculty and offered regularly are the following:

CBE 448/MAT 481 Introduction to Nonlinear Dynamics
MAT323/APC 323 Topics in Mathematical Modeling
MAE 541/APC 571 Applied Dynamical Systems

Any other course that students might use to satisfy the independent work requirement must have prior approval from the applied and computational mathematics undergraduate representative. Students may satisfy the independent work requirement outside of a course after consultation with and approval by the undergraduate representative. If the senior thesis option is selected, attempts will be made to coordinate it with departmental requirements.

Certificate of Proficiency

Students who fulfill all requirements of the program will receive a certificate of proficiency in applied and computational mathematics upon graduation.

Relevant Advanced Courses. A list of representative advanced undergraduate and some graduate courses that meet the certificate requirements can be found on the program website. This list is primarily illustrative and is by no means complete. Specific programs should be tailored by the program undergraduate representative in consultation with the student to meet individual and/or departmental needs.

Courses

APC 192 An Integrated Introduction to Engineering, Mathematics, Physics (See EGR 192)

APC 199 Math Alive (also MAT 199 ) QR

An exploration of some of the mathematical ideas behind important modern applications, from banking and computing to listening to music. Intended for students who have not had college-level mathematics and are not planning to major in a mathematically based field. The course is organized in independent two-week modules
focusing on particular applications, such as bar codes, CD-players, population models, and space flight. The emphasis is on ideas and mathematical reasoning, not on sophisticated mathematical techniques. Two 90-minute classes, one computer laboratory. Staff

APC 321 Numerical Methods (See MAT 321)
APC 323 Topics in Mathematical Modeling (See MAT 323)
APC 345 The Efficient Universe (See COS 345)
APC 377 Combinatorial Mathematics (See MAT 377)
APC 441 Computational Geophysics (See GEO 441)
APC 486 Transmission and Compression of Information (See ELE 486)
Program in Archaeology

Director
Nathan T. Arrington

Executive Committee
John F. Haldon, History, Hellenic Studies
Frederik J. Simons, Geosciences
Deborah A. Vischak, Art and Archaeology

The Program in Archaeology is designed to provide students with an interdisciplinary foundation in archaeology—the study of the material remains of the past—and to equip students to use archaeological evidence in other fields of inquiry. The program offers courses that cover many cultures and periods, including Egypt, the Near East, Greece, Rome, and the Americas. It encourages a deep integration of the humanities and the sciences, and promotes the awareness of issues of cultural heritage.

Once subfields of ancient art or ancient history, archaeology today embraces anthropological approaches as well as the physical and social sciences. Technology has transformed the practice of archaeology, with tools such as ground-penetrating radar, GIS, and photogrammetry offering new insights. Yet archaeology is not just concerned with uncovering and understanding the past; it is also devoted to protecting it. Rampant looting and the destruction of sites has placed archaeologists at the forefront of discussions on cultural heritage. Many of the program courses, therefore, including the required methods course (ART 401), highlight ethical and political dimensions of archaeology.

Admission

The program is open to all majors. Students should apply to the program during their sophomore year.

In order to gain admission, a student must have taken any one of the courses offered by the program (see list below). Appropriate freshman seminars or writing seminars may fulfill the requirement, with the program director's approval.

Program of Study

The program aims to provide a broad introduction to the field of archaeology and to allow students to pursue archaeological interests that complement their research in other areas. The core courses and fieldwork requirement ensure breadth and provide a theoretical and methodological foundation for further study. The remaining courses should be selected in consultation with the program director and students' department advisors, and will allow students to tailor their study.

The plan of study consists of four elements: two core courses, fieldwork or its equivalent, three additional courses, and independent research. All courses must be taken for a grade. Students can double-count up to two courses toward the certificate and their major.

1. Students take two core courses: ART 100: An Introduction to the History of Art: Meanings in the Visual Arts, and ART 401: Introduction to Archaeology

2. Students participate in fieldwork.
ART 304: Archaeology in the Field or its equivalent.

“Fieldwork” is not limited to excavation. Sustained engagement in any aspect of an archaeological project fulfills the obligation. Students may, for example, assist in a geophysical survey, participate in a surface survey, work in archaeological archives, or intern for a zoologist. Fieldwork must be approved by the program’s executive committee ahead of time.

3. Students take a further three courses. At least one must be offered in the Department of Art and Archaeology in the ancient area, and at least one must be a course outside of the Department of Art and Archaeology (see the list below). Approved freshman seminars may count toward the three courses. A freshman seminar taught by a faculty member in the Department of Art and Archaeology may not count for the required course outside of the department.

4. Students undertake independent research, which may take one of three forms: 1) a senior thesis with an archaeological component; 2) a junior paper on an archaeological topic; 3) or a 25-page research paper on an archaeological topic.

Languages

The acquisition of languages that may assist in research (e.g., German or French) or in fieldwork is strongly recommended, but not required.

Study Abroad

The fieldwork requirement offers an ideal opportunity for students to participate in summer study abroad, and the executive committee can recommend many summer study opportunities.

Certificate of Proficiency

A student who completes the requirements of the program with satisfactory standing receives a certificate of proficiency in archaeology.

Courses (most of following are crosslisted)

ANT 206 Human Evolution
ANT 308 Forensic Anthropology
ANT 374 Bioarchaeology of the Peoples of the Past
ART 100 An Introduction to the History of Art: Meanings in the Visual Arts
ART 102 An Introduction to the History of Architecture
ART 200 The Art and Archaeology of the Ancient Near East and Egypt
ART 201 Roman Architecture
ART 266 Introduction to Pre-Columbian Art
ART 267 Mesoamerican Art
ART 290 The Art and Archaeology of Ancient Egypt
ART 300 Greek Archaeology of the Bronze Age
ART 301 Art of the Iron Age: The Near East and Early Greece
ART 304 Archaeology in the Field
ART 306 Classical Athens: Art and Institutions
ART 308 Roman Cities and Countryside: Republic to Empire
ART 395 The Ancient Egyptian Body
ART 401 Introduction to Archaeology
ART 418 Antioch through the Ages: Archaeology and History
ART 481 Egyptian Architecture: The Monumental Landscape
FRS 126/129 Contact: The Archaeology of Interaction in the Ancient Mediterranean
FRS 187 Earth's Environments and Ancient Civilizations
GEO 103 Natural Disasters
GEO 203 Fundamentals of Solid Earth Science
GEO 370 Sedimentology
School of Architecture

Dean
Monica Ponce de Leon

Associate Dean
Paul Lewis

Departmental Representative
Spyros Papapetros (fall)
Mario I. Gandelsonas (spring)

Director of Graduate Studies
Paul Lewis, M.Arch, Post-Professional Program
Forrest Meggers, M.Arch, Professional Program
Beatriz Colomina, Ph.D. Program

Professor
Stanley T. Allen
M. Christine Boyer
Beatriz Colomina
Elizabeth Diller
Mario I. Gandelsonas
Guy J.P. Nordenson
Monica Ponce de Leon
Jesse A. Reiser
Alejandro Zaera-Polo

Associate Professor
Paul Lewis
Spyridon Papapetros

Assistant Professor
Lucia Allais
Axel Kilian
Forrest Meggers, also Andlinger Center for Energy and the Environment
Michael Meredith

Associated Faculty
Sigrid M. Adriaenssens, Civil and Environmental Engineering
Eduardo L. Cadava, English
Bruno M. Carvalho, Spanish and Portuguese Languages and Cultures
Esther da Costa Meyer, Art and Archaeology
Brigid Doherty, German and Art and Archaeology
Hal Foster, Art and Archaeology Ruben Gallo, Spanish and Portuguese Languages and Cultures
Maria E. Garlock, Civil and Environmental Engineering
Thomas Y. Levin, German
Douglas S. Massey, Woodrow Wilson School and Sociology
Anson G. Rabinbach, History

The undergraduate program at the School of Architecture is known for its rigorous and interdisciplinary approach to pre-professional education. The four-year undergraduate program leads to an A.B. with a concentration in architecture and offers an introduction to the discipline of architecture within the framework of a liberal arts curriculum. In addition to design and the history and theory of architecture and urbanism, undergraduates study a range of disciplines that contribute to an architect's knowledge and vision, including courses in architectural analysis, representation, computing, and building technologies. Such a broad academic program also prepares students for a graduate program in architecture and other related disciplines such as landscape architecture, urban planning, civil engineering, art history, and the visual arts.

Information and Departmental Plan of Study Prerequisites

Students who wish to enter the school are required to complete two courses: ARC 203 Introduction to Architectural Thinking, and ARC 204 Introduction to Architectural Design during their freshman or sophomore year. The courses
do not need to be taken in sequence. At least one course in architectural history, taken in either the School of Architecture or the Department of Art and Archaeology, is recommended but not required to be completed before their junior year.

Program of Study

The program provides a foundation for graduate professional study in architecture, landscape architecture, urban planning, historic preservation, and related fields of study. In particular, the program prepares students for further study at the graduate level in design and the history and theory of art or architecture.

In addition to the general prerequisites and the requirements for independent work, each student is required to complete 10 courses in three cognate areas. The History and Theory distribution requires six courses: three courses in History and Theory of Architecture, one of which is ARC 403; two courses in History and Theory of Urbanism and Landscape; and at least one upper level course to be taken in the Department of Art and Archaeology. The Technology distribution requires two courses, one of which is ARC 311 Building Science and Technology: Building Systems. The Design Seminar distribution requires two courses. All students are required to take ARC 403 Topics in the History and Theory of Architecture in the fall semester of their senior year. This course covers methodologies of historical analysis and research, the literature of the field, and the varieties of architectural writing. All students are required to enroll in ARC 404 Advanced Design Studio, in the fall semester of their senior year. The advanced design studio presents a challenging independent design project in which the knowledge of previous studios is synthesized and new techniques of representation are employed. Students should check with the school office to determine which one-time-only courses are being offered during the academic year.

Independent Work

Each student is required to complete independent work in each semester of the junior and senior years.

Junior Year. In the junior year, the independent work requirement is satisfied by a paper (of approximately 30 pages), due at the end of the academic year addressing a subject related to architecture selected by the student, in consultation with a faculty member. The work will be initiated in the fall (topic, outline and bibliography) and completed in the spring. Students will work in consultation with their faculty adviser and with the assistance of a Ph.D. student, who will provide writing support.

Senior Year. In the fall and spring semesters of the senior year, the independent work requirement is satisfied by the architectural thesis. The senior thesis is a detailed project, presenting a well-argued piece of research on a precise architectural theme, and may include a substantial amount and variety of visual materials (including any of several forms of representation, for example, architectural drawings, models, video, photographs, and computer-generated images). The final presentation and oral defense of the senior thesis in the spring will constitute a section of the departmental examination.

The thesis is a year-long project that begins in the fall semester. Faculty thesis advisers are assigned at the end of the fall term of the senior year, and students work closely with the adviser in the formulation of the topic, research methods, organization of the thesis material, and presentation of the work.

Senior Departmental Examination

All students in the program will take the departmental examination in May of their senior year.
Preparation for Graduate Study

Students who contemplate pursuing graduate professional study in architecture are strongly advised to elect MAT 103, or 101 and 102; and PHY 101. Courses in the social sciences and art and architectural history are also encouraged.

Professional Study in Architecture. Princeton undergraduates completing the program, if admitted to Princeton's graduate professional program (M.Arch. degree), generally complete their graduate studies in three years. Advanced standing may be granted by professional graduate schools at other universities.

In order to qualify for licensing as architects in the United States, students are required, by individual states, to complete a program leading to a professional degree that is accepted by the National Architectural Accrediting Board. Please see the NAAB statement at the end of this section.

Architecture and Engineering. Students interested in pursuing studies in both architecture and civil engineering may participate in the joint Program in Architecture and Engineering offered through the Department of Civil and Environmental Engineering in the School of Engineering and Applied Science. The program leads to the B.S.E. degree. For further information, consult the appropriate program entry in the engineering section.

Program in Urban Studies. The Program in Urban Studies is an interdepartmental plan of study for undergraduates that offers an interdisciplinary framework for the study of cities, metropolitan regions, and urban and suburban landscapes. With courses in diverse departments including art and archaeology, history, music, civil and environmental engineering, sociology, and politics, along with the School of Architecture and the Woodrow Wilson School of Public and International Affairs, the program encourages students to think about metropolitan centers in all their complexity as physical spaces; social, cultural, political, and economic nexuses; and historical artifacts. For more information, please see the program's website.

Facilities. The Architecture Building is home to undergraduate and graduate design studios, the Betts Auditorium, an exhibition gallery, the School of Architecture Library, the Archives and Audio-Visual Resources Collection, the Computer-Aided Design and Imaging Facility, and facilities for work related to building and construction technologies.

The School of Architecture has two model-building facilities available to students. The first is the School of Architecture Laboratory (aka SoA Lab), a full service model laboratory located on the School of Architecture's ground floor. It also houses some of the latest computer-driven fabrication technologies, including two Universal Laser Systems X Class CO2 Lasers; a Precix 4' X 8' Computerized Router Table; and the 3-D Systems Z-650 3-D Printer. All can be utilized after the completion of orientation and training sessions. There is a material charge to students for any model prints on the Z-650 3-D Printer. There are always Shop Staff or trained Student Shop Monitors on-duty when opened. The second facility is the Architectural Laboratory (aka Arch Lab) which is located off the SoA grounds proper. This facility allows for heavier fabrication work, hands-on material experiments, and the construction of full-scale mock-ups. It has been where all Construction Methods labs are conducted. The Architectural Laboratory also has become a working research laboratory focusing on parametric design, robotics, and fabrication. Access to and use of this facility will be limited in 2015-16 as the building will undergo renovation to become a Center for Embodied Computation, a site which will combine architectural and engineering experimentation for interdisciplinary design exploration and prototyping.
The School of Architecture Library is part of the larger Princeton University Library system. The holdings focus on architectural-related topics dating from the mid-19th century through the present, such as design, professional practice, architectural theory, landscape architecture, urban design, city planning, housing, architectural history, and interior design. The collection constitutes approximately 28,500 volumes on-site with thousands more housed in the Research Collections and Preservation Consortium (ReCAP) facility. The library subscribes to more than 325 architectural-related journals and other serials. Supplementing the School of Architecture Library's collections are the Marquand Library of Art and Archaeology, the Engineering Library, and Firestone Library.

National Architectural Accrediting Board Statement. In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture offered by institutions with U.S. regional accreditation, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted an eight-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture degree programs may require a pre-professional undergraduate degree in architecture for admission. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

Princeton University School of Architecture offers the following NAAB-accredited degree programs:

Master of Architecture (non-pre-professional degree + 108 graduate credit hours) Master of Architecture (pre-professional degree + 72 graduate credit hours)

Next anticipated accreditation visit: 2023.

Courses

ARC 201 Drawing I (See VIS 201)

ARC 202 Drawing I (See VIS 202)

ARC 203 Introduction to Architectural Thinking Fall LA
A broad overview of the discipline of architecture: its history, theories, methodologies, and its manners of thinking and working. Rather than a chronological survey, the course will be organized thematically, with examples drawn from a range of historical periods as well as contemporary practice. Through lectures, readings, precepts, and studio sessions, students will acquire a working knowledge of key texts, buildings, and architectural concepts. Two lectures, one preceptorial. Staff

ARC 204 Introduction to Architectural Design Spring LA
The first in a series of design studios offered to students interested in majoring in architecture. The course will introduce architecture as an "impure" plastic art, inseparable from a network of forces acting upon it. The student will be confronted with progressively complex exercises involving spatial relations in two dimensions, three dimensions, and time. The course will stress experimentation while providing an analytical and creative framework to develop an understanding of structure and materials as well as necessary skills in drawing and model making. Two three-hour studios with lectures included. P. Lewis
ARC 205 Roman Architecture (See ART 201)

ARC 207 Introduction to Urban Studies (See URB 201)

ARC 208 Designing Sustainable Systems (See ENE 202)

ARC 242 The Experience of Modernity: A Survey of Modern Architecture in the West (See ART 242)
ARC 262A Structures and the Urban Environment (See CEE 262A)

ARC 262B Structures and the Urban Environment (See CEE 262B)

ARC 302 Architecture and the Visual Arts (also ART 347) Not offered this year LA
Explores the relationships between architectural discourse and the visual arts from the historical avantgarde to the present. Architectural discourse will be considered here as the intersection of diverse systems of representation: buildings, projects, drawings, but also architectural theory and criticism, exhibitions, photographs, professional magazines, and the popular press. The course will treat as visual arts not only painting and sculpture, but also photography, cinema, fashion, advertisement, and television. Two lectures, one preceptorial. S. Papapetros

ARC 304 Cities of the 21st Century Not offered this year HA
Examination of a range of urban spatial types, city plans, maps, and communication networks. Focus on how inherited models have been used by modern architects/planners in the 20th century. One 90-minute lecture, one 90-minute preceptorial. M. Boyer

ARC 305 Urban Studies: Analysis of Contemporary Urban Form Not offered this year LA
Studies of the contemporary problems and process of urban design and physical planning. Analysis of the design and organization of space, activities, movement, and interaction networks of the urban physical environment. One three-hour seminar. Staff

ARC 308 History of Architectural Theory (also ART 328) Fall HA
Architectural theory, criticism, and historiography from the Renaissance to the present, emphasizing the transformations of the classical Vitruvian tradition and theories of modern architecture from the end of the 17th century to the 1930s. Architectural thought in its institutional and cultural context and as it relates to design method and practice. Two lectures, one preceptorial. Staff

ARC 310 Traditional Chinese Architecture (See ART 351)

ARC 311 Building Science and Technology: Building Systems Fall
An introduction to the nature of building. Emphasis will be placed on understanding construction methods, materials, and evaluating the processes by which architects formulate strategies to execute their design ideas. A continuing theme will be to evaluate the relationship between architectural design and building systems and technology. Two lectures, one two-hour laboratory. N. Oppenheimer

ARC 315 Medieval Architecture (See ART 315)
ARC 320 Rome, the Eternal City (See ART 320)
ARC 327 Painting I (See VIS 203)

ARC 328 Painting I (See VIS 204)

ARC 332 The Landscape of Allusion: Garden and Landscape Architecture, 1450-1750 (See ART 332)

ARC 333 Renaissance and Baroque Architecture (See ART 333)

ARC 364 Materials in Civil Engineering (See CEE 364)

ARC 374 Computational Design Fall LA
This course will examine the possibilities of representation and information in the virtual realm. Through a series of modeling/rendering/compositing exercises, presentations, and in-class discussions, students will investigate the evolving relationship between architecture and its means of representation, as well as broader issues of technology and culture. The course will provide a firm understanding of current computer software. One three-hour seminar. A. Kilian

ARC 401 Theories of Housing and Urbanism Fall SA
Housing ideas and urban projects of architects and social scientists since the mid-19th century as a response to industrialization, the development of the welfare state, the rise of professionalism, and the dispersion of democratic culture. Material drawn from architecture, urban planning, political theory, sociology, and social psychology. One three-hour seminar. A. Laing

ARC 403 Topics in the History and Theory of Architecture Fall LA
Selected issues in relationship to the development of architectural history and theory as critical disciplines, emphasizing the historiography and methodology of these disciplines. Course focuses on particular critics through a close reading and analysis of selected texts. One three-hour seminar. A. Zaera-Polo

ARC 404 Advanced Design Studio Fall
Examines architecture as cultural production, taking into account its capacity to structure both physical environments and social organizations. A specific problem or topic area will be set by each studio critic, and may include a broad range of building types, urban districts or regional landscapes, questions of sustainability, building materials, or building performance. Studio work will include research and data gathering, analysis, and program definition. Students are expected to master a full range of design media, including drawing, model-making, and computer-aided design. M. Gandelsonas

ARC 405 Architecture and Democracy (See POL 403)

ARC 406 Energy and Form (also ENV 406) Not offered this year
Introduction to concepts of energy utilization and conservation in building. Course presents the physics of building thermal performance, including quantitative methods, and discusses conservation strategies in building design and source energy. Passive design and alternative energy sources, including wind and solar-thermal, will be covered. One three-hour seminar. Staff
ARC 445 Topics in the History and Theory of Architecture in Early-Modern Europe (See ART 445)

ARC 458 Seminar. Modern Architecture (See ART 458)

ARC 492 Topics in the Formal Analysis of the Urban Structure (also URB 492 / ENV 492) Spring The Western city, American and European, has undergone a number of mutations since the Renaissance. This course will explore the complex relationships between different cities and architecture, between "real" cities and "fictional" architectural cities. Possible topics might include: urbanization as it affects contemporary life; the American vs. European city; the state of New Jersey, the exurban state "par excellence." One three-hour seminar. 

M. Gandelsonas
Program in Architecture and Engineering

Director
Forrest M. Meggers, Architecture, Andlinger Center for Energy and the Environment
Maria E. Garlock for Energy and the Environment
Guy J. Nordenson, Architecture

Executive Committee
Sigrid M. Adriaenssens, Civil and Environmental Engineering
Mario I. Gandelsonas, Architecture
Maria E. Garlock, Civil and Environmental Engineering
Axel Kilian, Architecture
Monica Ponce de Leon, Architecture, ex officio (spring)
James A. Smith, Civil and Environmental Engineering
Alejandro Zaera-Polo, Architecture

The Program in Architecture and Engineering is intended for students interested in pursuing a career in architectural design or engineering design. The program includes course work and independent studies in structures and architecture, history of architecture and of structures, and studio design.

Admission to the Program
Students interested in this joint program are encouraged to consult the program director. Further information may be found under the listing of the Department of Civil and Environmental Engineering.

Certificate of Proficiency
Students who fulfill the program requirements will receive a certificate of proficiency upon graduation.

Courses

CEE 102A Engineering in the Modern World (also EGR 102A / MAE 102A ) Fall HA
Lectures and readings focus on bridges, railroads, power plants, steamboats, telegraph, highways, automobiles, aircraft, computers, and the microchip. Historical analysis provides a basis for studying societal impact by focusing on scientific, political, ethical, and aesthetic aspects in the evolution of engineering over the past two and a half centuries. The precepts and the papers will focus historically on engineering ideas including the social and political issues raised by these innovations and how they were shaped by society as well as how they helped shape culture. Two lectures, one preceptorial. M. Littman

CEE 102B Engineering in the Modern World (also EGR 102B / MAE 102B ) Fall STL
Lectures and readings focus on bridges, railroads, power plants, steamboats, telegraph, highways, automobiles, aircraft, computers, and the microchip. We study some of the most important engineering innovations since the industrial revolution. The laboratory centers on technical analysis that is the foundation for design of these major innovations. The experiments are modeled after those carried out by the innovators themselves, whose ideas are explored in the light of the social environment within which they worked. Two lectures, one three-hour laboratory. M. Littman
CEE 105 Lab in Conservation of Art (also ART 105 / EGR 105)  Not offered this year STL
This course examines how environmental factors (acid, rain, ice, salts, biota) damage sculpture and monuments made of stone and masonry, paintings on wood, and sculptures in bronze. It examines campus buildings that illustrate each type of damage and uses a visit to the Cloisters Museum to learn how those medieval buildings are protected. Lectures on structure and properties of materials and mechanisms of attack. Labs include quantifying water movement through stone, damage from freezing and salts, strength of mortars, protective effects of sealants and consolidants, effect of moisture on wood. Two lectures and one three-hour laboratory. G. Scherer

CEE 205 Mechanics of Solids  Fall STN
This course teaches fundamental principles of solid mechanics. Equilibrium equations, reactions, internal forces, stress, strain, Mohr's circle, and Hooke's law. Analysis of the stress and deformation in simple structural members for safe and stable engineering design. Axial force in bars, torsion in shafts, bending and shearing in beams, stability of elastic columns, strain transformation, stress transformation, circle of Mohr, combined loadings, design project. Two lectures, one class. Prerequisites: MAT 104, PHY 103. S. Adriaenssens

CEE 207 Introduction to Environmental Engineering (also ENV 207) STN
The course introduces the students to the basic chemical and physical processes of relevance in environmental engineering. Mass and energy balance and transport concepts are introduced and the chemical principles governing reaction kinetics and phase partitioning are presented. We then turn our focus to the application of these principles in environmental engineering problems related to water and air pollution. Two 80-minute lectures. Prerequisite: CHM 201 or MAT 104 or instructor's permission. I. Bourg

CEE 208 Mechanics of Fluids (See MAE 222)

CEE 242 The Experience of Modernity: A Survey of Modern Architecture in the West (See ART 242)

CEE 262A Structures and the Urban Environment (also ARC 262A / EGR 262A / URB 262A / ART 262)  Spring LA
This course focuses on structural engineering as a new art form begun during the Industrial Revolution and flourishing today in long-span bridges, thin shell concrete vaults, and tall buildings. Through laboratory experiments students study the scientific basis for structural performance and thereby connect external forms to the internal forces in the major works of structural engineers. Students examine contemporary exemplars that are essential to the understanding of 21st century structuring of cities with illustrations taken from various cities in the U.S. and abroad. Two lectures, one preceptorial. M. Garlock

CEE 262B Structures and the Urban Environment (also ARC 262B / EGR 262B / URB 262B) Spring STL
This course focuses on structural engineering as a new art form begun during the Industrial Revolution and flourishing today in long-span bridges, thin shell concrete vaults, and tall buildings. Through laboratory experiments students study the scientific basis for structural performance and thereby connect external forms to the internal forces in the major works of structural engineers. Students examine contemporary exemplars that are essential to the understanding of 21st century structuring of cities with illustrations taken from various cities in the U.S. and abroad. Two lectures, one three-hour laboratory. M. Garlock
CEE 263 Rivers and the Regional Environment Not offered this year QR
River basins are the fundamental frameworks for examining the natural environment and its interaction with the works of society. These works, exemplified by major dams, are the basis for the agricultural and industrial development of a modern society. The course will explore the history, science, and engineering of water resource development and the design of large-scale structures related to that development. Two lectures, one preceptorial. J. Smith

CEE 267 Materials for Energy Technologies and Efficiency (See ENE 267)

CEE 302 Practical Models for Environmental Systems (See ENV 302)

CEE 304 Environmental Engineering and Energy (also ENE 304 / ENV 300 ) Fall/Spring The course uses materials balance, energy balance, and life cycle assessment tools to examine the environmental impacts of energy technologies. Environmental implications include those associated with water quality, air quality, land use, and climate change. Builds the tools for investigating energy technologies and then examines technologies including conventional fossil fuel combustion, advanced fossil energy systems, solar, wind, geothermal, hydroelectric, and nuclear energy. Focused primarily on scientific and technological principles, but socioeconomic aspects are also addressed. Prerequisites: CHM 201 and MAT 104, or permission of the instructor. Staff

CEE 305 Environmental Fluid Mechanics (also GEO 375 / ENE 305 ) Not offered this year STN
The course starts by introducing the conservation principles and related concepts used to describe fluids and their behavior. Mass conservation is addressed first, with a focus on its application to pollutant transport problems in environmental media. Momentum conservation, including the effects of buoyancy and earth's rotation, is then presented. Fundamentals of heat transfer are then combined with the first law of thermodynamics to understand the coupling between heat and momentum transport. We then proceed to apply these laws to study air and water flows in various environmental systems, with a focus on the atmospheric boundary layer. E. Bou-Zeid

CEE 306 Hydrology Spring STN
Analysis of fundamental processes affecting the dynamics of the hydrologic cycle. These include precipitation, evaporation, infiltration, runoff, and groundwater flow. Governing equations will be developed and applications will be considered for a range of hydrologic systems. Concepts and techniques for design of water projects will also be covered. Students will be encouraged to solve problems in Matlab. Prior experience with Matlab is not required. Three lectures. Prerequisite: MAT 201, may be taken concurrently. J. Smith

CEE 307 Water, Energy, and Ecosystems (also EEB 305 ) Spring STL
This three-week course, offered as part of a four-course study abroad semester, takes place at Princeton University's Mpala Research Centre in central Kenya. The course will provide an introduction to the principles of hydrological sciences via the development and application of instrumentation for characterizing surface/subsurface hydrological dynamics in field settings. Lectures and field activities will address the theory of operation, design, and implementation of methods used to quantify hydrological patterns and processes. Prerequisite: MAT 201. K. Caylor

CEE 308 Environmental Engineering Laboratory Spring STL
Designed to teach experimental measurement techniques in environmental engineering and their interpretations. Analytical techniques to assess biodegradation of wastes, lake eutrophication, non-point source pollution, and transport of contaminants in surface and groundwater, as well as hydrologic measurements to determine river and groundwater discharges, and soil-moisture dynamics in response to precipitation events will be conducted. One three-
hour laboratory plus one lecture per week. Prerequisites: CEE 303 and CEE 306 or Permission of Instructor. CEE 306 may be taken concurrently. P. Jaffé

CEE 311 Global Air Pollution (also CHM 311 / GEO 311 / ENE 311 )  Fall
The chemical and physical processes involved in the transformation, transport, sources, and sinks of air pollutants on local to global scales. Topics include photochemical smog, particulate matter, greenhouse gases, and stratospheric ozone depletion. Students will have the unique opportunity to analyze chemical and physical data acquired in real-time from the NSF Gulfstream-V research aircraft as it probes the atmosphere from the Earth's surface to the lower stratosphere over a latitudinal range from the Arctic to the Antarctic. A wide range of environments will be studied, from very clean, remote portions of the globe to urban megacities. M. Zondlo

CEE 312 Statics of Structures  Spring STN
Presents the fundamental principles of structural analysis, determination of internal forces, and deflections under the static load conditions, and introduces the bending theory of plane beams and the basic energy theorems. The theory of the first order will be developed for continuous girders, frames, arches, suspension bridges, and trusses, including both statically determinate and indeterminate structures. Basic principles for construction of influence lines and determination of extreme influences will be presented. Two lectures, one preceptorial. Prerequisite: CEE 205. B. Glisic

CEE 323 Modern Solid Mechanics (See MAE 223)

CEE 334 Global Environmental Issues (also WWS 452 / ENV 334 / ENE 334 )  Spring STN
This course examines a set of global environmental issues including population growth, ozone layer depletion, climate change, air pollution, the environmental consequences of energy supply and demand decisions and sustainable development. It provides an overview of the scientific basis for these problems and examines past, present and possible future policy responses. Individual projects, presentations, and problem sets are included. Prerequisites: AP Chemistry, CHM 201, or permission of instructor. D. Mauzerall

CEE 360 Earth's Atmosphere (See GEO 361)

CEE 361 Matrix Structural Analysis and Introduction to Finite-Element Methods (also MAE 325 )  Fall QR

CEE 362 Structural Dynamics and Earthquake Engineering  Not offered this year STN
Analysis of forces and deformations in structures under dynamic loads. Idealization as discrete parameter systems. Single and multiple degrees of freedom. Response analysis under free vibration, harmonic, impulsive and random dynamic loads. Time and frequency domains. Earthquake phenomena from the engineering point of view. Seismic waves and power spectra. Measurement of strong ground motion. The concepts of response spectra, structural response to earthquakes, design criteria, and seismic safety.
Prerequisite: 361 or instructor Staff
CEE 364 Materials in Civil Engineering (also ARC 364)  Spring STL
Lectures on structure and properties of building materials including concrete (conventional and low CO2), steel, asphalt and wood; fracture mechanics; strength testing; mechanisms of deterioration (corrosion; freeze-thaw cycles, pollution). Labs on brittle fracture, heat treatment of steel, strength of concrete, mechanical properties of wood. Prerequisites: CEE 205 C. White, G. Scherer

CEE 365 Soil Mechanics  Not offered this year
General introduction to physical and engineering properties of soils. Soil classification and identification methods. Soil exploration, sampling, and in situ testing techniques. Permeability, seepage, and consolidation phenomena. Bearing capacity, equations, stress distributions and settlements. Slope stability and lateral pressures. Prerequisite: CEE 205 or permission of instructor. J. Prévost

CEE 366 Design of Reinforced Concrete Structures  Fall STN

CEE 370 Sedimentology (See GEO 370)

CEE 375 Independent Study  Fall
Independent Study in the student's area of interest. The work must be conducted under the supervision of a faculty member and must result in a final paper. Permission of advisor and instructor are required. Open to sophomores and juniors. Must fill out Independent Study form. C. Peters

CEE 376 Independent Study  Spring
Independent research in the student's area of interest. The work must be conducted under the supervision of a faculty member, and must result in a final paper. Students must obtain prior approval of a faculty member to serve as research advisor, and Hand in to E-211 E-Quad the Independent Research Proposal Project form signed by your advisor & the dept rep. Open to sophomores and juniors. C. Peters

CEE 390 Innovation in Practice: Pathways and People (See EGR 390)

CEE 391 Innovation and the Built and Natural Environment (also EGR 393)  Fall
How does innovation apply to issues of broad scale and scope affecting long term harmony between the built and natural environment? These significant topics have big impacts: from ongoing access to safe drinking water, to creating where we live and work, to climate concerns. Because of their nature and stakeholders, these issues pose special challenges and policy considerations. Class will explore: What distinguishes innovation for the built and natural environment? What roles do civil and environmental engineers play? Other disciplines? What frameworks and tools are useful? How do human, organizational and institutional factors matter? E. Fisher

CEE 417 Environmental Microbiology (See GEO 417)

CEE 418 Extraordinary Processes (See VIS 418)
CEE 423 Dynamic Meteorology (See GEO 423)

CEE 424 Introductory Seismology (See GEO 424)
CEE 428 Cleaner Transport Fuels, Combustion Sensing and Emission Control (See ELE 428)

CEE 439 Structural Health Monitoring Fall
This course introduces the topics with basic definitions of measurement and monitoring, monitoring activities and entities, and with various available and emerging monitoring technologies. The fundamental criteria for applications on concrete, steel and composite materials are elaborated, and basics on data interpretation and analysis for both static and dynamic monitoring are presented. Finally, methods applicable to large spectrum of civil structures, such as bridges, buildings, geo-structures, and large structures are developed. Prerequisites: CEE 205 or CEE 312 or CEE 361, or permission from the lecturer B. Glisic

CEE 455 Mid-Infrared Technologies for Health and the Environment (See ELE 455)

CEE 460 Risk Analysis Spring QR

CEE 461 Design of Large-Scale Structures: Buildings Spring STN
This course will focus on the structural design of buildings and is open to students of engineering and of architecture who meet the prerequisites. The course will culminate in a major building design project incorporating knowledge and skills acquired in earlier course work. Structural design is considered from concept development to the completion of detailed design while incorporating appropriate engineering standards and multiple realistic constraints. Not Open to Freshmen. Prerequisites: both CEE 312 and CEE 366, or permission from the instructor. Staff

CEE 462 Design of Large-Scale Structures: Bridges Not offered this year STN
The design of bridges is considered from the conceptual phase up to the final design phase. The following issues are addressed in this course: types of bridges, design codes, computer modeling of bridges, seismic analysis and design, seismic retrofit design, inspection, maintenance and rehabilitation of bridges, movable bridges, bridge aerodynamics, organization of a typical engineering firm, marketing for engineering work. Several computer codes are used in this course. Prerequisite: CEE 366 or CEE 361, or instructor's permission. Staff

CEE 463 A Social and Multi-Dimensional Exploration of Structures (also LAS 463) Fall
The class has pedagogical objectives related to the spatial relations of dimensions and time (sustainability and society). It develops the students' skills in drawing, model making, writing, oral communication, and advanced engineering analysis. The course is focused on a study of one theme that changes every year. Two three-hour studios per week with lectures included. Prerequisites: both CEE205 and CEE312 M. Garlock, I. Payá-Zaforteza
CEE 465 Resilience Engineering Spring
Most critical infrastructures have rigid operating parameters and tend to be vulnerable to small, unforeseen natural and man-made disasters. The need to maintain efficient functioning of the system and to explore the system at some "equilibrium" state is of utmost importance to planners, designers and engineers. This course will discuss the characteristics of resilient systems and ways to measure and monitor the resilience of critical infrastructures, including organizational resilience. The course will also introduce the concept of sustainability and will attempt to connect sustainability and resilience in a unified framework. N. AttohOkine

CEE 466 Wind Engineering Fall
Introduction of wind effects on the built environment. The nature of wind storms, tropical cyclones and climate change, prediction of design wind speeds and structural safety, strong wind characteristics and turbulence, basic bluff-body aerodynamics, resonant dynamic response and effective static load distributions, wind tunnel experiments, tall buildings, low-rise buildings, windborne debris, wind loading codes and standards, wind-induced storm surge, wind and surge damage. Prerequisites: undergraduate level basic courses in Probability and Statistics and in Differential Equations. N. Lin

CEE 467 Design and Behavior of Steel Structures Fall
Topics in the design and analysis of steel structures are covered such as geometric properties and stresses of built-up shapes, columns (including plate buckling), beams, tension members, beam-columns. M. Garlock

CEE 471 Introduction to Water Pollution Technology (also GEO 471 / URB 471) Fall STN
An introduction to the science and engineering of water quality management and pollution control in natural systems; fundamentals of biological and chemical transformations in natural waters; identification of sources of pollution; water and wastewater treatment methods; fundamentals of water quality modeling. Two 90-minute lectures and field trips. Open to Juniors and Seniors Only. Prerequisites: Student should have some background in chemistry and an interest in water pollution problems. P. Jaffé

CEE 472 Hydrometeorology and Remote Sensing Not offered this year STN
The structure and evolution of precipitation systems are examined, including the dynamical and microphysical processes that control the spatial and temporal distribution of precipitation. The fundamentals of remote sensing of aerosols, clouds and precipitation are introduced. Related topics in hydrology and hydraulics are covered. Three lectures. Prerequisite: instructor's permission. J. Smith

CEE 474 Special Topics in Civil and Environmental Engineering (also ENV 474) Not offered this year STN
This class is an introduction to physical computing using the Arduino platform, with the goal of developing environmental sensors that talk to the internet over cellular networks. You will learn to develop computer code and wire electronics, as well as learn the nuts and bolts of the internet, including linux utilities, mysql, python, and sms. Not Open to Freshmen. K. Caylor

CEE 477 Engineering Design for Sustainable Development (also ENE 477) Fall STN
Students will design several features of a LEED-certified building project. Features that will be considered include ground source heat pumps; ventilation; photovoltaics (PV); insulation; glazing; green materials; and storm water management systems, including a green roof, porous parking lots, and the gray water usage. Ventilation will be designed considering the potential for vapor emissions from building materials. Energy software will be used to determine the carbon footprint of alternative designs. Two 90-minute lectures. Prerequisite: CEE 303 or equivalent with instructor's permission. Open to Seniors and Graduate students only. R. Harris

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CEE 478 Senior Thesis  Fall/Spring
A formal report on research involving analysis, synthesis, and design, directed toward improved understanding and resolution of a significant problem in civil and environmental engineering. The research is conducted under the supervision of a faculty member, and the thesis is defended by the student at a public examination before a faculty committee. The senior thesis is equivalent to a year-long study and is recorded as a double course in the spring. C. Peters

CEE 487 Ecohydrology (also ENV 487 )  Spring
The course is focused at the undergraduate level towards the understanding of the systems that control the circulation of water between atmosphere, soil, and plants. The course will address the dynamics of soil moisture and its relationship with the ecosystem structure. It will also study the impact of environmental conditions on natural ecosystems, plant strategies in water use, and hydrologic controls on nutrient cycles. Prerequisites: A first course in Probability and Statistics at the undergraduate level and an elementary course in Differential Equations at the undergraduate level. I. Rodriguez-Iturbe

CEE 490 Mathematical Modeling of Energy and Environmental Systems (also ENE 490 )  Fall
Department of Art and Archaeology

Chair
Michael Koortbojian

Departmental Representative
Bridget Alsdorf

Director of Graduate Studies
Charles E. Barber

Professor
Charles E. Barber
Esther da Costa Meyer
Hal Foster
Thomas DaCosta Kaufmann
Michael Koortbojian
Elizabeth Anne McCauley
Andrew M. Watsky

Visiting Professor
Alan C. Braddock, also Princeton Environmental Institute

Associate Professor
Bridget Alsdorf
Rachael Z. DeLue
Brigid Doherty, also German
Chika Okeke-Agulu, also African American Studies
Cheng-hua Wang

Assistant Professor
Anna Arabindan-Kesson, also African American Studies
Nathan T. Arrington
Beatrice Kitzinger
Carolina Mangone

Irene V. Small
Deborah A. Vischak
Carolyn Y. Yerkes

Lecturer with Rank of Professor
James C. Steward

Visiting Lecturer with Rank of Professor
Yve-Alain Bois

Lecturer
Friedrich Teja Bach, also Council of the Humanities
Dora C.Y. Ching
John Elderfield
Andrew J. Hamilton, also Council of the Humanities
Alexander K. Harper, also Council of the Humanities
Caroline I. Harris
Bryan C. Just
J. Michael Padgett
Alan M. Stahl

Visiting Lecturer
Peter Parshall

Associated Faculty
Leonard Barkan, Comparative Literature
Anthony T. Grafton, History
Michael W. Jennings, German
Spyridon Papapetrous, Architecture
Susan A. Stewart, English
The Department of Art and Archaeology is devoted to the study of the visual arts and the investigation of material artifacts from a wide range of cultures and periods. It is also where students interested in the practice of art (taught by faculty in the Program in Visual Arts) can pursue a major. Working closely with faculty members in small classes and often dealing directly with original objects and primary sources, students can explore subjects as diverse as Roman city planning, Greek archaeology, Japanese painting, Renaissance architecture, Chinese cinema, 19th-century photography, and contemporary art.

Students in the Department of Art and Archaeology learn techniques for analyzing visual materials and locating them within time and place. They also investigate the factors that influence stylistic change (e.g., religious beliefs, economic constraints, patronage demands, and technological changes). Like any humanist or social scientist, they must evaluate evidence, form hypotheses, test data, and draw conclusions. Successful majors master the translation of visual perceptions into linguistic expression, develop visual memory, and make connections with a wide array of historical evidence. Students must have at least a C- average based on courses and independent work in order to graduate from the department.

**Information and Departmental Plan of Study**

Students interested in majoring in the Department of Art and Archaeology must choose one of two programs, each of which has its own admission prerequisites and curricular requirements.

**Advanced Placement**

No advanced placement credit is granted for the Art History Advanced Placement Examination.
Early Concentration

A sophomore may apply for early concentration through consultation with the departmental representative.

Study Abroad

Foreign study can be a richly rewarding part of any concentration in the Department of Art and Archaeology. Art history courses taken abroad (normally up to two per term or four for a year in a study abroad program) can be pre-approved for departmental credit by the departmental representative. Students generally study abroad during the junior year or the first term of the senior year. Junior independent work can be completed under the supervision of a departmental faculty member with prior approval and ongoing contact with the faculty adviser. Senior independent work in the fall of the senior year may be done overseas, but the spring term work must be done in residence. Students contemplating study abroad should speak with the departmental representative as early as possible and should plan to take courses in the language of the country in which they wish to study.

In addition, students interested in archaeology may choose to participate in overseas archaeological excavations undertaken by departmental faculty. For further information, contact Professor Nathan Arrington.

Preparation for Graduate Study

Students who are contemplating graduate work in the history of art and archaeology are reminded that most graduate programs require a reading knowledge of two or more foreign languages. In many fields German is particularly important.

Certificate in Visual Arts. For certificate requirements, see the description under the Program in Visual Arts.

Resources for Research. Outstanding resources are available for students concentrating in art and archaeology. These include the Marquand Library, a non-circulating research library with over 400,000 books; the Princeton University Art Museum; the Index of Christian Art; the Visual Resources Collection; and the P.Y. and Kinmay W. Tang Center for East Asian Art. Firestone Library also houses extensive holdings of illuminated manuscripts, prints, and photographs in departments including the Manuscripts Division, Graphic Arts Collection, Rare Books and Special Collections, the Cotsen Children's Library, and the Western Americana Collection. Staff members in the University Art Museum and the Index of Christian Art occasionally offer courses or otherwise participate in the department's teaching activities. Students are encouraged to take advantage of the proximity of major museum collections in New York, Philadelphia, and elsewhere.

Honors. Honors are awarded by a vote of the faculty to students having the highest, weighted grade point average based on grades achieved in departmental courses (including all courses taken outside the department that have been designated as cognates), junior independent work, senior independent work, and the senior oral examination.

Program 1. History of Art

This central program allows a broad and rich exposure to the visual arts produced in a great variety of periods and locations.
Prerequisites

Any two courses offered by the Department of Art and Archaeology.

Program of Study

A total of 10 courses in the Department of Art and Archaeology, including ART 100, ART 400 (Junior Seminar) and two seminars at the 400- or 500-level. Students must also take at least one course in each of the following three areas: Group 1 (ancient), Group 2 (medieval/early modern), and Group 3 (modern/contemporary). In choosing courses to satisfy the distribution requirement, students are encouraged to explore a range of media (e.g., architecture, painting, sculpture, photography, film). Thematic courses as well as courses spanning more than one area will be allocated to a distribution area on a case-by-case basis. ART 100, ART 400, and ART 401 count as departmentals but not as distribution courses.

Cognates. No more than two cognate courses taken in other departments (including the Program in Visual Arts) may be counted toward the 10 departmentals. This includes summer courses. Students participating in the Study Abroad Program may be allowed to count more than two courses taken overseas as departmentals. All cognate courses must be approved prior to enrollment by the departmental representative based on the submission of a syllabus and course description. Courses cross-listed with the Department of Art and Archaeology automatically count as departmentals.

Junior Seminar. During the fall of the junior year, all majors must take the junior seminar (ART 400). The course introduces students to various methodologies used by art historians and archaeologists, and prepares them for writing the junior and senior independent work. Students who are abroad during the fall of the junior year can complete the junior seminar during the fall term of the senior year.

Independent Work

Junior Independent Work. The fall junior independent work consists of a paper of approximately 20 pages addressing the state of the literature on a particular subject selected by the student as well as various methodologies appropriate to it. This paper is usually advised and graded by the instructor of the student's junior seminar. During the spring term, students write a second research paper (approximately 25 pages) with a departmental adviser of their choice.

Senior Independent Work. The senior independent work consists of a year-long research project of approximately 60-80 pages on a topic selected by the student and approved by the faculty adviser. The student selects a faculty adviser in the spring of the junior year and submits an extensive outline and annotated bibliography to the adviser by mid-November of the senior year. The thesis grade is the average of the grades given by the faculty adviser and a second faculty reader.

Senior Departmental Examination

The senior departmental examination consists of a one-hour oral examination discussing the senior thesis and also covering material from departmental courses. It is attended by three faculty members (including the adviser of the senior thesis, its second reader, and one additional faculty member).
Program 2. Studio Arts

Concentrators in this program explore the traditions, thought processes, and methods of making visual art in connection with a liberal arts education. Courses are offered in painting, drawing, graphic design, media, sculpture, photography, film and video production, and film history and theory.

Prerequisites

Two courses in the Program in Visual Arts and one course in the Department of Art and Archaeology. By the first Wednesday following spring break, sophomores submit an application and a portfolio of creative work to the Lewis Center for the Arts administrative office. The admissions committee for the Program in Visual Arts will notify students accepted into the program by early April. No AP credit is accepted toward the Program 2 concentration.

Program of Study

A total of 10 courses, of which at least seven must be from the Program in Visual Arts and three must be from the Department of Art and Archaeology.

The visual arts courses must include: studio courses in at least two different media; two studio courses at the 300 or 400 level; VIS 392 Issues in Contemporary Art; and VIS 416 Exhibition Issues and Methods or VIS 417 Fall Film Seminar. The Department of Art and Archaeology courses must include: at least one course in the modern/contemporary area (19th century to the present); and two others, including at least one course from group 1 or group 2 (the third may be from any group).

Cognates. Up to two courses in studio art or art history may be taken at other institutions during the summers with prior approval by the departmental representative (for art history courses) or the director of the Program in Visual Arts (for studio art courses). Courses taken as part of the Study Abroad Program may be allowed to count as departmentals with prior approval from the departmental representative.

Junior Seminar. During the fall of the junior year, all concentrators must take the junior seminar, VIS 392 Issues in Contemporary Art. The course coincides with admission to the junior studios and investigates the history, challenges, and rewards of studio practice. Through readings, discussions, studio critiques, and a culminating exhibition of works in progress, VIS 392 provides the foundation for each student's independent creative development, as well as the impetus for beginning to be able to articulate the historical precedents and ambitions of their work.

Independent Work

Junior Independent Work. The fall junior independent work consists of an artist's book of at least 32 pages addressing the student's work, daily life, an art historical influence, a contemporary artist, or any other germane topic approved by the VIS 392 instructor. The book may be text only, text and images, or images only. It can be made of any materials, in any format, but must be gathered in book form or an expanded definition of book form. This book is advised and graded by the instructor of the student's junior seminar (VIS 392) and his/her primary adviser. The spring junior independent work involves the development of a sustained studio practice among peers, and with the consultation of one's advisers, culminating in a comprehensive junior independent work exhibition at the end of the term.
The spring junior independent work is done in consultation with the student's adviser. Students also interact with the general visual arts faculty in "open studios." The advisers' spring-term grade for junior independent work represents an evaluation of the entire year's studio work. The creative junior independent work is exhibited in a group show at the end of the junior spring semester.

**Senior Independent Work.** By the end of the second week of the fall term of the senior year, students must have three advisers, including one from the Department of Art and Archaeology faculty. The senior independent work is a major studio project completed by the end of the spring term, which is done in consultation with the student's advisers. Students present their work in an exhibition at the end of the year, usually in a two-person show with another certificate or Program 2 student. The grade for the senior independent work represents an evaluation of the entire year's studio work and is the average of two grades: (1) the average of the grades given by the student's three advisers; and (2) the average of the grades given by the rest of the Program in Visual Arts faculty who view the senior exhibition. A separate grade is given for the student's oral defense of the thesis exhibition by his/her thesis advisers only.

**Senior Departmental Examination**

The senior departmental examination takes the form of a one-hour critical discussion of the senior thesis exhibition with the student's three advisers in the latter half of the spring term, in the presence of each student's exhibition. The discussion is open to all Program in Visual Arts faculty and Program 2/Certificate students. The grade for the oral examination is the average of the three grades given by the advisers participating in the examination.

**Certificate in Archaeology**

The Department of Art and Archaeology offers students the opportunity to earn a certificate in archaeology while concentrating in another department. The Program in Archaeology aims to provide a broad introduction to the field of archaeology and to allow students to pursue archaeological interests that complement their research in other areas.

Undergraduate students may apply for formal admission to the Program during their sophomore year after taking any one of the courses offered by the Program. A freshman seminar or other alternative may be approved by the Program director.

For the Classes of 2019 and earlier: students may pursue either the Department’s "Program 3" Major in Archaeology or a certificate in archaeology. Please consult the 2015-2016 Undergraduate Announcement regarding the Program 3 requirements.

**Courses**

**ART 100 An Introduction to the History of Art: Meanings in the Visual Arts**  
Fall LA  
A team-taught introduction to the history of art and to the discipline of art history. Faculty members of the Department of Art and Archaeology lecture in their fields of expertise; precepts in the renowned Princeton University Art Museum facilitate direct engagement with works of art. Not a comprehensive survey but a sampling of arts -- painting, sculpture, architecture, photography and prints -- and artistic practices from diverse historical periods, regions, and cultures. The course balances consideration of historical developments and methods of interpretation with attention to individual works of art. *A. Kesson*
ART 102 An Introduction to the History of Architecture
Not offered this year LA
A survey of architectural history in the West, from ancient Egypt to 20th-century America, stressing a critical approach to architectural form through the analysis of context, expressive content, function, structure, style, and theory. Discussion will focus on key monuments and readings that have shaped the history of architecture. Two lectures, one preceptorial. Staff

ART 105 Lab in Conservation of Art (See CEE 105)

ART 200 The Art and Archaeology of the Ancient Near East and Egypt (also NES 205 )
Not offered this year LA
The art and archaeology of the ancient Near East and Egypt from the end of the prehistoric period, ca. 3000 B.C., to the beginning of the Iron Age, ca. 650 B.C. Focus on the rise of complex societies and the attendant development of architectural and artistic forms that express the needs and aspirations of these societies. Occasional readings in original texts in translation will supplement the study of art and architecture. For department majors, this course satisfies the Group 1 distribution requirement. Two lectures, one preceptorial. Staff

ART 201 Roman Architecture (also ARC 205 )
Fall LA
This course will examine the architecture of the Romans, from its mythic beginnings (as recounted, for example, by Vitruvius) to the era of the high empire. Topics will include: city planning; the transformation of the building trades; civic infrastructure; and the full breadth of Roman structures, both public and private. For department majors, this course satisfies the Group 1 distribution requirement. M. Koortbojian

ART 203 Roman Art
Not offered this year LA
Roman painting, sculpture, architecture, and other arts from the early Republic to the late Empire, focusing upon the official monuments of Rome itself and the civic and private art of Pompeii and Herculaneum. Emphasis on historical representation, imperial propaganda, portraiture, narrative technique, and classical art theory. For department majors, this course satisfies the Group 1 distribution requirement. Two lectures, one preceptorial. M. Koortbojian

ART 205 Medieval Art in Europe (also HLS 205 )
Not offered this year LA
The art of Europe from the fall of Rome to the Renaissance. Emphasis on the effects of cultural, religious, and political change on artistic production. Works treated include the Lindisfarne Gospels, the Bayeux Tapestry, Chartres Cathedral, and the Ste. Chapelle. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. Staff

ART 206 Byzantine Art and Architecture (also HLS 206 )
Not offered this year LA
Art and architecture of the Eastern Mediterranean and Eastern Europe ca. 600-1500. The course will focus on the art of the Byzantine Empire and its capital, Constantinople, and on its broad sphere of cultural influence (Russia, Armenia, Georgia, Sicily, Venice, Serbia, Bulgaria, Rumania). An examination of principal factors that shaped the artistic legacy of eastern Christendom during the Middle Ages. Offered in alternate years. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. C. Barber

ART 210 Italian Renaissance Painting and Sculpture
Not offered this year LA
A selective survey, 1260-1600, allowing discussion of themes such as patronage; functions; materials and techniques; emulation as motivation; social, political, and economic issues; aesthetics; and the professions of the artist and of the art historian. Artists treated include Giotto, Masaccio, Donatello, Bellini, Leonardo, Raphael, Michelangelo, and
ART 211 Major Figures in American Art Not offered this year LA
A selective overview of key figures from the 18th to the 20th century, with each lecture devoted to a single painter, architect, or sculptor as representative of significant themes in the history of American art. Among the artists considered are Copley, Jefferson, Cole, Homer, Eakins, Richardson, Saint-Gaudens, Olmsted, and O'Keeffe. Two lectures, one preceptorial. For department majors, this course satisfies the Group 3 distribution requirement. R. DeLue

ART 212 Neoclassicism through Impressionism Not offered this year LA
A broad study of European painting and sculpture from the French Revolution to 1900 with special attention to art's relationship to social and cultural changes. Lectures will explore a range of themes including art and revolution, the rise of landscape, shifting conceptions of realism, and the birth of "modernism" and the avant-garde. Emphasis on major figures including David, Canova, Goya, Ingres, Turner, Courbet, Manet, Monet, Degas, Rodin, Van Gogh, and Cézanne. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. B. Alsdorf

ART 213 Modernist Art: 1900 to 1950 Fall LA
A critical study of the major movements, paradigms, and documents of modernist art from fauvism to art brut. Among the topics covered are primitivism, abstraction, collage, the readymade, machine aesthetics, photographic reproduction, the art of the insane, artists in political revolution, anti-modernism. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. H. Foster

ART 214 Contemporary Art: 1950 to the Present Spring LA
A critical study of the major movements, paradigms, and documents of postwar art--abstract-expressionist, pop, minimalist, conceptual, process and performance, site-specific, etc. Special attention to crucial figures (e.g., Jackson Pollock, Andy Warhol, Robert Smithson) and problems (e.g., "the neo-avant-garde," popular culture, feminist theory, political controversies, "postmodernism"). For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. I. Small

ART 216 Chinese Painting Not offered this year LA
Thematic introduction to the role of painting in Chinese cultural history, with attention to the interaction of stylistic standards, materials, and techniques; the impact of regional geographies on landscape painting; the influence of class, gender, and social behavior on figure painting; the engagement of art with traditional philosophies and 20th-century socialism; and the shape of time in art-historical development. For department majors, this course satisfies the Group 2 distribution requirement. Three lectures. Staff

ART 217 The Arts of Japan (also EAS 217) Not offered this year LA
Surveys arts of Japan from the pre-historic period through the present day. Painting, sculpture, and architecture form the core of study. Examines critical role of other forms, including calligraphy, lacquer, and ceramics. Takes close account of the broader cultural and historical contexts in which art was made. Topics include ongoing tension in Japanese art between foreign and indigenous, role of ritual in Japan's visual arts, re-uses of the past, changing loci of patronage, and formats and materials of Japanese art. For department majors, this course satisfies the Group 1, 2, or 3 distribution requirement. Two lectures, one preceptorial. A. Watsky
ART 219 Northern Renaissance Art  Not offered this year LA
The course surveys painting, prints, and sculpture in the Netherlands, Germany, and France from about 1350-1550. With emphasis on the work of major figures such as Van Eyck, Bosch, Dürer, and Bruegel, the course will consider changing circumstances of artistic production, function, iconography, and patronage. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. Staff

ART 221 Art of Hispania (also LAS 221 )  Not offered this year LA
Painting, sculpture, and architecture in the Spanish-speaking world from 1492 to 1810. The great flowering of Spanish art, as represented by such figures as El Greco, Velázquez, and Goya, in its cultural and historical context, including developments in Latin America. Some attention to the art of Portugal. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. Staff

ART 230 Early Islamic Art and Architecture (also NES 230 )  Not offered this year LA
A survey of art in the Islamic world from 600 through 1200. The course examines the formation of Islamic art and its roots in the art of late antiquity. Emphasis will be on the development of various types of religious and secular architecture and their decoration (wall-painting, carved stucco and wood, mosaic and epigraphy) in the central regions of the early Islamic world. Topics such as textiles, metalwork, and ceramics will be considered. For department majors, this course satisfies either the Group 1 or 2 distribution requirement. Two lectures, one preceptorial. Staff

ART 232 The Arts of the Islamic World (also NES 232 )  Not offered this year LA
A survey of the architecture and the arts of various Islamic cultures between northern Africa and the Indian subcontinent from the seventh to the 20th century. Emphasis will be on major monuments of religious and secular architecture, architectural decoration, calligraphy, and painting. Background in Islam or Middle Eastern languages is not a prerequisite. For department majors, this course satisfies the Group 1, 2, or 3 distribution requirement. Two lectures, one preceptorial. Staff

ART 242 The Experience of Modernity: A Survey of Modern Architecture in the West (also ARC 242 / CEE 242 )  Not offered this year LA
An analysis of the emergence of modern architecture from the late 19th century to World War II, in light of new methodologies. The course will focus not only on major monuments but also on issues of gender, class, and ethnicity to provide a more pluralistic perspective on the experience of modernity. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. E. Azevedo Meyer

ART 248 Photography's History from Analog to Digital  Fall LA
A survey of photography from its multiple inventions in the early 19th century to its omnipresence (and possible obsolescence) in the 21st. Themes will include photography's power to define the "real"; its emulation and eventual transformation of the traditional fine arts; and its role in the construction of personal and collective memories. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. A. McCauley

ART 256 Writing as Art  Not offered this year LA
In China, Japan, Islamic world, and other cultures, writing is ranked as highest of the visual arts, far above painting, sculpture, even architecture. Forms taken by beautiful writing are at least as diverse as the writing systems that underlie them: think of Egyptian writing, Chinese calligraphy, and Roman monumental inscriptions. This course
introduces world's major calligraphic traditions and examine the functions of beautiful writing, reasons for its existence and prestige, and factors that shape styles of writing. For department majors, this course satisfies the Group 2 distribution requirement. One three-hour seminar. **Staff**

**ART 262 Structures and the Urban Environment (See CEE 262A)**

**ART 266 Introduction to Pre-Columbian Art**  
Not offered this year LA
General survey of the indigenous civilizations of North America, Central America, and South America. The goals are to demonstrate methods and techniques employed by art historians working in this area to study the past, and to examine how art history, archaeology, and ethnohistory contribute to the interdisciplinary study of ancient peoples. For department majors, this course satisfies the Group 1 distribution requirement. Two lectures, one preceptorial. **Staff**

**ART 267 Mesoamerican Art (also LAS 267 / ANT 366 )**  
Not offered this year LA
This course acquaints students with the art, architecture, and archaeology of ancient Mexico and Central America. The course considers a wide range of cultures spanning from the first arrival of humans at the end of the Upper Paleolithic period through the 16th century Spanish invasion. Major culture groups to be considered include Olmec, Teotihuacan, Maya, Zapotec, and Aztec. Precepts will include theoreticallyfocused discussions, debate regarding contested scholarly interpretations, and hands-on work with objects at the Princeton University Art Museum. For department majors, this course satisfies the Group 1 distribution requirement. **B. Just**

**ART 270 Photography and Society**  
Not offered this year LA
What is the role of photography in contemporary society? By looking at photographic forms, ranging from commercial portraits, ID cards, family albums, and fashion and advertising photography to newspaper and magazine illustrations, this course explores diverse ways that photographs have come to define and challenge the "real." Students will talk with professionals in fields of journalism and fashion, examine controversies over digital manipulation and politically charged photos, and consider historical sources of contemporary styles. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar. **A. McCauley**

**ART 300 Greek Archaeology of the Bronze Age**  
Not offered this year LA
A study of the culture of Greece and the Aegean from the Early Bronze Age to the eighth century B.C. Special emphasis is placed on the Minoan-Mycenaean civilization, the Dark Ages of the early first millennium, and the age of Homer. For department majors, this course satisfies the Group 1 distribution requirement. Two lectures, one preceptorial. Offered in alternate years. **Staff**

**ART 301 The Art of the Iron Age: The Near East and Early Greece (also HLS 301 / CLA 302 )**  
Not offered this year LA
The course will focus on the formation of new artistic traditions in the ancient Near East and late-period Egypt after 1000 B.C.E. and then investigate their interrelationships with early Greece and the controversial theories of modern scholars of the dependence of early Greece on the ancient Near East. For department majors, this course satisfies the Group 1 distribution requirement. Two 90-minute classes. **Arrington**
ART 306 Classical Athens: Art and Institutions (also CLA 306 ) Not offered this year LA
An examination of the culture and institutions of classical Athens, its buildings, monuments, and works of art, set against the historical background of the city's growth. Aspects of government, religious festivals, society, and daily life are investigated. The archaeological record is enriched by study of ancient historical sources in translation. For department majors, this course satisfies the Group 1 distribution requirement.
Two lectures, one preceptorial. *Staff*

ART 308 Roman Cities and Countryside: Republic to Empire Not offered this year LA
Roman urban and suburban architecture throughout the Roman provinces from the late Republic to late Empire, focusing upon the Romanization of the provinces from Britain in the northwest to Arabia in the southeast. Town planning, imperial monuments, villas and sanctuaries, domestic and public architecture, and interior decoration considered. For department majors, this course satisfies the Group 1 distribution requirement. One three-hour class. *Staff*

ART 315 Medieval Architecture (also ARC 315 ) Not offered this year LA
Historical patterns of development in Western European architecture between 300 and 1300: Early Christian through Gothic, with emphasis on Romanesque and Gothic innovations. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. *Staff*

ART 318 Medieval Manuscript Illumination Not offered this year LA
A technical and historical introduction to manuscript illumination from the invention of the codex to the advent of the printed book. Topics include the history of script and ornament, genres of illuminated manuscripts, the varying relations between text and image, owners of books, circumstances of production.
Extensive work with Princeton's manuscript collections. For department majors, this course satisfies the Group 2 distribution requirement. Two 90-minute classes. Offered in alternate years. *Staff*

ART 319 Italian Trecento Art Not offered this year LA
Painting and sculpture of the formative years of the early Renaissance in Italy (ca. 1250-1400) with emphasis on the cultural, social, and religious concerns that found expression in art. Topics include the relationship between art and piety, the effect of the Black Death, and the rediscovery of the classical heritage. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. *Staff*

ART 320 Rome, the Eternal City (also ARC 320 ) Not offered this year LA
The fabric and image of the city seen in planning, architecture, and the works of artists and writers. Attention to the city as an ideal and an example, from its foundation to the present, with emphasis on major periods. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. *Staff*

ART 328 History of Architectural Theory (See ARC 308)

ART 331 Weimar Germany: Painting, Photography, Film (See GER 370)

ART 332 The Landscape of Allusion: Garden and Landscape Architecture, 1450-1750 (also ARC 332 ) Not offered this year LA
The concept of nature from the Renaissance through the 18th century as seen in European gardens and landscape architecture. Major consideration will be given to the Italian villa-garden complex, the French classical garden, and the English romantic garden and park as evidence of large-scale planning. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. Staff

**ART 333 Renaissance and Baroque Architecture (also ARC 333)** Not offered this year LA
European architecture from 1420 to the mid-18th century with particular emphasis on its historical and social background. The various architectural movements—Renaissance, baroque, and rococo—are studied in terms of important architects and buildings especially of Italy, France, and England. For department majors, this course satisfies the Group 2 distribution requirement. Two lectures, one preceptorial. C. Yerkes

**ART 334 The Renaissance (See COM 314)**

**ART 337 Court, Cloister, and City: Art and Architecture in Central and Eastern Europe (also GER 337)**
Not offered this year LA
Painting, sculpture, and architecture in Austria, Hungary, Czech Republic, Slovakia, Poland, Germany, and Russia, ca. 1450-1800. Special emphasis is placed on the changing roles of court, city, cloister, and aristocracy and the relation of local styles to international trends, including art elsewhere in Europe. For department majors, this course satisfies the Group 2 distribution requirement. Offered in alternate years. One three-hour seminar. T. Kaufmann

**ART 343 Topics in 19th-Century Art (also GSS 350)** Not offered this year LA
An often interdisciplinary study of themes and problems in 19th-century art with special attention to recent writing in the field. Possible topics include: the persistence of realism, Impressionism and its aftermath, shifting representations of masculinity and femininity, and the formation of the first European avantgardes. The course may also center on a particular artistic medium or geographical location. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. B. Alsdorf

**ART 344 Topics in 20th-Century Art** Fall LA
An often interdisciplinary study of themes and problems in 20th-century art with special attention to recent writing in the field. Possible topics include: models of abstraction, critiques of the traditional mediums of art, artistic responses to technological transformation and/or political revolution, and artistic explorations of the unconscious. For department majors, this course satisfies the Group 3 distribution requirement. Two 90-minute classes. I. Small

**ART 347 Architecture and the Visual Arts (See ARC 302)**

**ART 348 Masters and Movements of 20th-Century Photography** Not offered this year LA
By focusing on six major figures (such as Stieglitz, Weston, Moholy-Nagy, Evans, Frank, Sherman), this course examines the ways that photography was transformed from a poor stepchild of the fine arts to a staple of museum exhibitions. Topics will include the impact of abstraction on photography; the interactions between art photography and the new print and cinematic mass media; and the development of photographic collections and criticism. For department majors, this course satisfies the Group 3 distribution requirement. Two 90-minute classes. A. McCauley
ART 350 Chinese Cinema (also EAS 356) Not offered this year LA
Thematic studies in Chinese film (Republic, People's Republic, Taiwan, Hong Kong), from the 1930s to the present with emphasis on recent years, viewed in relation to traditional and modern Chinese visual arts and literature, colonialism and globalism, Communist politics, gender and family values, ethnicity and regionalism, melodrama and the avant-garde, the cinematic market, artistic censorship, and other social issues. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar, one evening viewing session. Staff

ART 351 Traditional Chinese Architecture (also ARC 310 / EAS 357) Not offered this year LA
Thematic introduction to traditional Chinese architecture, urban design, and garden building, with attention to principles and symbolism of siting and design; building techniques; modularity of structures and interchangeability of palace, temple, tomb, and domestic design; regional variation. For department majors, this course satisfies the Group 2 distribution requirement. Two 90-minute classes. Staff

ART 354 The Early Modern Print Not offered this year LA
Surveys the history of prints in Europe and the United States from 1400 to the present. It will combine two main approaches: first, the distinctive history of printmaking, including origins, evolution of techniques, and the political, religious, and cultural functions of prints; and second, individual artistic developments, with emphasis on the work of major printmakers, iconography, and formal innovations. For department majors, this course satisfies the Group 2 or 3 distribution requirement. One three-hour seminar. Staff

ART 366 Ancient Arts of Mexico (also LAS 366) Not offered this year LA
Detailed examination of the Pre-Columbian arts of the indigenous civilizations of Mexico. The first part of the course will examine the architecture, monumental art, and craft art of the Aztecs and their contemporaries, the Huaztecs, Tarascans, Mixtecs, Zapotecs, and Mayas. The rest of the course is designed as a survey of the major Mexican art traditions that preceded them. For department majors, this course satisfies the Group 1 distribution requirement. Two lectures, one preceptorial. Staff

ART 370 History of American Art to 1900 Not offered this year LA
An introduction to the history of art in the United States from the colonial period to 1900. Works of art will be examined in terms of their cultural, social, intellectual, and historical contexts. Students will consider artistic practices as they intersect with other fields, including science and literature. Topics include the visual culture of natural history, fashioning the self, race and representation, landscape and nation, art and the Civil War, gender politics, art and medicine, and realism and deception. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. R. DeLue

ART 371 History of American Art, 1900 to the Present Not offered this year LA
Introduction to the history of American art, 1900 to present. Artists and works of art are examined in terms of cultural, social, intellectual, and historical contexts. Students will consider artistic practices as they intersect with other fields, including science and literature. Topics include modern metropolis, art and social reform, Harlem Renaissance, early film, identity politics, abstract art, machine age, post-modernism, and globalization. Visits to the Princeton University Art Museum are an integral part of the course. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. R. DeLue
ART 373 History of African American Art (also AAS 373 )  Not offered this year LA
An introduction to the history of African American art and visual culture from the colonial period to the present. Artists and works of art will be considered in terms of their social, intellectual, and historical contexts. Students will consider artistic practices as they intersect with other cultural spheres, including science, politics, religion, and literature. Topics and readings will be drawn from the field of art history as well as from cultural studies, critical race theory, and the history of the Atlantic world. For department majors, this course satisfies the Group 3 distribution requirement. Two lectures, one preceptorial. A.
Kesson

ART 390 Modernist Colloquies: Photography and Literature (See GER 373)

ART 391 Art in Germany Since 1960 (See GER 371)

ART 392 Issues in Contemporary Art (See VIS 392)

ART 400 Junior Seminar  Fall LA
An introduction to a range of methods and texts in the history of the discipline. The junior seminar is required of all art and archaeology concentrators. One three-hour seminar. B. Alsdorf

ART 401 Introduction to Archaeology  Fall LA
Introduces students to the methods and thinking of archaeologists and prehistorians. Topics include the concept of prehistory; ethnographic analogy and the interpretation of material remains; relating material culture to texts; schemes of cultural interpretation; and how to read an excavation report. This seminar is required for the Certificate in Archaeology. One three-hour seminar. D. Vischak

ART 410 Seminar. Greek Art (also HLS 410 )  Not offered this year LA
Topics of Greek art and architecture that will normally deal with the Hellenistic period (323-31 B.C.). Depending on student interest, special subjects may also be treated in relation to the Hellenistic period, such as classicism, or the course may concentrate on thematic studies, such as architectural sculpture. Two 90-minute seminars. Prerequisite: a course in ancient art or instructor's permission. For department majors, this course satisfies the Group 1 distribution requirement. Offered in alternate years. N. Arrington

ART 420 Seminar in Asian Art  Not offered this year LA
A topic in Chinese or Japanese art, explored in depth. For department majors, this course satisfies the Group 1, 2, or 3 distribution requirement. One three-hour seminar. Prerequisite: a course in Asian art or the instructor's permission. A. Watsky

ART 423 Landscape Art in China (also EAS 423 )  Not offered this year LA
A course about Chinese concepts of nature and human nature, theories and traditions of landscape art. Weekly consideration of such themes as replicating and transforming the landscape; submission to/control of nature; landscape as political allegory; pilgrimage and exile; gardens and artists' studios; landscape magic in ancient China; endangered pandas, power dams, and the technology of modern art. For department majors, this course satisfies the Group 2 or 3 distribution requirement. One three-hour seminar. Staff
ART 424 Virtue, Tyranny, and the Political Functions of Chinese Painting  Not offered this year  LA
The patrons of Chinese painting and many of its leading artists were politicians by profession, both royal and commoner-bureaucrats, and much of their art was designed to fulfill political functions: propaganda, moral self-cultivation, self-advertisement and self-consolation, expressions of support, resistance, and resignation. Half of the course covers premodern China, half covers the 20th century. For department majors, this course satisfies the Group 2 or 3 distribution requirement. One three-hour seminar. Prerequisite: a course in Chinese art history or instructor's permission. Staff

ART 425 The Japanese Print (also EAS 425 )  Spring LA
An examination of Japanese woodblock prints from the 17th through the 19th century. This seminar considers formal and technical aspects of woodblock prints, and the varied subject matter, including the "floating world" of prostitution and the theater, Japanese landscape, and burgeoning urban centers. Students explore the links between literature and prints, especially the re-working of elite classical literary themes in popular prints. For department majors, this course satisfies the Group 2 or 3 distribution requirement. Prerequisite: at least one course in art history or Japanese studies, or permission of instructor. One three-hour seminar. A. Watsky

ART 430 Seminar. Medieval Art (also HLS 430 / MED 430 )  Fall LA
Topics in medieval art and/or architecture. Prerequisite: a course in the art of this period or instructor's permission. For department majors, this course satisfies the Group 2 distribution requirement. One three-hour seminar. C. Barber

ART 438 Representation of Faith and Power: Islamic Architecture in Its Context (also NES 428 ) Not offered this year LA
The seminar explores the means by which messages of political and religious content were conveyed in Islamic architecture. Selected key monuments or ensembles will be discussed on the basis of their specific historical and religious setting. Special attention will be given to the problem of symbolism in Islamic architecture. For department majors, this course satisfies either the Group 1 or 2 distribution requirement. Staff

ART 440 Seminar. Renaissance Art  Fall LA
Topics in 15th- and 16th-century art. Prerequisite: a course in the art of this period or instructor's permission. For department majors, this course satisfies the Group 2 distribution requirement. One three-hour seminar. P. Parshall

ART 442 Master Drawings  Not offered this year LA
The study of techniques, functions, and connoisseurship of drawings, and their place in the interpretation of the history of art. Drawings ca. 1400-1800 will be the major objects considered. Extensive use of the resources of the art museum. For department majors, this course satisfies either the Group 2 or 3 distribution requirement. Prerequisite: a course in Renaissance or baroque art or instructor's permission. One three-hour seminar. T. Kaufmann

ART 443 Global Exchange in Art and Architecture (also LAS 443 )  Not offered this year LA
Examines the global exchange in art and architecture between and among the continents of Europe, Asia, Africa, and the Americas in the period 1492-1800. The course focuses on the geographical, historical, religious, anthropological, and aesthetic aspects of issues such as cultural encounters, diffusion, transculturation, regionalism, and related topics. For department majors, this course satisfies the Group 2 distribution requirement. One three-hour seminar. T. Kaufmann
ART 445 Topics in the History and Theory of Architecture in Early-Modern Europe (also ARC 445) Not offered this year LA
Topics will focus on major figures, such as Palladio, Wren, and Piranesi; centers, such as Rome and Venice; or themes, such as architectural theory, the legacy of classical antiquity, and the villa. For department majors, this course satisfies the Group 2 distribution requirement. One three-hour seminar. C.
Yerkes

ART 446 Seminar. Northern European Art of the Late Middle Ages and Early Renaissance Not offered this year LA
This seminar will address various aspects of northern European art during the period late Middle Ages through early Renaissance. Prerequisite: a course in the art of this period or instructor's permission. For department majors, this course satisfies the Group 2 distribution requirement. One three-hour seminar.
Staff

ART 448 Seminar. 17th- and 18th-Century Art Spring LA
Topics in 17th- and 18th-century art and architecture. For department majors, this course satisfies the Group 2 distribution requirement. Prerequisite: a course in the art of this period or instructor's permission. One three-hour seminar. T. Kaufmann

ART 450 Seminar. 19th-Century European Art (also FRE 408) Not offered this year LA
This seminar will focus in depth on a specific aspect of art, history, theory, and criticism in Europe between 1789 and 1914. Possible topics include French painting and its critics, portraiture and sociability, shifting conceptions of realism and naturalism, the onset of modernism, and representations of interior space. Prerequisites: a course in the art of this period or permission of the instructor. Visits to area museums. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar. B. Alsdorf

ART 452 Seminar. Modernism: The Ends of Art Not offered this year LA
Does art have an essential nature? Do different mediums--painting, sculpture, photography, film, television, video--have specific ontologies that demand specific methods? How is the autonomy of art debated, and why is this debate so central to modernism? With images and texts by primary artists and critics, the seminar will investigate the "ends" of art in the sense of posited goals and presumed deaths. For department majors, this course satisfies the Group 3 distribution requirement. Prerequisite: a course in the art of this period or instructor's permission. One three-hour seminar. Staff

ART 454 Seminar. History of Photography (also AAS 454) Spring LA
Topics on the aesthetic and stylistic development of photography, including the study of movements and related critical theory, and on the artistic achievement of particular photographers. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar. A. McCauley

ART 456 Seminar. Contemporary Art Fall LA
Topics in contemporary painting, sculpture, or criticism in Europe and America since World War II. Prerequisite: a course in the art of this period or instructor's permission. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar. I. Small
ART 458 Seminar. Modern Architecture (also ECS 458 / ARC 458 / FRE 458)  Not offered this year  LA
A study of some of the major themes and movements of modern architecture from the late 19th century to the present day. Students will be encouraged to examine the social and political context, to probe the architects' intellectual background, and consider issues of class and gender in their relation to architectural and urban form. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar. E. Azevedo Meyer

ART 461 Great Cities of the Greek World (See HLS 461)

ART 463 American Art and Visual Culture  Not offered this year LA
An in-depth exploration of the history, theory, and interpretation of American art and visual culture from the colonial period to the present day. Topics covered will include race and representation in American art and culture; art and science; landscape art and theory; the Harlem Renaissance; and the art and artists of the Stieglitz circle. Visits to the Princeton University Art Museum as well as to other area museums (such as the Metropolitan Museum of Art in New York) will be an integral part of this course. For department majors, this course satisfies the Group 3 distribution requirement. One three-hour seminar. R. DeLue

ART 470 Interdisciplinary Studies in the Humanities (See HUM 470)

ART 496 Special Topics in Computer Science (See COS 496)
Department of Astrophysical Sciences

Chair
James M. Stone

Associate Chair
Nathaniel J. Fisch (Plasma Physics)
Michael A. Strauss (Astronomy)

Departmental Representative
Neta A. Bahcall

Astronomy
Professor
Neta A. Bahcall
Adam S. Burrows
Christopher F. Chyba, also Woodrow Wilson School
Bruce T. Draine
Jo Dunkley, also Physics
Jeremy Goodman
Jenny E. Greene
David J. McComas
Eve C. Ostriker
David N. Spergel
Anatoly Spitkovsky
James M. Stone, also Applied and Computational Mathematics
Michael A. Strauss
Edwin L. Turner
Joshua N. Winn

Associate Professor
Gáspár A. Bakos

Assistant Professor
Matthew W. Kunz

Visiting Lecturer
Michael D. Lemonick

Associated Faculty
N. Jeremy Kasdin, Mechanical and Aerospace Engineering
Lyman A. Page Jr., Physics
Suzanne T. Staggs, Physics
Paul J. Steinhardt, Physics
Robert J. Vanderbei, Operations Research and Financial Engineering
Information and Departmental Plan of Study

The Department of Astrophysical Sciences offers an outstanding program for astrophysics majors with the flexibility to accommodate students with a broad range of interests. Many of our majors plan to continue in graduate school in astrophysics. For students with career goals in other areas such as science education, science policy, space exploration, as well as law, medicine, finance, and teaching, we offer a flexible choice of courses and research projects. The department covers all major fields in astrophysics -- from planets, to black holes, stars, galaxies, quasars, dark matter, dark energy, and the evolution of the universe from the Big Bang to today. The relatively small size of the department provides an informal, flexible, and friendly setting for students. The department is known for providing strong and supportive mentorship to all students, for cutting-edge independent research done by students for their JPs and theses, as well as for the warm and amiable atmosphere. Full accessibility to all faculty members and to the excellent departmental facilities, including our on-campus and remote telescopes and sophisticated computer system, is provided.

Prerequisites

Mathematics 201, 202 or equivalent, and Physics 205 or 207; Astrophysical Sciences 204 is strongly recommended.

Early Concentration

Students interested in early concentration in astrophysics should contact the departmental representative.

Program of Study

Every student majoring in astrophysical sciences will acquire the necessary training in astrophysics by taking at least three astrophysics courses at the 300 or 400 level. In addition to these courses, departmental students will take
courses in the Department of Physics that provide basic training in mechanics, quantum mechanics, electromagnetic theory, and other relevant topics.

**Independent Work**

**Junior Year.** In addition to the course work carried out during the junior year, each student carries out two junior independent research projects, one each semester. Each project is on a research topic of current interest, carried out under close supervision of a faculty adviser who is doing research in this area. The student will complete each term's independent work by submitting a written paper. The research projects can involve data analysis using astronomical data from our telescopes, including data from the Sloan Digital Sky Survey -- a unique three-dimensional map of the universe -- and the Hyper Suprime-Cam Survey with the Subaru telescope, as well as data from other national and international facilities such as the Hubble Space Telescope. Similarly, theoretical and computational projects in astrophysics are available. The topics, to be selected jointly by the student and his/her adviser, can range from areas such as cosmology and the early universe, to galaxy formation, large-scale structure of the universe, quasars, black holes, stars, extra-solar planets, high-energy astrophysics, and plasma astrophysics. Interdisciplinary projects, including astronomy and education, science policy, planetary science, astrobiology, space science exploration, and more are possible.

**Senior Year.** In the senior year, in addition to course work, students carry out an extensive research project with a faculty adviser for their senior thesis. The thesis is completed by submitting the final written paper summarizing the work. There is a wide range of observational and theoretical topics available, including interdisciplinary projects as discussed above. The senior thesis work is frequently published as part of a scientific paper in an astrophysical journal. After the thesis has been completed and read by the adviser and an additional faculty member, the student presents an oral summary of the work, followed by an oral defense of the thesis.

**Senior Departmental Examination**

The thesis work and the oral defense, combined with a brief oral examination on general topics in astrophysics, compose the senior departmental examination.

**Preparation for Graduate Study**

The undergraduate program in the department provides an excellent preparation for graduate study in astrophysics, with concentrators frequently accepted at the top graduate schools in the country.

**Additional Courses:** See Course Offerings, especially for courses offered on a one-time-only basis.

**Courses**

**AST 203 The Universe Spring QR**

This specially designed course targets the frontier of modern astrophysics. Subjects include the planets of our solar system; the birth, life, and death of stars; the search for extrasolar planets and extraterrestrial life; the zoo of galaxies from dwarfs to giants, from starbursts to quasars; dark matter and the large-scale structure of the universe; Einstein's special and general theory of relativity, black holes, neutron stars, and big bang cosmology. This course is designed for the non-science major and has no prerequisites past high school algebra and geometry. High school physics would be useful. *A. Spitkovsky, C. Chyba, D. Spergel*
AST 204 Topics in Modern Astronomy         Spring STN
The birth and evolution of the stars; supernovae, neutron stars, and black holes; the formation, structure, and evolution of galaxies; cosmology, dark matter, dark energy, and the evolution of the universe from the Big Bang to today. Prerequisites: PHY 103 or 105 and MAT 103 or 104 or equivalent. Intended for students in the sciences. E. Ostriker

AST 205 Planets in the Universe          Fall STN
This is an introductory course in astronomy focusing on planets in our Solar System, and around other stars (exoplanets). The course starts with reviewing the formation, evolution and characterization of the Solar system. Following an introduction to stars, the course will then discuss the exciting new field of exoplanets; discovery methods, basic properties, earth-like planets, and extraterrestrial life. Core values of the course are quantitative analysis and hands-on experience, including telescopic observations. This STN course is designed for the non-science major and has no prerequisites past high school algebra and geometry. G. Bakos

AST 207 A Guided Tour of the Solar System (See GEO 207)

AST 255A Life in the Universe (See GEO 255A)

AST 255B Life in the Universe (See GEO 255B)

AST 301 General Relativity (also PHY 321)      Not offered this year STN
This is an introductory course in general relativity for undergraduates. Topics include the early universe, black holes, cosmic strings, worm holes, and time travel. Two 90-minute lectures. Prerequisites: MAT 201, 202; PHY 207, 208. Designed for science and engineering majors. J. Goodman

AST 303 Modeling and Observing the Universe: Research Methods in Astrophysics     Fall
Introduces students to the techniques that astrophysicists use to model and observe the universe. The course will prepare students in research methods that will be used in their independent work in astrophysics. The techniques covered will be useful for students concentrating in any of the natural sciences. Topics include methods of observational astronomy, instruments and telescopes, statistical modeling of data, and numerical techniques. Two 90-minute lectures. Prerequisites: PHY 103-104, or PHY 105-106, and MAT 103-104, or permission of instructor. M. Strauss, J. Greene

AST 309 Science and Technology of Nuclear Energy: Fission and Fusion (also MAE 309 / PHY 309 / ENE 309)    Not offered this year
Concern about climate change and improved operation of nuclear fission power plants are creating the potential for a 'renaissance' of nuclear fission power. The recent international agreement to construct a major fusion energy experiment ITER to demonstrate the scientific and technological feasibility of fusion is increasing interest in the practical application of fusion power. This course introduces the history, science, technology, and economics of both fission and fusion, with special emphasis on both societal risks, such as nuclear weapons proliferation, and societal benefits, such as reduced CO2 emissions. Two 90-minute lectures. R. Goldston
AST 374 Planetary Systems: Their Diversity and Evolution (See GEO 374)

AST 401 Cosmology (also PHY 401)  Not offered this year
Topics include the properties and nature of galaxies, quasars, clusters, superclusters, the large-scale structure of the universe, dark matter, dark energy, the formation and evolution of galaxies and other structures, microwave background radiation, and the evolution of the universe from the Big Bang to today. Two 90-minute lectures. Prerequisites: MAT 201, 202; PHY 207, 208. Designed for science and engineering majors. N. Bahcall

AST 403 Stars and Star Formation (also PHY 402)  Spring
Stars form by the gravitational collapse of interstellar gas clouds, and as they evolve, stars return some of their gas to the interstellar medium; altering its physical state and chemical composition. This course discusses the properties and evolution of the gaseous and stellar components of a galaxy; the physics of the diffuse and dense interstellar medium, the theory and observations of star formation; stellar structure; energy production and nucleosynthesis; stellar evolution; and stellar end states. Two 90-minute lectures. Prerequisites: MAT 202; PHY 207, 208. B. Draine, A. Burrows
Program in Biophysics

Director
William Bialek

Executive Committee
Robert H. Austin, Physics
William Bialek, Physics, Lewis-Sigler Institute for Integrative Genomics
David W. Tank, Molecular Biology, Princeton Neuroscience Institute
Ned S. Wingreen, Molecular Biology, Lewis-Sigler Institute for Integrative Genomics

Associated Faculty
Michael J. Berry II, Molecular Biology, Princeton Neuroscience Institute
Clifford P. Brangwynne, Chemical and Biological Engineering

Curtis G. Callan, Jr, Physics
Thomas Gregor, Physics, Lewis-Sigler Institute for Integrative Genomics
Andrew M. Leifer, Physics, Princeton Neuroscience Institute
H. Sebastian Seung, Computer Science, Princeton Neuroscience Institute
Joshua W. Shaevitz, Physics, Lewis-Sigler Institute for Integrative Genomics
Howard A. Stone, Mechanical and Aerospace Engineering
Haw Yang, Chemistry

Sits with Committee
Benjamin B. Machta, Lewis-Sigler Institute for Integrative Genomics

The Program in Biophysics is designed for students who are interested in bringing the intellectual traditions of physics to bear on the phenomena of life. In practice, this means taking courses that reach across the huge gulf between disciplines, and exploring the interface through junior and senior independent work. At Princeton, "biophysics" means much more than the application of methods from physics to the problems of biology; students are encouraged to appreciate that physicists and biologists ask different questions, and expect different kinds of answers. Current examples of this style of work range from the dynamics of single molecules to the networks of neurons responsible for perception and memory, from collective behavior in groups of organisms to the mechanics of single cells, and from information flow in genetic regulatory networks to evolution. As in all areas of physics, research in biophysics involves both theory and experiment.

Recent certificate students have concentrated in physics, some in molecular biology, and some in other departments. Students are encouraged to speak with the program director to find a program of study that builds on existing requirements in their home department.

Admission to the Program

Students are admitted to the program once they have chosen their field of concentration and consulted with the program director, who will assign them an adviser. Normally, they will have completed the freshman and sophomore prerequisites for their concentration.
Program of Study

Biophysics students develop a program in consultation with their adviser that consists of a core curriculum plus the necessary prerequisites, junior and senior independent work in biophysics, and electives. Because a sound training in mathematics is a prerequisite for successful performance in upperclass physics courses, at least one 300-level course in differential equations should be taken as early as possible.

Physics concentrators who enter the department via the traditional route (PHY 105/6 or 103/4 as freshmen) are encouraged to take MOL 214 or (preferably) 215 as early as possible, to have a clearer idea of the opportunities at the interface between physics and biology. To broaden their background, students must also take one 300- or 400-level course in the biological sciences. Most certificate students have also taken PHY 412 (Biological Physics) or the graduate course PHY 562 (Biophysics). Finally, students are encouraged to gain direct laboratory experience with biological systems, either by arranging to split their junior laboratory experience between PHY 312 and MOL 350 (by arrangement with the physics departmental representative), or by working in a biophysics laboratory on campus over the summers. For physics concentrators who enter the department via the Integrated Science curriculum (ISC 231-4 as freshmen), the sophomore course ISC 235/6 can serve as an introduction to the biological sciences. These students should use PHY 412 and/or 562 as electives to deepen their understanding of current work in the field.

Molecular biology concentrators who enter the department through the Integrated Science curriculum are encouraged to continue their physics education through PHY 203 or 205, and PHY 208, but most importantly through PHY 301 (Thermal Physics). This should provide the preparation required for PHY 412, and for serious independent work with physics content. Molecular biology concentrators who enter the department through the more traditional path are encouraged to take their introductory physics courses (PHY 103/4, or, preferably, 105/6) as early as possible, and to plan a curriculum that brings them to 300-level mathematics courses in the start of their junior year. These students should continue their physics education as described above.

Recognizing that biophysics is an interdisciplinary program whose excitement lies in the fluidity of the intellectual landscape, alternative programs of study may be arranged at the discretion of the program committee. Junior independent work in the physics department can be on two different topics in biophysics, or one in physics, the other in biophysics. Independent work for molecular biology concentrators should display a clear connection to the ideas, as well as the methods, of physics. Independent research topics are approved in advance by the program committee, in consultation with faculty advisers.

To qualify for the biophysics program certificate, a minimum B average must be attained in the program courses, and a B average in the independent work. Program courses may not be taken pass/D/fail.

Certificate of Proficiency

Students who fulfill all requirements of the program will receive a certificate of proficiency in biophysics upon graduation.

Program-related Courses. There are a variety of electives available to suitably prepared program members:

Applied and Computational Mathematics
514 Biological Dynamics (also EEB 514/MOL 514)

Chemistry
542 Principles of Macromolecular Structure
543 Advanced Topics in Structural Biology
306 Physical Chemistry: Chemical Thermodynamics and Kinetics
Certain 500-level courses, with the instructor's permission

Engineering
ELE 352 Physical Optics

Molecular Biology
400-level and certain 500-level courses, with the instructor's permission

Physics
412 Biological Physics
562 Biophysics, with the instructor's permission
The Center for the Study of Religion facilitates intellectual exchange and interdisciplinary study of religion among students and faculty. The center is especially interested in encouraging scholarship that examines religion or aspects of religion comparatively and in its diverse historical and contemporary manifestations through the lenses of the various humanities and social science disciplines. It supplements the curriculum of the Department of Religion by drawing students and faculty together from other departments and by fostering studies in which religion or the consequences of religion may be one of several components under investigation. One of the center's activities is to cosponsor freshman seminars and other occasional undergraduate courses. The center also offers two interdisciplinary seminars, Religion and Culture and Religion and Public Life that are open to upper-level
undergraduates with permission of the instructor. The center was founded in recognition of the fact that Princeton University includes among its faculty a number of uniquely qualified specialists throughout an exceptionally wide range of disciplines. It draws to students' attention the fact that more than 50 courses dealing with the historical development of religious traditions and their role in current affairs are regularly offered under the auspices of more than a dozen departments and programs.

The Center for the Study of Religion provides resources to faculty members throughout the University who may be interested in developing new courses or research interests. The center sponsors freshman seminars, lecture courses, and advanced seminars on topics significantly concerned with the study of religion. In addition, the center supports faculty who wish to plan interdisciplinary conferences, symposia, or guest speaker series focusing on topics related to religion such as ethics and biotechnology, Buddhist death practices, religion and sexuality, poverty and charity, religion and film, religion and neuroscience, and mysticism and modernity. These and other center-sponsored public lectures and conferences promote greater discussion about understanding of religion in higher education and in the wider society.

Through these various activities, students are encouraged to develop a better understanding of the interactions among religions and their social contexts and to pursue junior independent work and senior theses concerned with the ethical, social, and cultural contributions and implications of religion. The center has small amounts of funding available for juniors and seniors undertaking research projects in the study of religion. The center's staff, faculty, and associates are available for students seeking information about courses relevant to the study of religion in other departments and programs.

Information about undergraduate courses relevant to the interdisciplinary study of religion can be found on the center's website.
Department of Chemical and Biological Engineering

Chair
Athanassios Z. Panagiotopoulos

Assistant Professor
Clifford P. Brangwynne
Mark P. Brynildsen
José L. Avalos, also Andlinger Center for Energy and the Environment

Departmental Representative
A. James Link

Director of Graduate Studies
Celeste M. Nelson

Professor
Ilhan A. Aksay
Jay B. Benziger
Pablo G. Debenedetti
Yannis G. Kevrekidis
Bruce E. Koel
Lynn Loo
Celeste M. Nelson
Athanassios Z. Panagiotopoulos
Robert K. Prud'homme
Richard A. Register
William B. Russel
Stanislav Y. Shvartsman, also Lewis-Sigler Institute for Integrative Genomics
Sankaran Sundaresan

Associate Professor
A. James Link

Information and Departmental Plan of Study Prerequisites

The freshman program in engineering or its equivalent.

General Requirements

In order to qualify for the B.S.E. degree in the Department of Chemical and Biological Engineering, a student must satisfy the requirements of the School of Engineering and Applied Science and must choose courses during the sophomore, junior, and senior years to provide a core knowledge of chemical engineering and advanced knowledge in an area of concentration. The advanced science and core chemical engineering courses in the sophomore and junior years provide the fundamental tools of thermodynamics, transport processes, and reactor analysis. In the spring semester of the junior year, students take a laboratory-based course that utilizes core chemical engineering knowledge. In the senior year, students undertake an in-depth design analysis with state-of-the-art design and optimization tools. Students can tailor their specific interests in chemical and biological engineering by pursuing an area of concentration that culminates with a senior thesis project. The areas of concentration, reflective of the
practice of modern chemical engineering, include bioengineering and biotechnology; materials and product engineering; energy and environmental engineering; optimization, dynamics, and information technology; entrepreneurship and management; and science and engineering for new technologies. The chemical engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. Students with special interests should consult the section on special programs and options. Total courses: 36.

**Departmental Requirements**

**Chemical and Biological Engineering Core**

The nine courses listed below are required of all chemical and biological engineering majors:

- 245 Introduction to Chemical Engineering Principles
- 246 Thermodynamics
- 250 Separations in Chemical Engineering and Biotechnology
- 341 Mass, Momentum, and Energy Transport
- 346 Chemical Engineering Laboratory
- 441 Chemical Reaction Engineering
- 442 Design, Synthesis, and Optimization of Chemical Processes
- 451, 452 Independent Work or 454 Senior Thesis

Most students carry out a two-term senior thesis. Students must complete a two-term thesis for departmental honors. Students who elect one term of independent work are required to take an additional chemical engineering elective at the 300 level or above.

**Mathematics Requirement**

MAE 305 Mathematics in Engineering I

**Chemistry Requirement**

CHM 201 General Chemistry I, or CHM 207 Advanced General Chemistry: Materials Chemistry
CHM 202 General Chemistry II, or CHM 215 Advanced General Chemistry: Honors Course CHM 303
Organic Chemistry I: Biological Emphasis

**Molecular Biology Requirement**

MOL 214 Introduction to Cellular and Molecular Biology, or MOL 215 Quantitative Principles in Cell and Molecular Biology
Advanced Science Requirements

Advanced Chemistry. The advanced chemistry course provides a greater depth in the underlying science of chemistry. The course may be any 300-level-or-above chemistry course, including those cross-listed by the chemistry department. With the approval of the departmental representative, the advanced chemistry requirement may be selected from another science department.

Advanced Chemical Engineering. One advanced chemical engineering course is also required. This can be any 300-level-or-above course (excluding independent work) offered or cross-listed by the Department of Chemical and Biological Engineering.

Societal Impact Requirement

Of the seven required Humanities and Social Science electives, undergraduates in chemical and biological engineering must take at least one course in the Ethical Thought and Moral Values area (EM)

Program of Study

In addition to the requirements above, students are required to designate an area of concentration and take three courses from the approved lists below in that area of concentration. The senior independent work should also be undertaken within the area of concentration. In addition, students are required to take at least one course each from two of the advanced areas outside their area of concentration to provide technical diversity. (Note: An asterisk indicates one-time-only courses.)

ABET requires chemical engineering students to complete a minimum of 12 engineering topic courses. This is satisfied by completing the nine CBE core courses (including the double credit thesis), plus the following: the required advanced chemical engineering course, and at least two program electives chosen from CBE, CEE, COS, EGR*, ELE, MAE, MSE, or ORF that are on the approved list of courses in the areas of concentration.

*EGR courses that are non-credit do not count for this requirement.

Bioengineering and Biotechnology

CBE 419 Enzymes
CBE 423 Biologically Inspired Materials
CBE 432 The Cell as a Chemical Reactor
CBE 433 Introduction to the Mechanics and Dynamics of Soft Living Matter
CBE 438/MOL 438 Biomolecular Engineering
CBE 439 Quantitative Physiology and Tissue Design
CBE 440 The Physical Basis of Human Disease
CBE 443 Separations in Chemical and Biochemical Processes
CBE 447 Metabolic Engineering
CBE 573/ELE 573 Cellular and Biochemical Computing Systems
CHM 412 Applied Quantitative Analysis: Molecular Recognition
CHM 440 Drug Discovery in the Genomics Era
CHM 538 Topics in Biological Chemistry - Chemistry Tools to Study Biological Systems
CHM 542 Principles of Macromolecular Structure: Protein Folding, Structure and Design
CHM 543 Advanced Topics in Structural Biology: Neurodevelopmental Disorders from a Molecular Point of View
EEB 320/MOL 330 Molecular Evolutionary Genetics
EEB 325 Mathematical Modeling in Biology and Medicine
EEB 327/MOL327 Immune Systems: From Molecules to Populations

ENE 418/ CBE 418 Fundamentals of Biofuels
GEO 428 Biological Oceanography

ISC 326/EEB 326/MOL 326 Human Genomics: The Past, Present, and Future of the Human Genome
MAE 344 Introduction to Bioengineering and Medical Devices
MOL 340 Molecular and Cellular Immunology
MOL 342 Genetics
MOL 345/CHM 345 Biochemistry
MOL 348 Cell and Developmental Biology
MOL 408 Cellular and Systems Neuroscience
MOL 410 Introduction to Biological Dynamics
MOL 433/CBE 434 Biotechnology
MOL 434 Macromolecular Structure and Mechanism in Disease
MOL 435 Pathogenesis and Bacterial Diversity
MOL 437 Computational Neurobiology
MOL 448/CHM 448 Chemistry, Structure and Structure-Function Relations of Nucleic Acids
MOL 455/COS 455 Introduction to Genomics and Computational Molecular Biology
MOL 457 Computational Aspect of Molecular Biology
MOL 459 Viruses: Strategy and Tactics
MOL 523 Molecular Basis of Cancer
NEU 258/PSY 258 Fundamentals of Neuroscience
NEU 259a, 259b/PSY 259a, 259b Introduction to Cognitive Neuroscience
NEU 408/MOL 408/PSY 404 Cellular and Systems Neuroscience
NEU 437/MOL 437/PSY 437 Computational Neuroscience
PSY 406 Functional Neuroanatomy
PSY 407 Developmental Neuroscience
QCB 510/CBE 535 Modeling Tools for Cell and Developmental Biology

**Entrepreneurship and Management**
CBE 260/EGR 260 Ethics and Technology: Engineering in the Real World
CEE 334/ WWS 452/ ENV 334/ ENE 334 Global Environmental Issues
CEE 460 Risk Assessment and Management
CHV 331/ WWS 372 Ethics and Public Health
COS 432 Information Security
ECO 310 Microeconomic Theory: A Mathematical Approach
ECO 311 Macroeconomics: A Mathematical Approach

EGR 392 Creativity, Innovation, and Design
EGR 437/MAE 437/ELE 437 Innovation Process Leadership
EGR 492 Radical Innovation in Global Markets
EGR 494 Leadership Development for Business
EGR 495 Special Topics in Entrepreneurship
EGR 497 Entrepreneurial Leadership
ELE 491 High-Tech Entrepreneurship
ENV 324 Environmental Entrepreneurship
GEO 366/ENV 339/WWS 451/ENE 366 Climate Change: Scientific Basis, Policy Implications
ORF 245 Fundamentals of Engineering Statistics
ORF 335 Introduction to Financial Engineering
ORF 435 Financial Risk Management
WWS 327/CHM 443 Pharmaceutical Research and Health Policy

Energy and Environmental Technology
AST 309/MAE 309/PHY 309 Science and Technology of Nuclear Energy: Fission and Fusion
CBE 335 The Energy Water Nexus
CEE 207 Introduction to Environmental Engineering
CEE 304/ENE 304/ENV 300 Environmental Implications of Energy Technology
CEE 305/GEO 375/ENE 305 Environmental Fluid Mechanics
CEE 306 Hydrology
CEE 308 Environmental Engineering Laboratory
CEE 311/CHM 311/GEO 311 Global Air Pollution
CEE 334/WWS 452/ENV 334/ENE 334 Global Environmental Issues
CEE 471 Introduction to Water Pollution Technology
CEE 474/ENV 474 Special Topics in Civil and Environmental Engineering - Design and Construction of Environmental Sensors
CEE 477/ENE 477 Engineering Design for Sustainable Development
CHM 333/ENV 333 Oil to Ozone: Chemistry of the Environment
CHM 525/ENV 525 Production of Renewable Fuels and Energy
ECO 429 Issues in Environmental and Natural Resource Economics ELE 431 Solar Energy Conversion

ENE 418/ CBE 418 Fundamentals of Biofuels
ENV 201a, 201b Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, Energy
ENV 202a, 202b Fundamentals of Environmental Studies: Climate, Air Pollution, Toxics, and Water ENV 204 Global Warming: Causes, Consequences, Policy Responses

ENV 305 Topics in Environmental Studies- Hormonally Active Pollutants
ENV 324 Environmental Entrepreneurship
ENV 531/GEO 531/CEE 583 Topics in Energy and the Environment: Intro to Petroleum Engineering

ENE 414 Renewable Energy Systems
GEO 220a or 220b Weather and Climate
GEO 322 Biogeochemical Cycles and Global Change
GEO 363/CHM 331/ENV 331 Environmental Geochemistry: Chemistry of the Natural Systems
GEO 364/ CHM 364 Earth Chemistry: Majors Realms of the Planet
GEO 366/ENV 339/ WWS 451/ ENE 366 Climate Change: Scientific Basis, Policy Implications
GEO 418/CHM 418 Environmental Aqueous Geochemistry
GEO 423/CEE 423 Dynamic Meteorology
GEO 424/CEE 424/ENE 425 Introductory Seismology
GEO 470/CHM 470 Environmental Chemistry of Soils
MAE 328/EGR 328/ENV 328 Energy for a Greenhouse-Constrained World
MAE 424/ ENE 424 Energy Storage Systems
MAE 427 Energy Conversion and the Environment: Transportation Applications

Materials and Product Engineering
CBE 415/CHM 415 Polymers
CBE 422 Molecular Modeling Methods
CBE 423 Biologically Inspired Materials
CBE 433 Introduction to the Mechanics and Dynamics of Soft Living Matter
CBE 526/ CHM 527/ MSE 526 Surface Science: Processes and Probes
CEE 364 Materials in Civil Engineering
CHM 403 Advanced Organic Chemistry
CHM 409 Structural Solid State Chemistry
ELE 441 Solid-State Physics I
ELE 442 Solid-State Physics II
ELE 449 Materials and Solid-State Device Laboratory
GEO 378 Mineralogy
MAE 324 Structure and Properties of Materials
MAE 334 Materials Selection and Design
MSE 301 Materials Science and Engineering
MSE 302 Laboratory Techniques in Materials Science and Engineering

MSE 504/CHM 560/PHY 512/CBE 520 Monte Carlo and Molecular Simulation in Statistical Physics & Material Science
MSE 531/ELE 531 Introduction to Nano/Microfabrication

Optimization, Dynamics, and Information Technology
CBE 422 Molecular Modeling Methods
CBE 448 Introduction to Nonlinear Dynamics
CBE 520 Molecular Simulation Methods
CBE 527 Nonlinear and Mixed-Integer Optimization
COS 217 Introduction to Programming Systems
COS 226 Algorithms and Data Structures
COS 323 Computing for the Physical and Social Sciences
COS 333 Advanced Programming Techniques
COS 402 Artificial Intelligence
COS 424 Interacting with Data
EEB 355 Introduction to Statistics for Biology
ORF 245 Fundamentals of Engineering Statistics
ORF 307 Optimization
ORF 309/EGR 309/MAT 380 Probability and Stochastic Systems
ORF 311 Optimization Under Uncertainty
ORF 406 Statistical Design of Experiments
ORF 409 Introduction to Monte Carlo Simulation
ORF 411 Operations and Information Engineering
ORF 417 Dynamic Programming

Science and Engineering for New Technologies

Transport Phenomena
CBE 342/CBE 501 Fluid Mechanics
MAE 306/MAT 392 Mathematics in Engineering II
MAE 336 Viscous Flows MAE
423 Heat Transfer

Chemical Technology
CBE 421/CHM 421 Catalytic Chemistry
CHM 304 Organic Chemistry II: Foundations of Chemical Reactivity and Synthesis, or CHM 304b
Organic Chemistry II: Biological Emphasis
CHM 403 Advanced Organic Chemistry
CHM 305 The Quantum World
CHM 306 Physical Chemistry: Chemical Thermodynamics and Kinetics
CHM 403 Advanced Organic Chemistry
CHM 405 Advanced Physical Chemistry: Quantum Mechanics
CHM 406 Advanced Physical Chemistry: Chemical Dynamics and Thermodynamics
CHM 407 Inorganic Chemistry: Structure and Bonding
CHM 408 Inorganic Chemistry: Reactions and Mechanisms

Engineering Physics
PHY 203 Classical Mechanics A, or PHY 205 Classical Mechanics B
PHY 208 Principles of Quantum Mechanics
PHY 301 Thermal Physics
PHY 304 Advanced Electromagnetism
Electronic Materials Processing
ELE 206/COS 306 Introduction to Logic Design
ELE 208 Integrated Circuits: Practice and Principles
ELE 341 Solid-State Devices
ELE 342 Physical Principles of Electronic Devices
ELE 441 Solid-State Physics I

The advanced chemistry course requirement and the advanced chemical engineering course requirement can both be satisfied by electives in the areas of concentration.

Special Programs and Options. The flexibility built into the chemical and biological engineering curriculum provides an opportunity for students to obtain a thorough education in the fundamentals of chemical engineering science and at the same time pursue a cognate field (a track) such as biology, business, medicine, chemistry, or physics. Students simply elect as few or as many courses in the cognate field as they desire. While some students may concentrate all their electives in a single field, others may prefer to divide their time between two tracks--for example, chemistry and the biological sciences, or physics and mathematics. The following listing suggests the many tracks available.

Applied and Computational Mathematics: Elective courses in mathematics, modeling, and applications.

Applied Mathematics and Computer Technology: Elective courses in statistical studies, mathematics, electrical engineering, computer science, mechanical and aerospace engineering, and civil engineering and operations research.

Applied Physics: Elective courses in physics, mathematics, and chemical and biological engineering.

Biotechnology: Elective courses in chemical and biological engineering, molecular biology, and chemistry.

Business and Finance: Elective courses in decision theory, engineering administration, and economics.

Chemistry: Additional courses in chemistry and the biological sciences beyond those required in the regular program.

Energy Conversion and Resources: Elective courses with emphasis on conversion of energy as given by the Departments of Mechanical and Aerospace Engineering, Chemical and Biological Engineering, and Physics.

Environmental Studies: Elective courses in ecology and evolutionary biology, molecular biology, chemistry, chemical and biological engineering, and civil and environmental engineering.

Materials Science: Elective courses in materials science and engineering, mechanical and aerospace engineering, chemical and biological engineering, and civil and environmental engineering.

Premedical: Elective courses in ecology and evolutionary biology, molecular biology, and chemistry.
Princeton University offers several special programs called certificate programs. Unlike the tracks described above, these certificate programs have formal requirements. They are described elsewhere in this announcement (for example, see the programs in engineering physics, engineering biology, materials science and engineering, sustainable energy, and environmental studies).

### Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Offered</th>
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</thead>
<tbody>
<tr>
<td>CBE 201</td>
<td>An Introduction to Scientific Computing</td>
<td>Not offered this year QR</td>
</tr>
<tr>
<td>CBE 215</td>
<td>Quantitative Principles in Cell and Molecular Biology</td>
<td>(See MOL 215)</td>
</tr>
<tr>
<td>CBE 228</td>
<td>Energy Technologies in the 21st Century</td>
<td>(See MAE 228)</td>
</tr>
<tr>
<td>CBE 245</td>
<td>Introduction to Chemical Engineering Principles</td>
<td>Fall STN</td>
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<tr>
<td>CBE 246</td>
<td>Thermodynamics</td>
<td>Spring STN</td>
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<tr>
<td>CBE 250</td>
<td>Separations in Chemical Engineering and Biotechnology</td>
<td>Fall STN</td>
</tr>
<tr>
<td>CBE 260</td>
<td>Ethics and Technology: Engineering in the Real World</td>
<td>Fall EM</td>
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</tbody>
</table>

### CBE 201 An Introduction to Scientific Computing
An introduction to computer programming emphasizing numerical modeling and problem solving, including numerical integration, solution of systems of non-linear equations, and composition of high level macros for numerical work within spreadsheets. The programming environment is Visual Basic.NET, an object-oriented programming language that is accessible to beginner programmers and permits the rapid development of applications with a graphical user interface. Utilizes MATLAB data analysis, visualization, programming, and symbolic mathematics systems. Two lectures, one preceptorial. Prerequisite: MAT 103.  
*A. Panagiotopoulos*

### CBE 215 Quantitative Principles in Cell and Molecular Biology (See MOL 215)

### CBE 228 Energy Technologies in the 21st Century (See MAE 228)

### CBE 245 Introduction to Chemical Engineering Principles
Application of the principles of conservation of mass and energy to the design and analysis of chemical processes. Elementary treatment of single and multiphase systems. First law of thermodynamics for closed and open systems. Steady state and transient analysis of reacting and nonreacting systems. Two lectures, one preceptorial. Prerequisite: CHM 201.  
*L. Loo*

### CBE 246 Thermodynamics
Basic concepts governing the equilibrium behavior of macroscopic fluid and solid systems of interest in modern chemical engineering. Applications of the first law (energy conservation) and second law (temperature, entropy, reversibility) to open and closed systems. Thermodynamic properties of pure substances and mixtures. Phase equilibrium and introduction to reaction equilibrium. Introduction to the molecular basis of thermodynamics. Applications include thermodynamics of protein stability, the Earth's energy balance, energy conversion schemes, and the binding of ligands to proteins. Prerequisites: CBE 245 and MAT 201.  
*I. Aksay*

### CBE 250 Separations in Chemical Engineering and Biotechnology
Fundamental thermodynamic principles and transport processes that govern separations in biotechnology and chemical processing. Staged operations, such as distillation and chromatography, are developed based on coupling phase equilibrium with mass balances. Transport processes driven by electric fields, centrifugal fields, or hydrodynamics provide the basis for understanding ultracentrifugation, membrane process, and electrophoresis. Three lectures. Prerequisites: CBE 245 and CBE 246. MAE 305 and CHM 303 may be taken concurrently.  
*A. Link*

### CBE 260 Ethics and Technology: Engineering in the Real World (also EGR 260)
An examination of engineering as a profession and the professional responsibilities of engineers. The ethics of engineering will be considered through case studies (e.g., automobile safety, pollution control), and the social responsibilities of engineering will be distinguished from those of science and business. Quantitative decision-making concepts, including risk-benefit analysis, are introduced and weighed against ethical considerations to
compare technology options. Ethical conflicts between utilitarian theories and duty theories will be debated. Two lectures, one preceptorial, one film class. J. Benziger

CBE 305 Mathematics in Engineering I (See MAE 305)

CBE 341 Mass, Momentum, and Energy Transport Fall STN
Survey of modeling and solution methods for the transport of fluids, heat, and chemical species in response to differences in pressure, temperature, and concentration. Steady state and transient behavior will be examined. Topics include fluid statics; conservation equations for mass, momentum and energy; dimensional analysis; viscous flow at high and low Reynolds number; thermal conduction; convective heat and mass transfer, correlations; diffusion and interphase mass transfer. Working knowledge of calculus, linear algebra and ordinary differential equations is assumed. Prerequisites: CBE 245, CBE 246 & MAE 305. Can take MAE 305 concurrently. M. Brynildsen

CBE 342 Fluid Mechanics Not offered this year
Elements of fluid mechanics relevant to simple and complex fluids. Topics include macroscopic balances; derivation of differential balance equations and applications to unidirectional flows; treatment of nearly unidirectional flows through the lubrication approximation; introduction to turbulent flow; flow through porous media; capillary flows; dispersed two-phase flows; and hydrodynamic stability. Three lectures. Prerequisite: CBE 341. S. Sundaresan

CBE 346 Chemical Engineering Laboratory Spring STL
An intensive hands-on practice of engineering. Experimental work in the areas of separations, heat transfer, fluid mechanics, process dynamics and control, materials processing and characterization, chemical reactors. Development of written and oral technical communication skills. One lecture, two three-hour laboratories. Prerequisites: CBE 246 and CBE 341 or equivalents. B. Koel, R. Prud'homme, J. Benziger

CBE 351 Junior Independent Work Fall
Subjects chosen by the student with the approval of the faculty for independent study. A written report, examination, or other evidence of accomplishment will be required. A. Link

CBE 352 Junior Independent Work Spring
Subjects chosen by the student with the approval of the faculty for independent study. A written report, examination, or other evidence of accomplishment will be required. A. Link

CBE 415 Polymers (also CHM 415 ) Fall
Broad introduction to polymer science and technology, including polymer chemistry (major synthetic routes to polymers), polymer physics (solution and melt behavior, solid-state morphology and properties), and polymer engineering (overview of reaction engineering and melt processing methods). Three lectures. Prerequisites: CHM 301 or 303, which may be taken concurrently, and MAT 104, or permission of the instructor. R. Register
CBE 421 Catalytic Chemistry (also CHM 421 / ENE 421) Not offered this year
Concepts of heterogeneous catalysis applied to chemical processes. Major industrial processes based on heterogeneous catalysis, including ammonia synthesis, partial oxidation, petroleum refining, and environmental control. The major classes of heterogeneous catalysts, such as solid acids and transition metals, and the classes of chemical reactions catalyzed by these materials. Processing conditions and reactor design are considered. Fundamentals of surface reactivity will be explored. Two lectures. Prerequisite: CHM 303 organic chemistry. J. Benziger

CBE 423 Biologically Inspired Materials Not offered this year
Focuses on the pathways utilized by biological systems to produce hierarchically structured inorganic/organic nanocomposites such as bone, teeth, diatoms, and sea-shells. These structures form through template-assisted self-assembly, in which self-assembled organic materials (proteins, lipids, or both) serve as the structural scaffolding. The outcome is multifunctional composites with self-healing, sensing, and actuating properties. The course will critically evaluate the potential of biologically inspired materials in future applications. Two lectures, one preceptorial. I. Aksay

CBE 432 The Cell as a Chemical Reactor Not offered this year
Presents a framework for the analysis of cellular responses, such as proliferation, migration, and differentiation. Emphasis on mechanistic models of biotransformation, signal transduction, and cell-cell communication in tissues. Focuses first on unit operations of cell physiology transcription, translation, and signal transduction. Models of these processes will rely on tools of reaction engineering and transport. Process dynamics and control will then be used to analyze the regulatory structure of networks of interacting genes and proteins. One lecture. Prerequisites: MOL 214 and MAE 305 or their equivalents. S. Shvartsman

CBE 434 Biotechnology (See MOL 433)

CBE 438 Biomolecular Engineering (also MOL 438) Not offered this year
This course will focus on the design and engineering of biomacromolecules. After a brief review of protein and nucleic acid chemistry and structure, we will delve into rational, evolutionary, and computational methods for the design of these molecules. Specific topics to be covered include aptamers, protein and RNA-based switches and sensors, unnatural amino acids and nucleotides, enzyme engineering, and the integration of these parts via synthetic biology efforts. Three lectures. A. Link

CBE 441 Chemical Reaction Engineering Spring STN
Stoichiometry and mechanisms of chemical reaction rates, both homogeneous and catalytic; adsorption, batch, continuous flow, and staged reactors; coupling between chemical reaction rates and mass, momentum, and energy transport; stability; optimization of reactor design. Application to environmental and industrial problems. Two lectures, one preceptorial. Prerequisites: CBE 246 and CBE 341. J. Avalos

CBE 442 Design, Synthesis, and Optimization of Chemical Processes Fall STL
Introduction to chemical process flow-sheeting; process simulation design, sizing and cost estimation of total processes; process economics; introduction to optimization, linear programming, integer programming, and nonlinear programming; heat integration methods, minimum utility cost, minimum number of units, network optimization. Three lectures, one laboratory. Prerequisites: CBE 341, CBE 346, and CBE 441. Y. Kevrekidis
CBE 443 Separations in Chemical and Biochemical Processes  
Not offered this year
Separations of importance in biochemical and chemical processes emphasizing physical and chemical mechanisms. Topics include: membrane separations, chromatographic separations, crystallization, centrifugation, filtration, extraction, and adsorption. Three lectures. *R. Prud'homme*

CBE 445 Process Control  
Spring
A quantitative study of the principles of process dynamics and control. Dynamic behavior of chemical process elements; analysis and synthesis of linear feedback control systems with special emphasis on frequency response techniques and scalar systems. Two lectures. Prerequisite: MAE 305, which may be taken concurrently. *S. Sundaresan*

CBE 447 Metabolic Engineering  
Spring STN
Introduction to engineering metabolism. The objective of this course is to introduce students to current techniques and challenges within the field of metabolic engineering. Specific topics include introduction to metabolism, transcriptional regulation, signal transduction, flux balance analysis, and metabolic flux analysis. Designed for upper division students in engineering, chemistry, and molecular biology. Two lectures. Prerequisites: MOL 214 or MOL 215, or equivalent. *M. Brynildsen*

CBE 448 Introduction to Nonlinear Dynamics (also MAT 481)  
Not offered this year
An introduction to the phenomenology of nonlinear dynamic behavior with emphasis on models of actual physical, chemical, and biological systems, involving an interdisciplinary approach to ideas from mathematics, computing, and modeling. The common features of the development of chaotic behavior in both mathematical models and experimental studies are stressed, as is the use of interactive graphics to explore and analyze this behavior. Two lectures. Prerequisites: knowledge of linear algebra (MAT 204) and ordinary differential equations (MAE 305). *Y. Kevrekidis*

CBE 451 Senior Independent Work  
Fall
A one semester study of an important problem or topic in chemical and biological engineering. Projects may be experimental, computational, or theoretical. Topics selected by the students from suggestions by the faculty. Written report required. *A. Link*

CBE 452 Senior Independent Work  
Spring
A one semester study of an important problem or topic in chemical and biological engineering. Projects may be experimental, computational, or theoretical. Topics selected by the students from suggestions by the faculty. Written report required. *A. Link*

CBE 454 Senior Thesis  
Spring
A full year study of an important problem or topic in chemical and biological engineering culminating in a senior thesis. Projects may be experimental, computational, or theoretical. Topics selected by the students from suggestions by the faculty. Written thesis, poster presentation, and oral defense required. The senior thesis is recorded as a double course in the spring. Departmental permission required. *A. Link*
Department of Chemistry

Chair
Thomas W. Muir

Associate Chair
Martin F. Semmelhack

Departmental Representative
Robert P. L'Esperance

Director of Graduate Studies
Haw Yang

Professor
Andrew B. Bocarsly
Roberto Car
Robert J. Cava
Paul J. Chirik
John T. Groves
Michael H. Hecht
David W. C. MacMillan
Thomas W. Muir
Joshua D. Rabinowitz, also Lewis-Sigler Institute for Integrative Genomics
Herschel A. Rabitz
Gregory D. Scholes
Jeffrey Schwartz
Annabella Selloni
Martin F. Semmelhack
Erik J. Sorensen
Salvatore Torquato
Haw Yang

Associate Professor
Jannette L. Carey
Abigail G. Doyle

Assistant Professor
Nozomi Ando
Brad P. Carrow
Todd K. Hyster
Ralph E. Kleiner
Robert R. Knowles
Mohammed R. Seyedsayamdost

Lecturer with Rank of Professor
Paul J. Reider

Lecturer
Sonja A. Francis
Henry L. Gingrich
Michael T. Kelly
Anne M. Morel-Kraepiel
Robert P. L'Esperance
István Pelczer
Susan K. VanderKam
Chia-Ying Wang

Associated Faculty
Bonnie L. Bassler, Molecular Biology
Emily A. Carter, Mechanical and Aerospace Engineering, Applied and Computational Mathematics
Frederick M. Hughson, Molecular Biology
Bruce E. Koel, Chemical and Biological Engineering
Alexei Korennykh, Molecular Biology
Lynn Loo, Chemical and Biological Engineering
François Morel, Geosciences
Satish C. B. Myneni, Geosciences
Sabine Petry, Molecular Biology
Jeffry B. Stock, Molecular Biology
Information and Departmental Plan of Study

The Department of Chemistry offers a flexible program suitable for those who plan to attend graduate school, as well as for premedical students or those intending to pursue a career in secondary school teaching. A chemistry concentration is appropriate for anyone who desires a broad background of undergraduate training in science.

Advanced Placement

A student who received an Advanced Placement Examination score of 4 qualifies for one unit of advanced placement and is eligible to take CHM 215 Advanced General Chemistry-Honors. A student who received an Advanced Placement Examination score of 5 qualifies for two units of advanced placement and is eligible to take CHM 301 or 303. One term of advanced placement satisfies the B.S.E. chemistry requirement.

A departmental placement examination is given during Freshman Orientation Week for students who did not have an opportunity to take the Chemistry Advanced Placement Exam.

Prerequisites

Before entering the department, students are expected to complete:

1. One year of general chemistry: CHM 201/203/207 and 202/204, or one unit of advanced placement in chemistry and CHM 202 or CHM 215, or the equivalent (such as two units of advanced placement in chemistry)

2. Differential and integral calculus: MAT 103 and 104, or the equivalent advanced placement

3. One year of general physics: PHY 101 and 102, or 103 and 104, or 105 and 106, or equivalent credit

Prerequisite courses may not be taken using the P/D/F grading option.

The sophomore program of prospective chemistry concentrators should include one year of organic chemistry (CHM 301 and 302 or 303 and 304/304B). Note: Also see Integrated Science sequence below.

Early Concentration

A student who has been granted advanced placement credit in chemistry and has taken advanced courses in the subject during both terms of freshman year may be eligible for independent work in the sophomore year. Students interested in this option should contact the departmental representative in the spring of their freshman year.

Program of Study

University regulations require that, before graduation, students take eight courses, designated as departmental courses in their field of concentration. A chemistry concentrator may, with the approval of the departmental representative, use one or more non-introductory courses from other science departments, mathematics, and engineering as departmental courses.

Chemistry concentrators typically take more than eight courses that qualify as departmental.
Core Courses. Students must take three 300-, 400-, or 500-numbered courses in chemistry and at least one term of experimental laboratory instruction at Princeton as departmental core courses. These courses must include at least one term each of organic, physical, and inorganic chemistry. The experimental requirement may be fulfilled by taking either CHM 371, or MOL 350, or MSE 302, or PHY 311 or 312, or CHE 346, or QCB 301. Note: The experimental course must be completed by the end of the junior year.

Cognates. The remaining four departmental courses of the eight required by the University degree regulations can be in either chemistry or a cognate scientific area (e.g., molecular biology, engineering, geology, materials science, computer science, mathematics, or physics). Many courses in the sciences at the 300, 400, and 500 levels are approved as departmental courses. Courses are evaluated on a case-by-case basis. To qualify as a departmental, the course must have one or more prerequisites (i.e., be nonintroductory) and must have a strong chemistry component.

Physics/Mathematics. An understanding of chemistry requires a thorough background in physics and mathematics. Students majoring in chemistry should obtain a broad background in these subjects. In general, it is desirable to take courses in mathematics at least through multivariable calculus (MAT 201 or 203) and linear algebra (MAT 202 or 204). These courses may be counted as departmental courses. These mathematics courses are also required for professional certification. (See "Professional Certification in Chemistry," below.)

The program described above deliberately allows substantial flexibility and encourages a broad view of chemistry.

Independent Work

Junior Independent Work.

First-term program:

1. The Junior Colloquium: One evening each week throughout the fall term talks will be given by faculty members on topics not normally included in coursework. Junior chemistry concentrators and early concentrators are required to attend these sessions.

2. Juniors will be assigned to one of several reading groups. Over the course of the semester, every group will meet with three separate instructors, one for each of three four-week reading periods. Instructors will discuss current literature topics with the groups. At the end of each reading period, students will submit a critical analysis of a research article.

Reading group advisers are selected by the Junior Colloquia chairperson to give the student a broad sampling of faculty interests. The student's final term grade is calculated by the departmental representative using the grades on the three papers plus the individual's record of attendance at the evening colloquia.

Second-term program:

Each student will select a faculty adviser for spring independent work by the start of the spring semester. The student will meet regularly with the faculty adviser during the semester. At the end of the term, the student will submit a research proposal for the senior thesis. The student will summarize any preliminary experimental results. A student's final term grade is determined by the departmental representative in conjunction with the faculty adviser's evaluation.
Senior Independent Work. At the end of the junior year, each student selects a thesis adviser (who may or may not be the same as the adviser during the junior year). The adviser and the student will agree on a topic on which the student will undertake independent original research throughout both terms of the senior year. This project will consist largely of original research involving wet laboratory work and/or chemical theory. On or before the University deadline, a written thesis based on this research work must be submitted to the department. The thesis will be evaluated and ranked by a committee of eight professors, two each from the following four areas of study: inorganic chemistry, organic chemistry, physical chemistry, and biochemistry.

Grading note: The grades for the junior and senior independent work will comply with the University's grading guidelines.

Senior Departmental Examination

In May of the senior year, the department administers examinations produced by the American Chemical Society in order to fulfill University degree requirements. These examinations cover the fields of biochemistry and inorganic, organic, and physical chemistry. Preparation for these exams involves the following: (1) The biochemistry exam covers material presented in MOL 345. (2) The inorganic chemistry exam encompasses material from both CHM 407 and 408. (3) The organic chemistry exam spans a full year of coursework from either CHM 301/302 or CHM 303/304. (4) The physical chemistry exam includes material from both quantum chemistry (CHM 305 or 405) and thermodynamics (CHM 306 or 406). Seniors preselect and complete two of the four examinations for this requirement.

Study Abroad

The department encourages students to consider opportunities for study abroad in the spring term of the junior year. Requirements for the junior independent work program are then met at the foreign host institution. In addition, the student may elect to have the number of required departmental courses reduced by one cognate per semester abroad, assuming advanced approval of a chemistry-related course of study at the foreign institution. (This course may not be counted as one of the four required core courses.) Students considering study abroad are urged to discuss their plans with the departmental representative early in the planning stages to lay out coursework, obtain approvals, and set up junior independent work assignments.

Integrated Science Sequence

Completion of the ISC/CHM/COS/MOL/PHY 231, 232, 233, 234 series fulfills the general chemistry and physics prerequisites. For full course descriptions and more information, see the Integrated Science website.

Professional Certification in Chemistry. As specified by the American Chemical Society. Students intending to pursue a career in chemistry, whether directly after graduation or following a graduate program, may wish to pursue a course of study leading to professional certification by the American Chemical Society. This certification requires two semesters of organic chemistry (one each of CHM 301 and 302, or 303 and 304, or equivalent), two semesters of physical chemistry (normally, CHM 305 or 405, and 306 or 406), one semester of inorganic chemistry (normally, CHM 407 or 408), one semester of experimental chemistry (CHM 371), multivariable calculus (MAT 201 or 203), linear algebra (MAT 202 or 204), and exposure to biochemistry (typically, MOL 345). MOL/EEB 214 or MOL/EEB/CBE 215 satisfies the biochemistry requirement, but is not counted as a departmental course; some upper-level courses in molecular biology or one of several different advanced chemistry courses also satisfy the requirement.
Chemistry Outreach Program. Nothing serves to foster excitement about science more than well-planned chemical demonstrations and activities. Many chemistry faculty, staff, and students participate in programs for local schools, museums, community groups, and youth organizations. The Chemistry Outreach Program gives chemistry concentrators hands-on experience with demonstrations and presentations and the opportunity to increase interest in science in the schools and the community. After a brief series of training sessions, chemistry outreach students, in concert with faculty and staff, present programs for visitors to Princeton and at local schools, museums, or libraries. The training sessions emphasize effective presentation, safe practice, choice of age-appropriate activities, and coordination with local educational requirements. They include laboratory sessions in which students master demonstrations and activities tested by the department or by the American Chemical Society. Students may also develop or help to develop new demonstrations or activities, and they may help with other science programs, such as the New Jersey State Science Olympiad. Interested students should contact Dr. Kathryn Wagner, director.

Courses

CHM 201 General Chemistry I Fall STL
An introductory course. Principles of chemistry; understanding the world around us; structure and reactions of atoms and molecules; laboratory manipulations, preparations, and analysis. Fulfills medical school entrance requirements in general chemistry and qualitative analysis. Three lectures, one class, one three-hour laboratory. Open to those whose mathematics preparation is insufficient to qualify them for 203. M. Hecht, R. L'Esperance

CHM 202 General Chemistry II Spring STL
Continuation of 201. Principles of chemistry; introduction to chemical bonding and solid state structure; chemical kinetics, nuclear chemistry; descriptive inorganic chemistry; laboratory manipulations, preparations, and analysis. Fulfills medical school entrance requirements in general chemistry and qualitative analysis. Three lectures, one class, one three-hour laboratory. G. Chan, R. L'Esperance

CHM 203 Advanced General Chemistry I Not offered this year STL
The fundamental principles of chemistry; descriptive chemistry, molecular structure, and bonding. Lectures and demonstrations. Laboratory includes qualitative and quantitative methods in chemical analysis, as well as selected experiments in general chemistry. Fulfills medical school entrance requirements in general chemistry and qualitative analysis. Three lectures, one class, one three-hour laboratory. Staff

CHM 204 Advanced General Chemistry II Not offered this year STL
Continuation of 203. Topics in chemistry selected to illustrate fundamental principles; electrochemistry, chemical kinetics, bonding, and descriptive chemistry focusing on inorganic chemistry. Lectures and demonstrations. Laboratory includes qualitative and quantitative methods in chemical analysis, as well as selected experiments in general chemistry. Fulfills medical school entrance requirements in general chemistry and qualitative analysis. Three lectures, one class, one three-hour laboratory. Staff

CHM 207 Advanced General Chemistry: Materials Chemistry Fall STL
Introduction to the basic concepts of chemistry: stoichiometry, types of reactions, thermodynamics, quantum mechanics, and chemical bonding. Introduction to the structure, chemistry, and properties of technologically important materials: metals, semiconductors, ceramics, and polymers. Fulfills medical school requirements in general
chemistry and qualitative analysis. Three lecture hours, one class, one three-hour laboratory. R. L'Esperance, A. Bocarsly, R. Cava

**CHM 215 Advanced General Chemistry: Honors Course**  
**Spring STL**  
An intensive study of fundamental theoretical and experimental principles. Topics are drawn from physical, organic, and inorganic chemistry. For students with excellent preparation who are considering scientific careers. Fulfills medical school entrance requirements in general chemistry and qualitative analysis. Completion of 215 qualifies the student for 300-level courses and some 400-level courses after consultation with the instructor of the upper-level course. Three lectures, one class, one three-hour laboratory. P. Chirik, R. L'Esperance

**CHM 231 An Integrated, Quantitative Introduction to the Natural Sciences I** (See ISC 231)

**CHM 232 An Integrated, Quantitative Introduction to the Natural Sciences I** (See ISC 232)

**CHM 233 An Integrated, Quantitative Introduction to the Natural Sciences II** (See ISC 233)

**CHM 234 An Integrated, Quantitative Introduction to the Natural Sciences II** (See ISC 234)

**CHM 235 An Integrated, Quantitative Approach to Biochemistry and Neuroscience** (See ISC 235)

**CHM 236 An integrated, Quantitative Approach to Genetics and Genomics** (See ISC 236)

**CHM 255A Life in the Universe** (See GEO 255A)

**CHM 255B Life in the Universe** (See GEO 255B)

**CHM 301 Organic Chemistry I**  
**Not offered this year STL**  
An introductory course that covers the structures, properties, spectroscopy, and reactivity of organic compounds. Students will learn the mechanisms of organic chemistry and general principles through a combination of lectures and problemsolving in small groups. The course may be followed by 302 or 304. This course is appropriate for students in chemistry, biology, and premedical programs. Prerequisite: 201 and 202; or 203 (or 207) and 204; or 215; or a score of 5 on the AP Chemistry Exam. Three lectures, one three-hour laboratory. *Staff*

**CHM 302 Organic Chemistry II**  
**Not offered this year STL**  
Continuation of 301. The principles introduced in 301 are extended to the structures and reactions of more complex, often polyfunctional molecules. Small-group problemsolving is emphasized. This course is appropriate for students in chemistry, biology, and premedical programs. Prerequisite: 301. Three classes, one three-hour laboratory. *Staff*

**CHM 303 Organic Chemistry I: Biological Emphasis**  
**Fall STL**  
Introductory course devoted to the concepts of organic chemistry, including the structures, properties, and reactivity of simpler organic compounds. Emphasis on the mechanisms of organic chemistry; examples from biology when appropriate to illustrate the principles. The course should be followed by 304 in spring. Appropriate for students in biology or premedical programs. Prerequisite: 201 and 202; or 203 (or 207) and 204; or 215; or a score of 5 on the AP Chemistry Exam. Three lectures, one preceptorial, one three-hour laboratory. *M. Semmelhack, H. Gingrich*
Continuation of 303 (or 301). The concepts introduced in CHM 303 will be extended to the structures and reactions of more complex molecules, with an emphasis on how organic chemistry provides the framework for understanding molecular processes in biology. The fundamental concepts of organic chemistry will be illustrated, as often as possible, with examples drawn from biological systems. Prerequisite: 301 or 303. Three lectures, one preceptorial, one three-hour laboratory. 

E. Sorensen, R. Knowles, M. Semmelhack

CHM 305 The Quantum World Fall STN

Introduction to quantum mechanics, surveying applications in chemistry, physics, molecular biology, and molecular imaging. Computer-based tools will be emphasized. Prerequisites: CHM 202 or 204 or 215; MAT 102 or 104; PHY 101 or 102 or AP Physics. Three lectures, one preceptorial. 

G. Scholes, J. Yang

CHM 306 Physical Chemistry: Chemical Thermodynamics and Kinetics Spring STN

Introduction to chemical thermodynamics, statistical mechanics, and kinetics. Special emphasis on biological problems, including nerve conduction, muscle contraction, ion transport, enzyme mechanisms, and macromolecular properties in solutions. Three lectures. Prerequisites: 201 and 202, or 203 (or 207) and 204, or 215; MAT 104; PHY 101 and 102, or PHY 103 and 104; or instructor's permission. 

M. Kelly

CHM 311 Global Air Pollution (See CEE 311)

CHM 331 Environmental Geochemistry: Chemistry of the Natural Systems (See GEO 363)

CHM 333 Oil to Ozone: Chemistry of the Environment (also ENV 333 / GEO 333) Spring STN

The chemistry behind environmental issues, including energy consumption, atmospheric change, water consumption and pollution, food production and toxic chemicals. The course includes discussion of questions and problems, guest lectures, and a group project to construct an informational Web page. Prerequisites: a 200-level chemistry course or permission of instructor. 

F. Morel, A. Morel-Kraepiel

CHM 345 Biochemistry (See MOL 345)

CHM 364 Earth Chemistry: The Major Realms of the Planet (See GEO 364)

CHM 371 Experimental Chemistry Fall STL

Discusses the principles of experimental design, data acquisition, analysis and interpretation, and the presentation of experimental results. Students are exposed to a broad range of quantitative laboratory methods in preparation for thesis work in chemistry. Typical laboratory exercises include synthesis, physical characterization, spectroscopy, kinetics, thermodynamics, electronics, and instrument design. Lectures on experimental design, data analysis, interpretation, and presentation. Two lectures, two three-hour laboratories. 

M. Kelly, C. Wang

CHM 403 Advanced Organic Chemistry Fall STN

A selection of advanced topics in organic chemistry. Topics include reaction mechanisms, synthetic chemistry, chemistry of biologically important molecules. Selected biosynthetic pathways are compared and contrasted to synthetic approaches. Three lectures. Prerequisites: 301 and 302 (or 304); or, 303 and 304. 

J. Groves, P. Reider
CHM 405 Advanced Physical Chemistry: Quantum Mechanics Fall STN
Introduction to quantum theory, atomic and molecular structure, and spectroscopy. This course will emphasize the development of fundamental underlying principles and illustrative examples. Prerequisites: 202, 204, or 215; MAT 201 or 203 (required); MAT 202 or 204 (very helpful, even if taken concurrently); PHY 103 (may be taken concurrently) or AP Physics. Three lectures, one preceptorial. A. Selloni

CHM 406 Advanced Physical Chemistry: Chemical Dynamics and Thermodynamics Spring STN
Statistical thermodynamics, kinetics, and molecular reaction dynamics. Three lectures. Prerequisites: background in thermodynamics as developed in 202, 204, or 215; MAT 201 or equivalent. C. Wang

CHM 407 Inorganic Chemistry: Structure and Bonding Fall STN
Structural principles and bonding theories are discussed for the various classes of inorganic and organometallic compounds. Includes an introduction to the electronic structure of transition elements and ligand field theory. Prerequisites: 201 and 202, or 207 and 202, or 215, or advanced placement. Three lectures. S. VanderKam

CHM 408 Inorganic Chemistry: Reactions and Mechanisms Spring STN
Synthetic and mechanistic aspects of inorganic chemistry are presented; modern problems in inorganic chemistry are emphasized. Prerequisites: 201 and 202, or 207 and 202, or 215, or advanced placement. Three lectures. J. Schwartz

CHM 415 Polymers (See CBE 415)

CHM 418 Environmental Aqueous Geochemistry (See GEO 418)

CHM 421 Catalytic Chemistry (See CBE 421)
CHM 470 Environmental Chemistry of Soils (See GEO 470)
Department of Civil and Environmental Engineering

Chair
James A. Smith

Departmental Representative
Branko Glišić

Director of Graduate Studies
Eric F. Wood

Professor
Michael A. Celia
Peter R. Jaffé
Denise L. Mauzerall, also Woodrow Wilson School
Catherine A. Peters
Jean Hervé Prévost
George W. Scherer
James A. Smith
Eric F. Wood

Visiting Professor
Eden Fisher, Kenan Visiting Professor for Distinguished Teaching

Associate Professor
Sigrid M. Adriaenssens
Elie Bou-Zeid
Maria E. Garlock

Assistant Professor
Ian C. Bourg, also Princeton Environmental Institute
Maurizio Chiaramonte
Ning Lin
Claire E. White

Information and Departmental Plan of Study

Requirements for study in the Department of Civil and Environmental Engineering follow the general requirements for the School of Engineering and Applied Science and the University. The student's course of study is planned in consultation with the departmental representative and the academic adviser and requires a year-long thesis, which counts as two courses. The CEE curriculum is sufficiently flexible to provide opportunities for students to pursue certificate programs across the University, and to do study abroad in the junior year.

Program of Study

The department offers five sub-plan options: architecture and engineering, environmental engineering, geological engineering, structural engineering, and engineering and the liberal arts. In the freshman year, students should complete the mathematics basic science, computing, and writing requirements common to all B.S.E. programs. At the end of the freshman year, the student declares CEE as a major and selects one of the subplans. Course

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requirements include engineering science courses, engineering design courses, a senior thesis, and program electives. For all but the non-ABET accredited tracks, there are additional math and science requirements that are normally satisfied by taking MAE 305 Mathematics in Engineering, ORF 245 Fundamentals of Engineering Statistics and GEO 203 Fundamentals of Solid Earth Science. In total, a student's program of study must include a minimum of fourteen engineering courses, with the exception of students in the non-ABET accredited tracks.

The selection of a sub-plan provides a guide in the selection of program electives. A student's program electives must provide a coherent sequence in the student's area of interest. Approval is based on agreement from the advisor and the departmental representative. For a list of pre-approved electives, consult the CEE Academic Guide (The Yellow Book). In addition, all candidates for the B.S.E. degree are required to satisfy the general University and School of Engineering and Applied Science requirements.

**Architecture and Engineering.** Structural engineers should have a sensitivity to the setting and the form of structures such as bridges, towers, and long-span roofs. Studies in architecture give engineering students such a perspective. This program, offered jointly by the Department of Civil and Environmental Engineering and the School of Architecture, presents a unique opportunity to integrate engineering and architectural design by combining the curricula of the two schools. A certificate is awarded to all students who successfully complete the program. Students interested in this program must choose between two options, as described below.

**Architecture and Engineering: Structural Focus**

In the structures-focus option, the requirements include a strong emphasis on civil and environmental engineering. This track is designed for students who intend to become practicing engineers and may go to graduate school in architecture or engineering. This track is accredited by the Engineering Commission of ABET (www.abet.org) under the program in civil engineering. This track has architecture course requirements beyond the normal requirements in civil and environmental engineering.

*Engineering science requirements* (eight courses):

CEE 205 Mechanics of Solids
CEE 262A Structures and the Urban Environment
CEE 207 Introduction to Environmental Engineering, or CEE 302 Practical Models for Environmental Systems, or CEE 304 Environmental Implications of Energy Technologies, or CEE 306 Hydrology, or CEE 307 Field Ecohydrology
CEE 312 Statics of Structures
CEE 361 Matrix Structural Analysis and Introduction to Finite-Element Methods
CEE 364 Materials in Civil Engineering
CEE 365 Soil Mechanics
ARC 374 Computational Design or CEE 463 A Social and Multi-Dimensional Exploration of Structures

Engineering design requirements (two courses):

CEE 366 Design of Reinforced Concrete Structures
CEE 461 or 462 Design of Large-Scale Structures: Buildings/Bridges
Independent Work (two courses):
CEE 478 Senior Thesis (Counts as two courses) Track

Specific Requirements (three courses):
ARC 203 Introduction to Architectural Thinking
ARC 204 Introduction to Architectural Design
ARC Junior Independent Work (Fall)

Program elective requirements (one or more courses): Students in this sub-plan must take one more program elective and it must be an engineering course.

Architecture and Engineering: Architecture Focus

In the architecture-focus option, the requirements include a strong emphasis on architecture theory, history, and practice. This track is designed for students planning to do graduate work in architecture or to practice engineering in consultation with architects and planners. Students choosing this option do a senior thesis under the direction of advisers from both the School of Architecture and the Department of Civil and Environmental Engineering.

Engineering science requirements (six courses):
CEE 205 Mechanics of Solids
CEE 262A Structures and the Urban Environment
CEE 312 Statics of Structures or CEE 361 Matrix Structural Analysis and Introduction to Finite-Element Methods
CEE 364 Materials in Civil Engineering
ARC 311 Building Science and Technology: Building Systems
ARC 374 Computational Design or CEE 463 A Social and Multi-Dimensional Exploration of Structures

Engineering design requirements (two courses):
CEE 366 Design of Reinforced Concrete Structures
CEE 461 or 462 Design of Large Scale Structures: Buildings/Bridges

Independent Work (two courses)
CEE 478 Senior Thesis (Counts as two courses) Track

Specific requirements (six courses):
ARC 203 Introduction to Architectural Thinking
ARC 204 Introduction to Architectural Design
ARC 403 Topics in the History and Theory of Architecture
ARC 404 Advanced Design Studio
Program elective requirements (two courses): Students in this program must take two or more program electives, normally selected from a pre-approved list of courses in CEE, architecture and art.

**Environmental Engineering.** This track is designed for students who wish to pursue a career related to the environment, whether in engineering, law, business, public policy, hydrological, or health and epidemiological sciences, and for students who wish to continue on to advanced graduate studies in environmental engineering (or a related earth science discipline). Course work in environmental engineering focuses on analysis of a large range of environmental problems as well as engineering design of innovative solutions to these problems. This is done through a combination of course work in hydrological sciences, environmental sciences, and geology, applied to different environmental settings, and environmental engineering design. The environmental engineering track is closely linked to the Environmental Studies Program of the Princeton Environmental Institute. This track is accredited by the Engineering Commission of ABET (www.abet.org) under the program in Civil Engineering. Students normally take the following courses:

Engineering science requirements (eight courses):

CEE 205 Mechanics of Solids  
CEE 207 Introduction to Environmental Engineering  
CEE 302 Practical Models for Environmental Systems or CEE 304 Environmental Implications of Energy Technologies  
CEE 305 Environmental Fluid Mechanics  
CEE 306 Hydrology or CEE 307 Field Ecohydrology  
CEE 308 Environmental Engineering Lab  
CEE 311 Global Air Pollution  
CEE 364 Materials in Civil Engineering or CEE 365 Soil Mechanics

Engineering design (two courses):

CEE 471 Introduction to Water Pollution Technology  
CEE 477 Engineering Design for Sustainable Development

Independent Work (two courses):

CEE 478 Senior Thesis (Counts as two courses)

Program elective requirements (three courses): No more than one program elective can be at the 200 level. For the environmental engineering track, at least one of the program electives must be an engineering course.

**Geological Engineering.** Geological engineering is the application of science to problems and projects involving Earth, its physical environment, Earth materials, and natural resources. The curriculum, offered in cooperation with the Department of Geosciences, is specially designed for the student who wishes to build upon the freshman and sophomore mathematics and engineering courses as a basis for studies in the earth sciences. Typical areas of
concentration are water resources, engineering geology, earth resources, geotechnical engineering, geophysics, geochemistry, and atmospheres and oceans. This track is accredited by the Engineering Commission of ABET (www.abet.org) under the program in Civil Engineering. In addition to the general requirements of the School of Engineering and Applied Science, the following courses are required:

Engineering science requirements (eight courses):

CEE 205 Mechanics of Solids  
CEE 207 Introduction to Environmental Engineering or CEE 302 Practical Models for Environmental Systems  
CEE 304 Environmental Implications of Energy Technologies  
CEE 305 (GEO 375) Environmental Fluid Mechanics or CEE 311 (GEO 311) Global Air Pollution CEE 306 Hydrology or CEE 307 Field Ecohydrology  
CEE 308 Environmental Engineering Laboratory or GEO 300 Summer Course in Geologic Field Methods CEE 365 Soil Mechanics (lab), or CEE 370 (GEO 370) Sedimentology (field course)

One course selected from the following list:

CEE 360 (GEO 361) - Physics of the Ocean and Atmosphere  
GEO 363 Environmental Geochemistry  
GEO 366 - Current and Future Climate  
CEE 417 (GEO 417) - Environmental Microbiology  
GEO 418 - Environmental Aqueous Geochemistry  
CEE 424 (GEO 424) - Seismology  
GEO 430 - Climate and The Terrestrial Biosphere  
GEO 441 - Computational Geophysics  
GEO 470 - Environmental Chemistry of Soils  
GEO 499 - Environmental Change, Poverty and Conflict

Engineering design requirements (two courses):

CEE 471 (GEO 471) Introduction to Water Pollution Technology  
CEE 477 Engineering Design for Sustainable Development

Independent Work (two courses):

CEE 478 Senior Thesis (Counts as two courses)

Program elective requirement (three courses): No more than one program elective can be at the 200 level. For the geological engineering track, two of the three required program electives must be engineering courses.
**Structural Engineering.** Structural engineering is concerned with the analysis and design of civil engineering structures with an emphasis on buildings, bridges, stadiums, dams, and foundations. Particular emphasis is given to the design of these structures to resist earthquake and wind loads. The program is designed to meet the needs of students who are interested in continuing to advanced graduate studies or who plan to go into engineering practice and consulting. This track is accredited by the Engineering Commission of ABET (www.abet.org) under the program in Civil Engineering. Its basic aim is the preparation of flexible and innovative graduates who can address the novel problems of modern engineering. Students in this program have the chance to interact directly with some of the best design and consulting companies in structural engineering. Students normally take the following courses:

**Engineering science requirements (eight courses):**
CEE 205 Mechanics of Solids
CEE 262A Structures and the Urban Environment
CEE 207 Introduction to Environmental Engineering, or CEE 302 Practical Models for Environmental Systems, or CEE 304 Environmental Implications of Energy Technologies
CEE 306 Hydrology, or CEE 305 Environmental Fluid Mechanics, or CEE 307 Field Ecohydrology CEE 312 Statics of Structures
CEE 361 Matrix Structural Analysis and Introduction to Finite-Element Methods

Any two from:

CEE 308 Environmental Engineering Laboratory, CEE 364 Materials in Civil Engineering, or CEE 365 Soil Mechanics

**Engineering design requirements (two courses):**
CEE 366 Design of Reinforced Concrete Structures
CEE 461 or 462 Design of Large-Scale Structures: Buildings/Bridges

**Independent Work (two courses):**
CEE 478 Senior Thesis (Counts as two courses)

**Program elective requirements (three courses):** For the structural engineering track, three program electives are required and at least one must be an engineering course.

**Engineering and the Liberal Arts.** This program is designed for students who wish to obtain an engineering background as a foundation for a wide range of careers, such as medicine, law, public policy, visual arts, or engineering studies in materials, ethics, or history. Course work in this track should integrate engineering courses in a coherent manner with the topic of interest to the student. The track is designed to be rigorous, yet allow for a wide degree of flexibility in the course of studies.

All students in engineering and the liberal arts are required to take a minimum of six courses in engineering sciences that stress design and analytical methods in civil and environmental engineering. The program electives should form a coherent sequence of at least four courses in the student's area of interest, and junior independent research is strongly recommended as a program elective. This is followed by the senior thesis. In the junior independent
research and senior thesis, students should relate their topics of interest to engineering problems. Students normally take the following courses:

Engineering Science Requirement (six courses):

A minimum of six CEE courses, of which at least three should be at the 300 level or above. At least one of the 300-level courses has to have a laboratory component.

Program Electives (seven courses):

Seven program electives are required and these should include a coherent sequence of at least four courses in the student's area of interest, three of which should be at the 300 level or above.

Independent Work (two courses):
CEE 478 Senior Thesis (Counts as two courses)

Collectively the selection of engineering science requirements and electives should form a coherent program of study, which needs to be approved by the advisor. At least eight of these courses must be at the 300 level or above.

Study Abroad

Study abroad can be used to enhance and diversify the educational experience of departmental majors. Courses taken during foreign study may be preapproved for credit as departmental requirements by the departmental representative. Study abroad has served as a valuable option for junior independent work and in providing research material for the senior thesis. Students considering study abroad should consult with the departmental representative as early as possible.

Courses

**CEE 102A Engineering in the Modern World (also EGR 102A / MAE 102A)** Fall HA

Lectures and readings focus on bridges, railroads, power plants, steamboats, telegraph, highways, automobiles, aircraft, computers, and the microchip. Historical analysis provides a basis for studying societal impact by focusing on scientific, political, ethical, and aesthetic aspects in the evolution of engineering over the past two and a half centuries. The precepts and the papers will focus historically on engineering ideas including the social and political issues raised by these innovations and how they were shaped by society as well as how they helped shape culture. Two lectures, one preceptorial. *M. Littman*

**CEE 102B Engineering in the Modern World (also EGR 102B / MAE 102B)** Fall STL

Lectures and readings focus on bridges, railroads, power plants, steamboats, telegraph, highways, automobiles, aircraft, computers, and the microchip. We study some of the most important engineering innovations since the industrial revolution. The laboratory centers on technical analysis that is the foundation for design of these major innovations. The experiments are modeled after those carried out by the innovators themselves, whose ideas are
explored in the light of the social environment within which they worked. Two lectures, one three-hour laboratory.  

M. Littman  

CEE 105 Lab in Conservation of Art (also ART 105 / EGR 105)  
Not offered this year STL  
This course examines how environmental factors (acid, rain, ice, salts, biota) damage sculpture and monuments made of stone and masonry, paintings on wood, and sculptures in bronze. It examines campus buildings that illustrate each type of damage and uses a visit to the Cloisters Museum to learn how those medieval buildings are protected. Lectures on structure and properties of materials and mechanisms of attack. Labs include quantifying water movement through stone, damage from freezing and salts, strength of mortars, protective effects of sealants and consolidants, effect of moisture on wood. Two lectures and one three-hour laboratory.  

G. Scherer  

CEE 205 Mechanics of Solids  
Fall STN  
This course teaches fundamental principles of solid mechanics. Equilibrium equations, reactions, internal forces, stress, strain, Mohr's circle, and Hooke's law. Analysis of the stress and deformation in simple structural members for safe and stable engineering design. Axial force in bars, torsion in shafts, bending and shearing in beams, stability of elastic columns, strain transformation, stress transformation, circle of Mohr, combined loadings, design project. Two lectures, one class. Prerequisites: MAT 104, PHY 103.  

S. Adriaenssens  

CEE 207 Introduction to Environmental Engineering (also ENV 207) STN  
The course introduces the students to the basic chemical and physical processes of relevance in environmental engineering. Mass and energy balance and transport concepts are introduced and the chemical principles governing reaction kinetics and phase partitioning are presented. We then turn our focus to the application of these principles in environmental engineering problems related to water and air pollution. Two 80-minute lectures. Prerequisite: CHM 201 or MAT 104 or instructor's permission.  

I. Bourg  

CEE 208 Mechanics of Fluids (See MAE 222)  

CEE 242 The Experience of Modernity: A Survey of Modern Architecture in the West (See ART 242)  

CEE 262A Structures and the Urban Environment (also ARC 262A / EGR 262A / URB 262A / ART 262)  
Spring LA  
This course focuses on structural engineering as a new art form begun during the Industrial Revolution and flourishing today in long-span bridges, thin shell concrete vaults, and tall buildings. Through laboratory experiments students study the scientific basis for structural performance and thereby connect external forms to the internal forces in the major works of structural engineers. Students examine contemporary exemplars that are essential to the understanding of 21st century structuring of cities with illustrations taken from various cities in the U.S. and abroad. Two lectures, one preceptorial.  

M. Garlock  

CEE 262B Structures and the Urban Environment (also ARC 262B / EGR 262B / URB 262B)  
Spring STL  
This course focuses on structural engineering as a new art form begun during the Industrial Revolution and flourishing today in long-span bridges, thin shell concrete vaults, and tall buildings. Through laboratory experiments students study the scientific basis for structural performance and thereby connect external forms to the internal forces in the major works of structural engineers. Students examine contemporary exemplars that are essential to the
understanding of 21st century structuring of cities with illustrations taken from various cities in the U.S. and abroad. Two lectures, one three-hour laboratory. M. Garlock

CEE 263 Rivers and the Regional Environment Not offered this year QR
River basins are the fundamental frameworks for examining the natural environment and its interaction with the works of society. These works, exemplified by major dams, are the basis for the agricultural and industrial development of a modern society. The course will explore the history, science, and engineering of water resource development and the design of large-scale structures related to that development. Two lectures, one preceptorial. J. Smith

CEE 305 Environmental Fluid Mechanics (also GEO 375 / ENE 305) Not offered this year STN
The course starts by introducing the conservation principles and related concepts used to describe fluids and their behavior. Mass conservation is addressed first, with a focus on its application to pollutant transport problems in environmental media. Momentum conservation, including the effects of buoyancy and earth's rotation, is then presented. Fundamentals of heat transfer are then combined with the first law of thermodynamics to understand the coupling between heat and momentum transport. We then proceed to apply these laws to study air and water flows in various environmental systems, with a focus on the atmospheric boundary layer. E. Bou-Zeid

CEE 306 Hydrology Spring STN
Analysis of fundamental processes affecting the dynamics of the hydrologic cycle. These include precipitation, evaporation, infiltration, runoff, and groundwater flow. Governing equations will be developed and applications will be considered for a range of hydrologic systems. Concepts and techniques for design of water projects will also be covered. Students will be encouraged to solve problems in Matlab. Prior experience with Matlab is not required. Three lectures. Prerequisite: MAT 201, may be taken concurrently. J. Smith

CEE 307 Water, Energy, and Ecosystems (also EEB 305) Spring STL
This three-week course, offered as part of a four-course study abroad semester, takes place at Princeton University's Mpala Research Centre in central Kenya. The course will provide an introduction to the principles of hydrological sciences via the development and application of instrumentation for characterizing surface/subsurface hydrological dynamics in field settings. Lectures and field activities will address the theory of operation, design, and implementation of methods used to quantify hydrological patterns and processes. Prerequisite: MAT 201. K. Caylor

CEE 308 Environmental Engineering Laboratory Spring STL
Designed to teach experimental measurement techniques in environmental engineering and their interpretations. Analytical techniques to assess biodegradation of wastes, lake eutrophication, non-point source pollution, and transport of contaminants in surface and groundwater, as well as hydrologic measurements to determine river and groundwater discharges, and soil-moisture dynamics in response to precipitation events will be conducted. One three-hour laboratory plus one lecture per week. Prerequisites: CEE 303 and CEE 306 or Permission of Instructor. CEE 306 may be taken concurrently. P. Jaffé

CEE 311 Global Air Pollution (also CHM 311 / GEO 311 / ENE 311) Fall
The chemical and physical processes involved in the transformation, transport, sources, and sinks of air pollutants on local to global scales. Topics include photochemical smog, particulate matter, greenhouse gases, and stratospheric ozone depletion. Students will have the unique opportunity to analyze chemical and physical data acquired in real-time from the NSF Gulfstream-V research aircraft as it probes the atmosphere from the Earth's
surface to the lower stratosphere over a latitudinal range from the Arctic to the Antarctic. A wide range of environments will be studied, from very clean, remote portions of the globe to urban megacities. M. Zondlo

CEE 312 Statics of Structures Spring STN
Presents the fundamental principles of structural analysis, determination of internal forces, and deflections under the static load conditions, and introduces the bending theory of plane beams and the basic energy theorems. The theory of the first order will be developed for continuous girders, frames, arches, suspension bridges, and trusses, including both statically determinate and indeterminate structures. Basic principles for construction of influence lines and determination of extreme influences will be presented. Two lectures, one preceptorial. Prerequisite: CEE 205. B. Glisic

CEE 323 Modern Solid Mechanics (See MAE 223)

CEE 334 Global Environmental Issues (also WWS 452 / ENV 334 / ENE 334) Spring STN This course examines a set of global environmental issues including population growth, ozone layer depletion, climate change, air pollution, the environmental consequences of energy supply and demand decisions and sustainable development. It provides an overview of the scientific basis for these problems and examines past, present and possible future policy responses. Individual projects, presentations, and problem sets are included. Prerequisites: AP Chemistry, CHM 201, or permission of instructor. D. Mauzerall

CEE 360 Earth's Atmosphere (See GEO 361)

CEE 361 Matrix Structural Analysis and Introduction to Finite-Element Methods (also MAE 325) Fall QR

CEE 362 Structural Dynamics and Earthquake Engineering Not offered this year STN
Analysis of forces and deformations in structures under dynamic loads. Idealization as discrete parameter systems. Single and multiple degrees of freedom. Response analysis under free vibration, harmonic, impulsive and random dynamic loads. Time and frequency domains. Earthquake phenomena from the engineering point of view. Seismic waves and power spectra. Measurement of strong ground motion. The concepts of response spectra, structural response to earthquakes, design criteria, and seismic safety. Prerequisite: 361 or instructor Staff

CEE 364 Materials in Civil Engineering (also ARC 364) Spring STL
Lectures on structure and properties of building materials including concrete (conventional and low CO2), steel, asphalt and wood; fracture mechanics; strength testing; mechanisms of deterioration (corrosion; freeze-thaw cycles, pollution). Labs on brittle fracture, heat treatment of steel, strength of concrete, mechanical properties of wood. Prerequisites: CEE 205 C. White, G. Scherer
CEE 365 Soil Mechanics  Not offered this year
General introduction to physical and engineering properties of soils. Soil classification and identification methods. Soil exploration, sampling, and in situ testing techniques. Permeability, seepage, and consolidation phenomena. Bearing capacity, equations, stress distributions and settlements. Slope stability and lateral pressures. Prerequisite: CEE 205 or permission of instructor. J. Prévost

CEE 366 Design of Reinforced Concrete Structures  Fall STN

CEE 370 Sedimentology (See GEO 370)

CEE 375 Independent Study  Fall
Independent Study in the student's area of interest. The work must be conducted under the supervision of a faculty member and must result in a final paper. Permission of advisor and instructor are required. Open to sophomores and juniors. Must fill out Independent Study form. C. Peters

CEE 376 Independent Study  Spring
Independent research in the student's area of interest. The work must be conducted under the supervision of a faculty member, and must result in a final paper. Students must obtain prior approval of a faculty member to serve as research advisor, and Hand in to E-211 E-Quad the Independent Research Proposal Project form signed by your advisor & the dept rep. Open to sophomores and juniors. C. Peters

CEE 417 Environmental Microbiology (See GEO 417)

CEE 423 Dynamic Meteorology (See GEO 423)

CEE 424 Introductory Seismology (See GEO 424)

CEE 455 Mid-Infrared Technologies for Health and the Environment (See ELE 455)

CEE 460 Risk Analysis  Spring QR

CEE 461 Design of Large-Scale Structures: Buildings  Spring STN
This course will focus on the structural design of buildings and is open to students of engineering and of architecture who meet the prerequisites. The course will culminate in a major building design project incorporating knowledge and skills acquired in earlier course work. Structural design is considered from concept development to the completion of detailed design while incorporating appropriate engineering standards and multiple realistic...
constraints. Not Open to Freshmen. Prerequisites: both CEE 312 and CEE 366, or permission from the instructor.

Staff

CEE 462 Design of Large-Scale Structures: Bridges Not offered this year STN
The design of bridges is considered from the conceptual phase up to the final design phase. The following issues are addressed in this course: types of bridges, design codes, computer modeling of bridges, seismic analysis and design, seismic retrofit design, inspection, maintenance and rehabilitation of bridges, movable bridges, bridge aerodynamics, organization of a typical engineering firm, marketing for engineering work. Several computer codes are used in this course. Prerequisite: CEE 366 or CEE 361, or instructor's permission. Staff

CEE 463 A Social and Multi-Dimensional Exploration of Structures (also LAS 463) Fall
The class has pedagogical objectives related to the spatial relations of dimensions and time (sustainability and society). It develops the students' skills in drawing, model making, writing, oral communication, and advanced engineering analysis. The course is focused on a study of one theme that changes every year. Two three-hour studios per week with lectures included. Prerequisites: both CEE 205 and CEE 312. M. Garlock, I. Payá-Zaforteza

CEE 471 Introduction to Water Pollution Technology (also GEO 471 / URB 471) Fall STN An introduction to the science and engineering of water quality management and pollution control in natural systems; fundamentals of biological and chemical transformations in natural waters; identification of sources of pollution; water and wastewater treatment methods; fundamentals of water quality modeling. Two 90-minute lectures and field trips. Open to Juniors and Seniors Only. Prerequisites: Student should have some background in chemistry and an interest in water pollution problems. P. Jaffé

CEE 472 Hydrometeorology and Remote Sensing Not offered this year STN
The structure and evolution of precipitation systems are examined, including the dynamical and microphysical processes that control the spatial and temporal distribution of precipitation. The fundamentals of remote sensing of aerosols, clouds and precipitation are introduced. Related topics in hydrology and hydraulics are covered. Three lectures. Prerequisite: instructor's permission. J. Smith

CEE 474 Special Topics in Civil and Environmental Engineering (also ENV 474) Not offered this year STN
This class is an introduction to physical computing using the Arduino platform, with the goal of developing environmental sensors that talk to the internet over cellular networks. You will learn to develop computer code and wire electronics, as well as learn the nuts and bolts of the internet, including Linux utilities, MySQL, Python, and SMS. Not Open to Freshmen. K. Caylor

CEE 477 Engineering Design for Sustainable Development (also ENE 477) Fall STN
Students will design several features of a LEED-certified building project. Features that will be considered include ground source heat pumps; ventilation; photovoltaics (PV); insulation; glazing; green materials; and storm water management systems, including a green roof, porous parking lots, and the gray water usage. Ventilation will be designed considering the potential for vapor emissions from building materials. Energy software will be used to determine the carbon footprint of alternative designs. Two 90-minute lectures. Prerequisite: CEE 303 or equivalent with instructor's permission. Open to Seniors and Graduate students only. R. Harris

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CEE 478 Senior Thesis Fall/Spring
A formal report on research involving analysis, synthesis, and design, directed toward improved understanding and resolution of a significant problem in civil and environmental engineering. The research is conducted under the supervision of a faculty member, and the thesis is defended by the student at a public examination before a faculty committee. The senior thesis is equivalent to a year-long study and is recorded as a double course in the spring. C. Peters
Information and Departmental Plan of Study

Three programs of study are offered within the Department of Classics. The first, Classics, uses knowledge of Greek or Latin (or both languages) as a gateway to the study of the literature, history, and culture of ancient Greece and Rome. The second, Classical Studies, allows for the study of different aspects of a specific period or facet of classical civilization and its impact; it does not initially require knowledge of Greek or Latin. The third, Ancient History, focuses on the history of the ancient world, with special attention to historical method and comparative approaches; it does not initially require knowledge of Greek or Latin.

Program 1. Classics

Prerequisites

To enter this program, a student normally should have completed CLG 108 or LAT 108 or demonstrated intermediate proficiency in Greek or Latin through test scores (SAT, AP), a placement exam, or coursework. A strongly motivated student who has completed CLG 102 or LAT 102 (or CLG 103 or LAT 103) may concentrate, with permission of the departmental representative.
Program of Study

Eight departmental courses are required. Of these, five must be in the original languages at the 200 level or above, including at least one course at the 300 level. The combination of LAT 104-108, or CLG/LAT 105108, may be counted as the equivalent of one 200-level course. One course in ancient history (CLA 214, 216, 217, 218, or 219, or HIS 343) must also be included among the departmentals. Students must also take the Junior Seminar in the fall of their junior year.

Students may count, among the eight departmentals, up to two courses not requiring the use of Greek or Latin (in addition to the course in ancient history). These courses may be offered by the department or, with the approval of the departmental representative, they may be courses in other departments that deal with aspects of Greek and Roman civilization (see examples below).

Students are expected to pass a sight translation examination from Greek or Latin. This examination may be taken, by arrangement, at the end of any term in the junior or senior year; it will be graded pass/fail.

Students who are considering further work in the field, either in graduate school or in independent study, should take both Latin and Greek to the 300 level, continuing with both languages in each term of the junior and senior years. Such students are also strongly advised to take at least one course in Greek history and one in Roman history in their underclass years.

Students concentrating in Classics have the opportunity to study in depth one or more of the areas listed below.

Greek or Latin Literature. Literary texts form the core of the study of the classical world, and the majority of concentrators are likely to plan their program of study around literature. In addition to the many courses offered in Greek and Latin, the department offers a number of courses on literature in translation, including CLA 212: Classical Mythology; CLA 323: Self and Society in Classical Greek Drama. COM 205: The Classical Roots of Western Literature also treats many Greco-Roman works.

Ancient History. In addition to survey courses in Greek and Roman history (CLA 216, 217, 218, 219), the department offers courses on the ancient historians in the original language and advanced seminars on selected historical topics (CLA 326, 327). Also available: CLA 214: The Other Side of Rome; CLA 324: Classical Historians and Their Philosophies of History; CLA 325: Roman Law; CLA 329: Sex and Gender in the Ancient World; NES 220: Jews, Muslims, and Christians in the Middle Ages; NES 331: The Ancient Near East.

Classical Philosophy. Courses are offered in both Greek and Latin and in translation, including CLA 205: Introduction to Ancient Philosophy; PHI 300: Plato and His Predecessors; and PHI 301: Aristotle and His Successors.

Classical Art and Archaeology. ART 202: Greek Art: Ideal Realism; ART 203: Roman Art; ART 300: Greek Archaeology of the Bronze Age; ART 301: The Art of the Iron Age: The Near East and Early Greece; ART 302: Myths in Greek Art; ART 306: Classical Athens: Art and Institutions; ART 308: Roman Cities and Countryside: Republic to Empire.
Medieval Studies. In addition to courses in Medieval Latin (LAT 232), the following are offered: HIS 343: The Civilization of the Early Middle Ages; HIS 344: The Civilization of the High Middle Ages; MED 227: The World of the Middle Ages; POL 301: Ancient and Medieval Political Theory; and ART 205: Medieval Art in Europe.

Studies in the Reception of Classical Antiquity. Courses are offered on the later reception of classical antiquity, including CLA 334: Modern Transformations of Classical Themes; CLA 335: Studies in the Classical Tradition.

Independent Work

Junior Seminar. During the fall of the junior year, all majors must take the Junior Seminar (CLA 340). The course introduces students to different fields of study within the department, including literature, ancient history, ancient culture, linguistics, and reception studies. Students will gain experience in the methods of their chosen area(s) of study while acquiring an understanding of the history of the discipline and its place in the 21st century. Students will also acquire the skills necessary to pursue junior and senior independent work. Students who are abroad during the fall of their junior year can complete the Junior Seminar during the fall semester of their senior year.

Junior Independent Work. In the fall term, each student researches and writes a paper of 15 to 20 pages on a topic of their choosing under the direction of a faculty adviser. The Junior Seminar will provide guidance in choosing a topic, structuring an outline, writing, and revising. In the spring term, students undertake a more ambitious research paper of 20 to 25 pages. Each student again works closely with a member of the faculty on the project, meeting regularly over the course of the spring term for discussion and analysis.

Senior Independent Work. At the end of the second term of the junior year, a departmental student is advised to select the subject of the senior thesis after consultation with the departmental representative. The thesis in its final form must be submitted to the department by April 15 of the senior year.

Senior Departmental Examination

Students are expected to pass the senior comprehensive examination on Greek and Roman literature, history, and culture. They will have the opportunity to write on either or both civilizations.

Study Abroad

Travel and study in the Mediterranean are important parts of a classical education. The department strongly encourages its students to participate in one of the many programs available. Many departmental students spend one term of junior year at the Intercollegiate Center for Classical Studies in Rome. The center offers instruction in classical languages, presents lectures on ancient literature and history, and sponsors a series of trips to important museums and archaeological sites. Instruction is in English by American faculty members, and the curriculum is integrated with the Princeton undergraduate program. Equally valuable is the summer program at the American School of Classical Studies in Athens.

The department has some funds to help meet the expenses of such summer study, and additional assistance may be available through the Program in Hellenic Studies.
Summer Study. Students who would benefit from intensive work in the languages may apply for financial assistance to study at a Greek or Latin institute.

Certificate in Language and Culture

Students pursuing a concentration other than Classics, Classical Studies, or Ancient History may still demonstrate their command of one or both of the classical languages and cultures by working for certificates in Greek and/or Roman language and culture. The requirements are:

1. Three Greek and/or Latin courses, of which one may be at the 200 level and the others must be at the 300 level.

2. A piece of independent work. This can be satisfied in several ways: (a) by a substantial paper growing out of one of the courses taken to fulfill the certificate requirement (this will be in addition to the work required in the course); (b) by a substantial paper on a topic agreed upon with an instructor in the department and approved by the program; or (c) with the agreement of the home department and the program, by a piece of independent work that will satisfy the requirements of both home department and program. As a substitute for this requirement, students may take either an additional course in their language at the 200 or 300 level or a CLA course focusing on the culture of their certificate program.

To enter either certificate program, students must file a written application with the Department of Classics before October 1 of their senior year.

Preparation for Graduate Study

Students should be aware that most graduate programs in Classics will demand a more extensive training in the ancient languages than these minimum requirements. Those considering going on to graduate school should plan to do additional work in Greek and Latin either during their time at Princeton or through a post-baccalaureate program.

Certificate in Hellenic Studies. Students who wish to study the literature and civilization of ancient, Byzantine, and modern Greece may find of interest the certificate Program in Hellenic Studies. The program's plan C provides a diachronic study of the Hellenic tradition from antiquity to the present.

The department offers courses in the following areas:

Courses taught through English translations, designated classics (CLA)
Courses in Greek (CLG) and Latin (LAT)
Courses in modern Greek (MOG)

Program 2. Classical Studies

This program offers the opportunity for sustained and focused inquiry into the history, literature, and culture of the ancient Mediterranean, as well as the impact of classical antiquity on later periods by using a variety of interpretative methods. The particular program for each student is determined in collaboration with the departmental representative.
and/or a faculty adviser. The focus can be on a specific disciplinary subfield (e.g., ancient politics) or on a particular period to be explored from a number of perspectives (e.g., the history, literature, and art of Imperial Rome). Each program must have a methodological component designed to introduce the student to techniques of analysis appropriate to the student's particular interests. This component of the program is satisfied by two comparative or methodological courses, the subject matter of which is concerned primarily with the classical world. These courses are chosen by each student in consultation with a faculty adviser and/or the departmental representative and must be preapproved by the departmental representative.

**Prerequisites**

One course from the list below (which may be taken during the spring semester of the sophomore year) or a comparable one-time-only course. A second course in addition to the prerequisite is strongly recommended as well, but this course can count as one of the six departmentals focusing on classical civilization. A freshman seminar on a classical subject may count as a prerequisite, but may not be used as a departmental.

Applicants to this program of study must submit to the departmental representative by April 15 a statement defining a field of concentration (e.g., Latin Epic, Greek History, Late Antique Culture) and a list of prospective courses. Given the range of possible interests each applicant may bring to the study of the ancient world, there is no set list of fields of concentration, and faculty members can give additional guidance in preparing a program of study.

**Program of Study**

The specific courses to be taken by each student must form a coherent program of study. Whatever the individual concentration, each student's program must contain eight departmentals and the Junior Seminar.

Six of these courses must focus in whole or in part on classical civilization or its influence (see the list below). At least three of these courses must be taught in the Department of Classics (CLA, CLG, or LAT). Courses taken during the freshman and sophomore years beyond the prerequisite may count toward this requirement if they are appropriate to the student's overall program. Students must also take the Junior Seminar in the fall of their junior year.

Two courses must fulfill the comparative/methodological component of the program of study. The aim of this requirement is to introduce students to new perspectives and new tools of inquiry for exploring their chosen subject. There is no set list, since different courses will be appropriate to different interests. These courses must be preapproved by the departmental representative to count as part of the student's program.

Each student must successfully complete either Ancient Greek or Latin to the level of 108 or achieve an equivalent level of knowledge, as demonstrated through test scores (SAT, AP), a placement exam, or coursework (including through a summer language program). However, at least one language course must be taken at Princeton.

Students should be aware that most graduate programs in Classics will demand a more extensive training in the ancient languages than these minimum requirements. Those considering going on to graduate school should plan to do additional work in Greek and Latin either during their time at Princeton or through a post-baccalaureate program.
Independent Work

Junior Seminar. During the fall of the junior year, all majors must take the Junior Seminar (CLA 340). The course introduces students to different fields of study within the department, including literature, ancient history, ancient culture, linguistics, and reception studies. Students will gain experience in the methods of their chosen area(s) of study while acquiring an understanding of the history of the discipline and its place in the 21st century. Students will also acquire the skills necessary to pursue junior and senior independent work. Students who are abroad during the fall of their junior year can complete the Junior Seminar during the fall semester of their senior year.

Junior Independent Work. In the fall term, each student researches and writes a paper of 15 to 20 pages on a topic of their choosing under the direction of a faculty adviser. The Junior Seminar will provide guidance in choosing a topic, structuring an outline, writing, and revising. In the spring term, students undertake a more ambitious research paper of 20 to 25 pages. Each student again works closely with a member of the faculty on the project, meeting regularly over the course of the spring term for discussion and analysis.

Senior Independent Work. At the end of the second term of the junior year, a departmental student is advised to select the subject of the senior thesis after consultation with a departmental faculty committee. The thesis in its final form shall be submitted to the departmental representative by April 15 of the senior year.

Senior Departmental Examination

An examination designed by the thesis adviser, and intended to cover the entirety of the student's program of study, is taken at the end of the spring semester of the senior year.

Preparation for Graduate Study

Students should be aware that most graduate programs in Classics will demand a more extensive training in the ancient languages than these minimum requirements. Those considering going on to graduate school should plan to do additional work in Greek and Latin either during their time at Princeton or through a post-baccalaureate program.

Program 3. Ancient History

The program offers students a pathway to explore the history of ancient Greece and Rome and their relationships with the neighboring cultures of the Near East, Europe, and Africa. It is also ideal for students interested in acquiring training in the academic discipline of history while concentrating on the period spanning the Late Bronze Age (ca. 1700 B.C.E.) to the early medieval and Byzantine worlds (ca. 600 C.E.). Although students may specialize in a particular field of history (political, social, economic, cultural), geographic area, or historical period of antiquity, the aim of the program is to provide a wellrounded training in the field of history, with a focus on ancient history. Students must take courses on both Greece and Rome, one course on a nonclassical premodern civilization, and at least one course on material culture, and develop intermediate-level proficiency in classical Latin and/or Greek. An additional course that introduces students to the main methods, theories, and philosophies of history is also strongly encouraged.
Prerequisites

One course from the list below (courses that can serve as prerequisites or satisfy requirement).

Program of Study

Eight departmental courses are required. These must include one survey course on ancient Greek history (CLA 216, CLA 217) and one survey course on Roman history (CLA 218, CLA 219); two seminars at the 300 level focusing on ancient history (e.g., CLA 324: Classical Historians and Their Philosophies of History; CLA 325: Roman Law; CLA 326, CLA 327: Topics in Ancient History); one course on material culture (e.g., CLA 202: Greek Art; CLA 305: Greek and Roman Architecture); two courses focusing in whole or in part on classical civilization (see list below); and one history course on a nonclassical premodern civilization (e.g., EAS 335: Early Chinese History to 221; NES 220: Jews, Muslims, and Christians in the Middle Ages; HIS 345: Europe at the Dawn of Modernity). Students must also take the Junior Seminar in the fall of their junior year.

Each student must successfully complete Ancient Greek or Latin to the level of 108 or achieve an equivalent level of knowledge, as demonstrated through test scores (SAT, AP), a placement exam, or coursework (including through a summer language program). However, at least one language course must be taken at Princeton.

Courses that can serve as prerequisites or satisfy departmental requirements:

Art and Archaeology
200 The Art and Archaeology of the Ancient Near East and Egypt
202 Greek Art: Ideal Realism
203 Roman Art
204 Pagans and Christians: Urbanism, Architecture, and Art of Late Antiquity
300 Greek Archaeology of the Bronze Age
301 The Art of the Iron Age: The Near East and Early Greece
302 Myths in Greek Art
305 Greek and Roman Architecture
306 Classical Athens: Art and Institutions
308 Roman Cities and Countryside: Republic to Empire

Classics
Any CLA course
Greek: Any 200- or 300-level CLG course
Latin: Any 200- or 300-level LAT course

Hellenic Studies
346 Introduction to Byzantine Civilization
Independent Work

Junior Seminar. During the fall of the junior year, all majors must take the Junior Seminar (CLA 340). The course introduces students to different fields of study within the department, including literature, ancient history, ancient culture, linguistics, and reception studies. Students will gain experience in the methods of their chosen area(s) of study while acquiring an understanding of the history of the discipline and its place in the 21st century. Students will also acquire the skills necessary to pursue junior and senior independent work. Students who are abroad during the fall of their junior year can complete the Junior Seminar during the fall semester of their senior year.

Junior Independent Work. In the fall term, each student researches and writes a paper of 15 to 20 pages on a topic of their choosing under the direction of a faculty adviser. The Junior Seminar will provide guidance in choosing a topic, structuring an outline, writing, and revising. In the spring term, students undertake a more ambitious research paper of 20 to 25 pages. Each student again works closely with a member of the faculty on the project, meeting regularly over the course of the spring term for discussion and analysis.
Senior Independent Work. At the end of the second term of the junior year, students are advised to select the subject for a senior thesis after consultation with the departmental representative. The thesis in its final form must be submitted to the department by April 15 of the senior year.

Senior Departmental Examination

In the spring semester of the senior year, students take a comprehensive examination designed to test their knowledge of Greek and Roman history.

Preparation for Graduate Study

Students should be aware that most graduate programs in Classics will demand a more extensive training in the ancient languages than these minimum requirements. Those considering going on to graduate school should plan to do additional work in Greek and Latin either during their time at Princeton or through a post-baccalaureate program.

Courses

CLA 205 Introduction to Ancient Philosophy (See PHI 205)

CLA 208 Origins and Nature of English Vocabulary (also ENG 240 / LIN 208 / TRA 208 ) Not offered this year LA
The origins and nature of English vocabulary, from proto-Indo-European prehistory to current slang. Emphasis on the Greek and Latin component of English vocabulary, including technical terminology (medical/scientific, legal, and humanistic). Related topics: the alphabet and English spelling, slang and jargon, social and regional variation, vocabulary changes in progress, the "national language” debate. Two lectures, one preceptorial. J. Katz

CLA 211 Rhetoric: Classical Theory, Modern Practice (also HLS 211 ) Fall EC
Stylish, seductive, surreptitious, and scorned, the ubiquitous art of persuasion will be the focus of this course. We will first approach rhetoric through the classical tradition, learning to recognize basic figures of speech and thought with an eye towards identifying what is persuasive and why. We will then consider how rhetoric continues to thrive, despite abundant moral and philosophical attacks, in public selfpresentation, whether of household products, of politicians, or institutions such as Princeton. A. Ford

CLA 212 Classical Mythology (also HUM 212 / GSS 212 / HLS 212 ) Fall LA
A study of classical myths in their cultural context and in their wider application to abiding human concerns (such as creation, generation, sex and gender, identity, heroic experience, death, transformations, and transcendence). A variety of approaches for understanding the mythic imagination and symbol formation through literature, art, and film. Two lectures, one preceptorial. B. Holmes

CLA 214 The Other Side of Rome (also CHV 214 ) Not offered this year EM
An introduction to Roman culture emphasizing tensions within Roman imperial ideology, the course explores attitudes toward issues such as gender and sexuality, conspicuous consumption, and ethnicity through the works of
authors such as Petronius, Lucan, and Tacitus. It also considers the role of cinematic representations of ancient Rome in 20th-century America. Two lectures, one preceptorial. *A. Feldherr*

**CLA 216 Archaic and Classical Greece (also HIS 216) Fall HA**
A formative episode in Western civilization: the Greeks from the rise of the city-state, through the conflict between Athens and Sparta, to the emergence of Macedon in the fourth century B.C. Emphasis on cultural history, political thought, and the development of techniques of historical interpretation through analysis of original sources (Herodotus, Thucydides, and others). Two lectures, one preceptorial. *M. Domingo Gygax*

**CLA 217 The Greek World in the Hellenistic Age (also HIS 217 / HLS 217) Not offered this year HA**
The Greek experience from Alexander the Great through Cleopatra. An exploration of the dramatic expansion of the Greek world into the Near East brought about by the conquests and achievements of Alexander. Study of the profound political, social, and intellectual changes that stemmed from the interaction of the cultures, and the entrance of Greece into the sphere of Rome. Readings include history, biography, religious narrative, comedy, and epic poetry. Two lectures, one preceptorial. *M. Domingo Gygax*

**CLA 218 The Roman Republic (also HIS 218) Fall HA**
A study of the causes and unforeseen consequences of one small city-state's rise to world-empire, primarily through the analysis of ancient sources (including Livy, Polybius, Caesar, and Cicero) in translation. Emphasis on the development of Roman society and the evolution, triumph, and collapse of the republican government that it produced. Two lectures, one preceptorial. *D. Padilla Peralta*

**CLA 219 The Roman Empire, 31 B.C. to A.D. 337 (also HIS 219) Not offered this year HA**
A study of the profound transformation of Rome by the multicultural empire it had conquered, ending with the triumph of Christianity. Emphasis on typical social and cultural institutions and on the legacies of Rome to us. Ancient sources in translation include documents, histories, letters, and novels. Two lectures, one preceptorial. *B. Shaw*

**CLA 301 Ancient and Medieval Political Theory (See POL 301)**

**CLA 302 The Art of the Iron Age: The Near East and Early Greece (See ART 301)**

**CLA 306 Classical Athens: Art and Institutions (See ART 306)**

**CLA 320 Topics in Medieval Greek Literature (also HLS 320 / MED 320 / GSS 320) Not offered this year LA**
The subject of this course will be medieval Greek Romantic fiction. We will read translations of the four surviving novels written in twelfth-century Constantinople in a bid to answer questions about the link between eroticism and the novel, truth and invention in the middle ages, who read fiction and why, and what role, if any, did the medieval or Byzantine Romances have in the story of the European novel. Above all, we will seek to recover some of the pleasure felt by the medieval readers and audiences of these novels. *E. Bourbouhakis*

**CLA 323 Self and Society in Classical Greek Drama (also COM 323) Not offered this year LA**
Designed to give students who are without knowledge of the Greek language the opportunity to read widely and deeply in the field of Greek drama, with particular emphasis on an intensive study of Greek tragedy, its origins and development, staging, structure, and meanings. Two 90-minute seminars. *Staff*
CLA 324 Classical Historians and Their Philosophies of History (also HIS 328 / HLS 322) Not offered this year HA
Major classical historians, especially Herodotus and Thucydides, are studied in connection with the theory and practice of the art or science of history. Lectures and preceptorials treat the development of historical writing and its relationship to philosophy, politics, literature, and science, and problems such as that of fact and interpretation in historical writing. Two lectures, one preceptorial. M. Domingo Gygax

CLA 325 Roman Law (also HIS 329) Not offered this year HA
The historical development of Roman law and its influence on modern legal systems. Particular attention is given to the fundamental principles of Roman private law, including the law of persons, property, inheritance, and contract; and there is a close analysis of courtroom procedure. Two lectures, one preceptorial. Staff

CLA 326 Topics in Ancient History (also HIS 326 / REL 329) Fall HA
A period, problem, or theme in ancient history or religion with critical attention to the ancient sources and modern discussions. The topic and instructor vary from year to year. Format will change each time, depending on enrollment. H. Flower

CLA 327 Topics in Ancient History (also HIS 327 / HLS 327) Not offered this year HA
A period, problem, or theme in ancient history or religion with critical attention to the ancient sources and modern discussions. The topic and instructor vary from year to year. Format will change each time, depending on enrollment. N. Luraghi

CLA 329 Sex and Gender in the Ancient World (also MED 329 / GSS 331) Not offered this year SA
The theoretical and ideological bases of the Western attitudes toward sex and gender categories in their formative period in the Greco-Roman world through the study of myth and ritual, archaeology, art, literature, philosophy, science, medicine, law, economics, and historiography. Selected readings in classical and modern texts. Staff

CLA 330 Greek Law and Legal Practice (also CHV 330 / HLS 340) Fall EM
The development of Greek legal traditions, from Homer to the Hellenistic age. The course focuses on the relationship between ideas about justice, codes of law, and legal practice (courtroom trials, arbitration), and the development of legal theory. Two 90-minute seminars. M. Domingo Gygax

CLA 334 Modern Transformations of Classical Themes (also COM 334 / HLS 334) Not offered this year LA
A special topic concerning the adaptation of one or more classical themes in contemporary culture through media such as literature, film, and music. Two 90-minute seminars. Staff

CLA 335 Studies in the Classical Tradition (also HLS 335 / MED 335) Not offered this year HA
A classical genre or literary theme will be studied as it was handed down and transformed in later ages, for example, the European epic; ancient prose fiction and the picaresque tradition; the didactic poem. Two 90-minute seminars. E. Bourbouhakis
CLA 340 Junior Seminar: Introduction to Classics Fall HA
This course will introduce concentrators to the study of classical antiquity. Students will become acquainted with different fields of study within the Department, including literature, ancient history, ancient culture, linguistics, and reception studies; gain experience in the methods of their chosen area(s) of study; and acquire an understanding of the history of the discipline and its place in the twenty-first century. Sessions will involve guest visits from members of the faculty. Particular attention will be paid to acquiring the skills necessary to pursue independent research and the selection of a topic for the spring Junior Paper. Y. Baraz

CLA 343 The Civilization of the Early Middle Ages (See HIS 343)

CLA 344 The Civilization of the High Middle Ages (See HIS 344)

CLA 355 Transformation of the Ancient World: Byzantium 500-1200 (See HIS 355)

CLG 101 Beginner's Greek: Greek Grammar Fall
Reading in the language is combined throughout with the learning of forms, vocabulary, and syntax. A foundation is built in classical vocabulary and grammar during the first term as a base for the student in the continuing course, Greek 102. Four classes. No credit is given for CLG 101 unless followed by CLG 102.
A. Ford

CLG 102 Beginner's Greek: Attic Prose Spring
The study of vocabulary, grammar, and syntax is continued from 101 by intensive reading in Attic prose of the classical period. Authors such as Plato are read. Four classes. J. Billings

CLG 103 Ancient Greek: An Intensive Introduction Spring
An intensive introduction to the essentials of Greek grammar. Students will begin reading Attic prose as quickly as possible. 103 covers the material of 101-102 in a shorter period through increased class-time, drills, and earlier exposure to actual Greek texts. Leads directly to 105. Five classes. E. Bourbouhakis

CLG 105 Socrates Fall
The life and teaching of Socrates based upon the evidence of Plato and Xenophon. Aristophanes's Clouds may also be read in English, with some excerpts in Greek. Includes a review of the grammar of Attic prose. Prerequisite: 102 or 103, or instructor's permission. Four classes. J. Billings

CLG 108 Homer Spring
The course consists of extensive reading in the Iliad supplemented by lectures and study assignments directed to Homer's literary art and to the moral and religious thought of the Homeric epics. Four classes. Prerequisite: 103, or the equivalent. C. Wildberg

CLG 213 Tragic Drama Fall LA
The tragic drama of the last three decades of the fifth century B.C. Normally one tragedy each by Euripides and Sophocles is read in Greek, with other texts and critical work in English. Two 90-minute seminars. B. Holmes

CLG 214 Greek Prose Authors Not offered this year LA
Deals with a major topic in Greek literature or cultural history with readings from several of the most important Greek authors. Three hours. Prerequisite: Greek 108 or equivalent. Alternates with 213. M.

*Domingo Gygax*

**CLG 240 Introduction to Post-Classical Greek from the Late Antique to the Byzantine Era (also HLS 240)**

*Spring LA*

Readings will focus on historical, literary, philosophical, or religious texts with a range from the Hellenistic to the Byzantine periods. Two 90-minute seminars. *E. Bourbouhakis*

**CLG 301 Plato**

*Not offered this year LA*

Reading of selected dialogues with lectures on various aspects of the Platonic philosophy. Two 90-minute seminars. *Staff*

**CLG 302 Greek Tragedy**

*Not offered this year LA*

Three tragedies are read in class; others (both in Greek and English) are assigned as outside reading. The preceptorials deal with general discussions of tragedy, including Aristotle's *Poetics*. Two 90-minute seminars. *B. Holmes*

**CLG 304 Greek Historians**

*Fall HA*

Intensive study of a major historical author, such as Herodotus or Thucydides, with special attention to narrative technique and historiographical principles. Two 90-minute seminars. *N. Luraghi*

**CLG 305 Greek Comedy**

*Not offered this year LA*

Several plays of Aristophanes are read in the original (for example, *Acharnians, Clouds*) and others in translation. The emphasis of the course is on the language and verbal effects of the comedies, and on the connections of Old Comedy with Euripidean tragedy, contemporary politics, and philosophy. Consideration is also given to New Comedy, with selections from Menander's *Dyskolos* in Greek. Two 90-minute seminars. *Staff*

**CLG 306 Greek Rhetoric: Theory and Practice**

*Not offered this year HA*

An introduction to the major techniques of Greek rhetoric with special attention to rhetorical treatises such as Aristotle's *Rhetoric* and to the application of these techniques in oratory and other literary forms. *A. Ford*

**CLG 307 Homer and the Epic Tradition**

*Not offered this year LA*

All of the *Odyssey* is read in English and a considerable portion is read in Greek. Classes include close translation of key passages and reports on special topics. Emphasis is upon literary interpretation of the epic on the basis of detailed analysis of epic style, diction, and narrative techniques. Two 90-minute seminars. *A. Ford*

**CLG 308 The Lyric Age of Greece**

*Not offered this year LA*

Major texts of the Greek lyric age in their cultural and literary setting. An author such as Hesiod or Pindar may be selected for intensive treatment. Two 90-minute seminars. *A. Ford*
CLG 310 Topics in Greek Literature  
Not offered this year LA  
The subject matter of the course will vary from year to year depending on the interests of the instructor and students. The reading may concentrate on one or more authors, a theme, a genre, a personality, or an event. J. Katz

LAT 101 Beginner's Latin  
Fall  
The course is designed to introduce the student with no previous training in the language to the basics of grammar, vocabulary, and syntax. A foundation is built in the first term for continuation in the spring-term course, 102. Four classes. No credit is given for LAT 101 unless followed by LAT 102. R. Kaster

LAT 102 Beginner's Latin Continued: Basic Prose  
Spring  
The study of grammar, vocabulary, and syntax is continued from Latin 101. Reading in basic prose works by authors such as Cicero or Caesar completes the course. Four classes. Y. Baraz

LAT 103 Latin: An Intensive Introduction  
Spring  
An intensive introduction to the Latin language that covers the material of 101-102 in a shorter time through increased class time and drills. Students completing the course will be prepared to take LAT 105. Four classes, one drill. A. Feldherr

LAT 104 Intensive Intermediate Latin  
Not offered this year  
An alternative to Latin 105, offering more review of Latin grammar and syntax. Also designed as an introduction to Latin literature through selected readings in poetry and prose. Five classes. R. Kaster

LAT 105 Intermediate Latin: Catullus and His Age  
Fall  
Selections from the poems of Catullus and from Cicero's Pro Caelio form the core of the reading. 105 is a continuation of 102 and is designed as an introduction to Latin literature. Important grammatical and syntactical principles are reviewed. Four classes. Prerequisite: 102 or equivalent. Staff

LAT 108 The Origins of Rome: Livy and Vergil  
Spring  
The reading will be composed of excerpts from the early books of Livy's History of Rome, together with selections from Vergil's Aeneid (such as Book 4 or 8). The course introduces the student to two major works of the Augustan Age and gives advanced instruction in the Latin language. Fulfills the A.B. language requirement. Four classes. Prerequisite: 104, 105, or equivalent. D. Feeney

LAT 203 Introduction to Augustan Literature  
Fall LA  
Readings from Ovid, particularly his love poetry and his "epic," the Metamorphoses, as well as from other poets (such as Horace, Tibullus, and Propertius). Three hours. Prerequisite: 108 or equivalent. D. Feeney

LAT 204 Readings in Latin Literature  
Fall LA  
The course will deal with a major topic in Roman cultural history or Latin literature, with readings from three or four of the most important Latin authors. This course may be taken for credit more than once, provided different topics are treated. Three hours. Prerequisite: 108 or equivalent. R. Kaster
LAT 205 Roman Letters Fall LA
A careful reading of a selection of Latin letters in prose and verse by Cicero, Horace, Ovid, Pliny, and others in order to understand the place this important form of communication held in Roman culture. Prerequisite: 108 or permission of instructor. Two 90-minute classes. R. Kaster

LAT 210 Invective, Slander, and Insult in Latin Literature Not offered this year LA
This course aims to build skills in reading literary Latin in a variety of genres, both poetry and prose, while introducing students to an important social function shared by many types of texts: winning status and prestige by slandering a rival. The substance of this invective--the kind of insult that wins over an audience--can also tell us much about Roman values in various realms of public and personal behavior. Prerequisite: LAT 108 or instructor's permission. Seminar. R. Kaster

LAT 232 Introduction to Medieval Latin Spring LA
Intended for students in any field interested in the Latin Middle Ages. Readings will include a wide variety of prose and poetry from the fourth to the 14th centuries. Attention will be given both to improving reading skills and to acquiring essential background information and critical method. Two 90-minute seminars. Prerequisite: 108 or equivalent. Staff

LAT 234 Latin Language and Stylistics Not offered this year LA
Study of the development of literary Latin (predominantly prose), with translation to and from Latin. Syntactic and stylistic analysis of sections of such authors as Cicero, Sallust, Seneca. Translations of brief portions of major authors, with practice in thematically related composition. Two 90-minute seminars. R. Kaster

LAT 330 Cicero Not offered this year LA
The course will present a representative selection from Cicero's enormous literary production. The specific texts studied will differ from year to year, but will normally include extensive reading from at least two of the three main genres of Cicero's prose works: essays, letters, and orations. Two 90-minute seminars. R. Kaster

LAT 331 Horace Not offered this year LA
Selected Odes, Epodes, Satires, and Epistles are read with emphasis on Horace's relation to Greek poetry, his poetic techniques and originality, his ethical and literary views, his portrayal of the life and culture of Augustan Rome, and his influence upon English poetry. Two 90-minute seminars. D. Feeney

LAT 332 Roman Drama Not offered this year LA
The course will concentrate on a single author (for example, Plautus) or will survey the development and technique of the drama in Rome, with major emphasis on comedy. Two 90-minute seminars. Y. Baraz

LAT 333 Vergil's Aeneid Not offered this year LA
An intensive study of the Aeneid, with focus on literary values but also with consideration of political and social factors, literary ancestry, and influence. Two 90-minute seminars. Y. Baraz
LAT 334 Vergil's Eclogues and Georgics
Critical reading and literary analysis of Vergil's cycle of 10 pastoral poems (Eclogues) and of the four books of Georgics. Two 90-minute seminars. Staff

LAT 335 Roman Literature: Selected Author or Authors
The subject matter of the course will vary from year to year, depending on the interests of the instructor and students. The reading may concentrate on one or more authors, a theme, a genre, a personality, or an event. Two 90-minute seminars. A. Feldherr

LAT 336 Epicureanism and Stoicism
A study of the two main philosophical schools of the Republic and Early Empire: Epicureanism and Stoicism. Readings (in Latin) will be selected from Lucretius, Cicero, and Seneca, supplemented by selections from Greek sources in English translation. Two 90-minute seminars. A. Feldherr

LAT 337 Roman Republican Historians
Selections of historians' works are read that illustrate topics such as the historian's use of sources, historical outlook, narrative techniques, style, and reliability. Sample historians of the Republic who may be read are Livy, Sallust, and Caesar, depending on the interests of the instructor and students. Two 90-minute seminars. H. Flower

LAT 338 Latin Prose Fiction
A critical study of Latin fiction such as Petronius's Satyricon and Apuleius's Metamorphoses (Golden Ass). Although the chief emphasis will be on the literary aspects of these influential works, some attention will also be given to their value as social and religious documents of their time. Two 90-minute classes. Staff

LAT 339 Roman Historians of the Empire
An examination of historians' approaches to history and their literary merits; sample historians to be surveyed include Tacitus, Suetonius, and Velleius Paterculus; sample topics to be covered include their views of autocracy (nature and effects) and of Roman civilization (value, influence, shortcomings). Two 90-minute classes. B. Shaw

LAT 340 Roman Satire
Selected satires of Horace, Juvenal, and Persius are read. Classes emphasize translation, stylistic analysis, and explication of the texts. There are also reports on special topics such as the origins and development of satire at Rome, and at least one in-depth interpretation by each student of a selected individual passage. Two 90-minute seminars. Y. Baraz

LAT 342 Roman Elegy from Catullus to Ovid
Selections from Latin elegy. Students will read the fourth book of Propertius and sections of Ovid's Fasti, together with other elegies. Focuses on the poetic presentation of the metropolis of Rome, its history, religion, and urban life. Two 90-minute classes. D. Feeney
Program in Cognitive Science

Director
Sarah-Jane Leslie

Executive Committee
Adele Goldberg, Psychology
Mark Johnston, Philosophy
Sarah-Jane Leslie, Philosophy
Casey Lew-Williams, Psychology
Kenneth A. Norman, Psychology and Neuroscience
Gideon A. Rosen, Philosophy
Eldar Shafir, Psychology and Woodrow Wilson School
Nicholas B. Turk-Browne, Psychology

Associated Faculty
Jonathan D. Cohen, Neuroscience and Psychology
Alin I. Coman, Psychology and Woodrow Wilson School
Nathaniel D. Daw, Psychology and Neuroscience
Adam N. Elga, Philosophy
Lauren L. Emberson, Psychology
Delia G. Fara, Philosophy
Susan T. Fiske, Psychology and Woodrow Wilson School
Asif A. Ghazanfar, Psychology and Neuroscience
Elizabeth Gould, Psychology and Neuroscience
Elizabeth Harman, Philosophy and University Center for Human Values
Gilbert H. Harman, Philosophy
Uri Hasson, Psychology and Neuroscience
Johannes Haushofer, Psychology and Woodrow Wilson School
Sanjeev Kulkarni, Electrical Engineering
Alexander Nehamas, Philosophy and Comparative Literature
Yael Niv, Psychology and Neuroscience
Daniel N. Osherson, Psychology
Elizabeth L. Paluck, Psychology and Woodrow Wilson School
Stacey A. Sinclair, Psychology and Center for African American Studies
Diana I. Tamir, Psychology
Jordan A. Taylor, Psychology
Alexander Todorov, Psychology
Samuel S. Wang, Molecular Biology and Neuroscience
Edwin S. Williams, Linguistics

Sits with Committee
Christiane D. Fellbaum, Computer Science Victoria McGeer, Philosophy and University Center for Human Values

Cognitive science is the interdisciplinary study of how the mind works, drawing on research from psychology, philosophy, linguistics, neuroscience, and computer science. The interdisciplinary character of cognitive science is reflected in its reliance on many different levels of analysis of mental phenomena and its employment of a variety of methodologies appropriate to each level. The goal of cognitive science is to integrate the insights from multiple disciplines and modes of research into a unified scientific account of the mind and its place in nature. Research in cognitive science includes, but is not limited to, work on psychophysics, perception, linguistics and language processing, philosophy of mind and language, cognitive development, memory, reasoning, emotion, moral and social cognition, and judgment and decision making. One ambition of cognitive science is to understand just how mental abilities and processes are realized in the brain, and how such neural realizations can ground the conscious, deliberate activity of thought and decision. Another is to map out just how the human mind develops from childhood on, and thereby articulate the deep mechanisms of learning and cognitive development. A third ambition is to investigate just how far mental processes can be duplicated in complex computational structures that could be instantiated in machines.
Admission to the Program

The program is open to undergraduates concentrating in any department. Students should meet with the director or program coordinator, usually during sophomore year, to apply to the program and plan a course of study. Applicants will be accepted based on interest and a coherent, tentative academic plan, including independent study.

Program of Study

Students are required to take five courses in cognitive science, which in combination satisfy the following requirements:

1. Three courses at the 300-level or higher;

2. Courses taken in at least three different academic units (please note that this restriction applies only to a course's primary course listing, not to additional cross-listings);

3. Typically no more than one course with a primary course listing from the student's department of concentration, unless permission is obtained from the director;

4. At least one course that is not counted towards the student's departmental concentration;

5. At most, one course may be taken P/D/F.

Students are also required to complete a thesis or a semester of junior independent work that incorporates substantial elements of cognitive science. The work may be used to satisfy both the requirements of the program and the student's departmental concentration. Students who are unable to incorporate cognitive science into their departmental independent work should consult the director or program coordinator to discuss alternative means of satisfying this requirement.

The Program in Cognitive Science sponsors a lunchtime talk series with speakers from the Princeton cognitive science community, as well as from outside Princeton. Students are strongly encouraged to attend these talks. If scheduling permits, certificate students who are completing independent work in cognitive science may volunteer to give a talk themselves, in consultation with the director.

Certificate of Proficiency

A student who fulfills the requirements of the program with satisfactory standing receives a certificate of proficiency in cognitive science upon graduation.

Cognitive Science and Related Courses

The following courses will count towards the program requirements. Other cognitive science related courses, including graduate courses, may be counted toward certificate completion with the approval of the director.

Computer Science

COS 116 The Computational Universe (also EGR 116)
COS 126 Computer Science: An Interdisciplinary Approach (also EGR 126)
COS 402 Machine Learning and Artificial Intelligence
COS 429 Computer Vision

**Linguistics**
LIN 201 Introduction to Language and Linguistics (also ENG 241)
LIN 216 Language, Mind, and Brain (also PSY 216)
LIN 250 Language in Its Contexts
LIN 301 Phonetics and Phonology
LIN 302 Syntax
LIN 303 Linguistic Semantics
LIN 306 The Structure and Meaning of Words
LIN 308 Bilingualism (also TRA 303)
LIN 310 Melodies of English (and Other Languages)
LIN 312 Linguistics of American Sign Language
LIN 314 Linguistics and Language Acquisition (also PSY 302)
LIN 355 Field Methods in Linguistics
LIN 360 Linguistic Universals and Language Diversity
LIN 408 Situated Language Usage: Conversations, Dialogues and other Goal-Based Communications (also PSY 408)
LIN 412 Advanced Syntax

**Mechanical and Aerospace Engineering**
MAE 345 Robotics and Intelligent Systems

**Neuroscience**
NEU 202A Introduction to Cognitive Neuroscience (also PSY 259A)
NEU 202B Introduction to Cognitive Neuroscience (also PSY 259B)
NEU 330 Introduction to Connectionist Models: Bridging between Brain and Mind (also PSY 330) NEU 437 Computational Neuroscience (also MOL 437/PSY 437)

**Philosophy**
PHI 207 Introduction to Philosophy of Cognitive Science
PHI 218 Learning Theory and Epistemology (also ELE 218)
PHI 311 Personal Identity
PHI 313 Theory of Knowledge
PHI 315 Philosophy of Mind
PHI 317 Philosophy of Language
PHI 322 Philosophy of the Cognitive Sciences
PHI 380 Explaining Values (also CHV 380)

**Psychology**
PSY 212 The Psychology of Moral Behavior (also CHV 212)
PSY 237 The Psychology and Philosophy of Rationality (also PHI 237)
PSY 254 Developmental Psychology
PSY 255 Cognitive Psychology
PSY 304 Social Cognition: The Psychology of Interactive Minds
PSY 306 Memory and Cognition (also NEU 306)
PSY 309 Psychology of Language (also LIN 309)
PSY 310 Psychology of Thinking
PSY 311 Rationality and Human Reasoning
PSY 337 Neuroscience of Social Cognition and Emotion (also NEU 337)
PSY 338 Animal Learning and Decision Making (also NEU 338)

*Woodrow Wilson School*

WWS 340 The Psychology of Decision Making and Judgment (also PSY 321)

**Courses**

CGS 205 Introduction to Language and Linguistics (See LIN 201)

CGS 207 Introduction to Philosophy of Cognitive Science (See PHI 207)

CGS 254 Developmental Psychology (See PSY 254)

CGS 255 Cognitive Psychology (See PSY 255)
CGS 304 Social Cognition: The Psychology of Interactive Minds (See PSY 304)

CGS 315 Philosophy of Mind (See PHI 315)

CGS 322 Philosophy of the Cognitive Sciences (See PHI 322)

CGS 408 Situated Language Usage: Conversations, Dialogues, and Other Goal-Based Communications (See LIN 408)
Committee for Film Studies

Chair
Steven Chung

Executive Committee
Bruno M. Carvalho, Spanish and Portuguese
Zahid R. Chaudhary, English
Anne Cheng, English, African American Studies
Steven Chung, East Asian Studies
Maria A. DiBattista, English, Comparative Literature
Su Friedrich, Lewis Center for the Arts, Visual Arts
Eric S. Gregory, Religion, ex officio
Erin Y. Huang, East Asian Studies, Comparative Literature
Thomas Y. Levin, German
Gaetana Marrone-Puglia, French and Italian
Franz K. Prichard, East Asian Studies
Michael Smith, Philosophy

The Committee for Film Studies, under the general direction of the Council of the Humanities, encourages the interdisciplinary study of film and video. The committee coordinates courses in the programs and departments that use film or video extensively; it also coordinates, so far as is appropriate, the acquisition of videotapes and films; and it organizes the visits of filmmakers and film scholars. Interested students are invited to consult members of the committee, who will provide additional information about film and video studies within the University.

For a list of film courses at Princeton, please check the committee's website.
The Committee for Statistical Studies seeks to encourage the cross-disciplinary study of statistics through its application to a diverse set of substantive problem areas in the natural sciences, engineering, the social sciences, and the humanities. The committee coordinates courses in departments and programs that make extensive use of statistical techniques; it also coordinates colloquia and lectures on topics of statistics. Interested students are invited to consult with the chair of the committee, who will assist them in obtaining information about course offerings, programs of study, and faculty members in various departments who can guide them in research projects.

A complete list of undergraduate and graduate courses may be found on the committee's website.
Committee on Renaissance and Early Modern Studies

Chair
Nigel Smith

Executive Committee
Leonard Barkan, Comparative Literature
Anthony T. Grafton, History
Eric S. Gregory, Religion, ex officio
Wendy Heller, Music
Thomas D. Kaufmann, Art and Archaeology

Eileen A. Reeves, Comparative Literature
Nigel Smith, English

Associated Faculty
April Alliston, Comparative Literature
Volker Schroder, French and Italian

At Princeton, Renaissance and Early Modern Studies is a cross-disciplinary association under the general auspices of the Council of the Humanities. There is a standing interdepartmental committee of faculty members and a number of recognized graduate student organizers. We seek to foster interdisciplinary discussion and cooperation among members of the University engaged in the study of Renaissance and early modern culture in Europe, the Mediterranean, and the Americas, as well as elsewhere. We help maintain Princeton's traditional strength and high standing in this field, and we encourage innovative developments in it. There is an unusually rich array of specialists in Renaissance and early modern history, history of science, English and Continental literatures, history of art and architecture, music, and philosophy. There is also wider representation from other fields among those related to Renaissance and early modern studies. This gives us a broad forum for discussion of research in progress by faculty members, graduate students, visiting scholars, and members of the Institute for Advanced Study.

In addition to a program of public lectures, workshops, conferences, and symposia--designed in collaboration with other departments and programs, we sponsor panel sessions at the Renaissance Society of America's annual conventions, and we facilitate the use of regional facilities for early modern study, such as the Folger Shakespeare Library in Washington.

A list of undergraduate and graduate courses in Renaissance and Early Modern Studies may be found on the committee's website.
Department of Comparative Literature

Chair
Eileen A. Reeves

Departmental Representative Lital Levy

Director of Graduate Studies
Benjamin Conisbee Baer

Professor
April Alliston
Leonard Barkan
David M. Bellos, also French and Italian
Sandra L. Bermann
Claudia J. Brodsky
Marina S. Brownlee, also Spanish and Portuguese
Maria A. DiBattista, also English
Thomas W. Hare
Daniel Heller-Roazen, also Council of the Humanities
Alexander Nehamas, also Council of the Humanities, Philosophy Eileen A. Reeves

Associate Professor
Wendy Laura Belcher, also African American Studies
Benjamin Conisbee Baer

Susana Draper
Lital Levy
Visiting Associate Professor Ayako Kano

Assistant Professor
Karen R. Emmerich
Erin Yu-Tien Huang, also East Asian Studies

Lecturer with Rank of Professor
Peter P. Brooks, also University Center for Human Values
Michael G. Wood

Associated Faculty
Eduardo L. Cadava, English
Bruno M. Carvalho, Spanish and Portuguese
Steven Chung, East Asian Studies
Devin A. Fore, German
Rubén Gallo, Spanish and Portuguese
Simon E. Gikandi, English
Anthony T. Grafton, History
Brooke A. Holmes, Classics
Thomas Y. Levin, German
F. Nick Nesbitt, French and Italian Sara S. Poor, German
Efthymia Rentzou, French and Italian
Michael A. Wachtel, Slavic Languages and Literatures

Information and Departmental Plan of Study
The Department of Comparative Literature invites students to approach literature from a broad, crosscultural perspective. The curriculum encompasses literatures, languages, and cultures from around the world—including those of Europe, the Americas, Africa, Asia, and the Middle East—as well as interdisciplinary work of many types. While each student in the department is expected to focus his or her studies on a particular foreign language and literature, an interest in the way different literatures illuminate one another, or enter into dialogue with other
disciplines, media, or forms of art, is fundamental to our work. Students motivated by a desire to understand literature in the broadest terms, as well as those interested in particular examples of literary comparison, will find an intellectual home in the Department of Comparative Literature.

The flexibility of the concentration has always been one of its strong points. With the guidance of the director of undergraduate studies and the junior and senior faculty advisers, each student creates a program of study tailored to his or her intellectual interests, choosing courses and independent projects that contribute to the whole.

Graduates successfully pursue many diverse careers, including law, medicine, business, foreign service, computing and technology, international investments and banking, creative writing, publishing and journalism, filmmaking, and education at the secondary and university levels. Many comparative literature students have gone on to graduate study in the field and now teach at a wide range of institutions in the U.S. and abroad.

Prerequisites

Foreign Language Requirement. To enter the department, students must be sufficiently knowledgeable in one language other than English to take an upper-level course in it in his or her junior year.

Plan to read a second foreign language before graduation. Proficiency in only one non-English language is required for admission to the department. However, students who concentrate in comparative literature are also expected to study at least one other non-English language and to be able to read in the language by the time they graduate. Such language study may take place before or during their years as departmental concentrators. Some students demonstrate their competency by taking an upper-level course in the literature of that language. Other students gain this competency by taking three terms of language study at Princeton, or two terms and an intensive language course in the summer, or (especially in the case of languages that are no longer spoken) an intensive language course in the summer. A few pass the AP test or take a foreign language test administered by the relevant department during the summer.

Introductory Courses. Students who wish to concentrate in comparative literature are advised (though not required) to take COM 205-206 or HUM 216-219 in their sophomore year or earlier.

Early Concentration

Qualified students may elect early concentration and enroll in the department at the beginning of the spring term of sophomore year. They may begin their departmental course of study as well as their independent work, if they wish.

Program of Study

Students in comparative literature select courses from a wide range of offerings throughout the University and are encouraged to construct a program of study to match their individual interests. Nine departmental courses are required of each student, chosen according to the type of comparative work pursued. COM 300, the Junior Seminar, counts as one of the nine. This course is especially designed to introduce students to the history and methodology of the field, as well as to different avenues of comparative study.

Concentrators must take the course in the fall term of their junior year, unless they are studying abroad, in which case the course may be taken in the senior year instead. Two other courses must be taken within the Department of Comparative Literature (i.e., listed or cross-listed as a COM course).
Regardless of the area of study elected, all concentrators must take four upper-level courses in a non-English-language literature department. Students in the department have studied foreign language literatures in French, Spanish, Italian, Portuguese, German, Russian, Chinese, Korean, Japanese, Arabic, Hebrew, Greek, Latin, Swahili, Hindi, Persian, Urdu, Turkish, Bosnian-Croatian-Serbian, Syriac, and Armenian. Upper-level courses generally are 300- or 400-level courses, but reading-intensive 200-level courses may be counted with permission from the director of undergraduate studies. These courses must entail study of texts in the foreign language, not in translation.

The remaining two courses are taken in appropriate departments throughout the University according to the student's area of study. Course selections generally fall into one of the areas described below. Each represents the study of literature in a different comparative context and includes all nine required courses:

Path A. Comparative work in literatures in at least two languages. Students in this track choose four upper-division courses in non-English-language literature; three courses listed or cross-listed with comparative literature (one of which is COM 300); and two upper-level courses in literature in any other language (including English and courses on readings taught in translation).

Path B. Comparative work in literature and a traditional textual discipline (that is, in the humanities [e.g., philosophy, art and archaeology, classics, or religion] or social sciences [e.g., anthropology, history, psychology, sociology, politics, economics, or public policy]). Students in this track choose four upper-level courses in non-English-language literature; three courses listed or cross-listed in comparative literature (one of which is COM 300); and two upper-level courses in the relevant textual discipline.

Path C. Comparative work in literature and another medium (that is, photography, film, art, art history, architecture, or music). Students in this track choose four upper-level courses in non-English-language literature; three courses listed or cross-listed in comparative literature (one of which is COM 300); and two upper-level courses in the relevant medium. Both courses must be in the same medium.

Path D. Comparative work in literature and regional or ethnic studies (that is, African [AFS], African American [AAS], American [AMS], East Asian [EAP or EAS], European [ECS or EPS], Hellenic [HLS], Judaic [JDS], Latin American [LAS], Latino [LAO], Near Eastern [NES], or South Asian [SAS].) Students in this track choose four upper-level courses in non-English-language literature; three courses listed or cross-listed in comparative literature (one of which is COM 300); and two courses in the relevant region or ethnicity.

Path E. Comparative work in literary study and the creative arts, (that is, creative writing [poetry, the novel, short stories, drama, memoir], screenwriting, translation, dance, theatrical performance, visual arts, film, or video). Students choose four upper-level courses in non-English-language literature; three courses listed or cross-listed with comparative literature (one of which is COM 300); and two courses in the relevant creative art. Both courses must be in the same area of study. Students entering the department select this program provisionally. Final admission depends upon the acceptance of the creative thesis proposal by the department and by an adviser from the relevant creative arts program.

Departmental Distribution Requirement. One course, which may or may not be one of the nine courses taken for the major, must be dedicated in its entirety to historical periods, literature, or cultures before 1800 C.E.
**Independent Work**

Junior Year. Concentrators must write two junior papers. The first paper, some 3,000 words in length, will normally involve the close study of a work from one of the non-English-language literatures in which the student has linguistic competence. Its purpose is to develop the student's basic skills as a reader of complex texts. The second paper should be wider in scope, and might serve as the beginnings of a senior thesis. It will normally be some 8,000 words in length.

Senior Year. Concentrators must write a senior thesis, normally between 15,000 and 20,000 words, which is comparative in nature and should reflect the student's ability to relate and analyze materials in the area chosen. Creative theses must be accompanied by a substantial critical essay.

**Senior Departmental Examination**

Concentrators must take the senior departmental examination, which tests their ability to analyze texts and make connections among them. The student consults with his or her senior faculty adviser to select specific titles from a broad reading list, reads them, and answers questions based on the student's particular language proficiency and chosen program of study. Students will also be asked to analyze a passage in their primary language.

**Study Abroad**

Summer Study Abroad. There are numerous opportunities for summer study abroad, some partially supported by University funds. A summer abroad can increase fluency in the language of concentration. It may also be an effective way to satisfy the departmental requirement of acquiring reading knowledge in a second foreign language. For further information about available programs, students should consult Princeton Summer Abroad Study Programs. Some departmental funding is available for summer language study for concentrators.

Summer Work Abroad. Princeton offers some excellent work abroad programs, including Princeton-in-France and the German summer work abroad program, to which qualified students from the department are encouraged to apply. The Office of International Programs also offers a selection of worldwide summer internships for which comparative literature students may be eligible.

**Study and Work Abroad**

The department strongly encourages its students to undertake a semester, a year, or a summer abroad, in order to gain fluency in the language of concentration and to pursue further study in its literature and culture. Many opportunities are available for study abroad.

Certificate Program in Translation and Intercultural Communication. Since concentrators in comparative literature consider texts from an international and interdisciplinary perspective, and often with an emphasis in the creative
arts, questions of translation and intercultural communication often arise. Majors in the department may write translation theses, for instance, or put theoretical problems associated with translation or cross-cultural comparisons at the center of their departmental work. In these cases, they might choose to combine the concentration with a certificate in the Program in Translation and Intercultural Communication.

Certificates in University Programs. Students in comparative literature frequently choose to combine their concentration with certificates from Princeton programs and centers. Concentrators interested in these certificates should consult with the director of undergraduate studies and the director of the relevant program.

Courses

COM 205 The Classical Roots of Western Literature (also HUM 205 / HLS 203 ) Fall LA
An introduction to the methods and some major texts of comparative literary study. It will focus on the Greco-Roman tradition, asking what it means to call a work a "classic": it will consider the outstanding characteristics of this tradition, how it arose and gained influence and attempt to place it in a global context. Readings will be divided into three topics: Epic Heroes (centering on Homer's Odyssey), Tragic Women (in ancient and modern drama), and the "invention" of modernity (Aeneid). Selected additional readings in non-Western literatures and in influential critical essays. Two lectures, one preceptorial. D.
Heller-Roazen

COM 206 Masterworks of European Literature (also HUM 206 ) Spring LA
This course seeks to discover (or rediscover) a series of significant works in the European tradition, and also to ask once again what a tradition is. The focus will be firmly on the close reading of particular texts, but discussions will also range freely over large questions: What is a classic, what difference does language make, can we think both about world literature, in Goethe's phrase, and about the importance of national and local loyalties? No easy answers promised, but astonishing adventures in reading guaranteed.
M. DiBattista

COM 207 The Bible as Literature (See ENG 390)

COM 209 Thinking Translation: Language Transfer and Cultural Communication (See TRA 200)

COM 220 Introduction to Literary Theory Not offered this year LA
An introductory course in the history of European literary theory. Readings include Plato, Aristotle, Longinus, Boccaccio, Dryden, Corneille, Schiller, Sartre, Lévi-Strauss, Barthes, Derrida. Theories will be related to selected literary texts in an effort to explore how theory illuminates literature while shedding light upon larger human questions. One lecture, one two-hour seminar. S. Bermann

COM 233 East Asian Humanities I: The Classical Foundations (See HUM 233)

COM 234 East Asian Humanities II: Traditions and Transformations (See HUM 234)

COM 300 Junior Seminar: Introduction to Comparative Literature Fall LA
Introduction to Comparative Literature for departmental concentrators. What is it to read comparatively across languages, disciplines, and media? How does Comparative Literature relate to a globalized world with its many
cultures, languages, and literatures? What is the place of translation in this picture? We will address these questions by both looking at Comparative Literature as a historical institution and as a site at which disciplines, methods, and positions blend and clash. Readings from a wide variety of texts: fiction, poetry, travel writing, theory, history; consideration of other media such as visual culture and music. E.

Reeves

COM 301 Theory and Methods of Comparative Literature: Critical and Literary Theory Spring
LA
A course in the formative issues of contemporary critical theory. Questions of the relationships between literature, philosophy, aesthetics, and linguistics will be treated with regard to the rise of modern philology, new criticism, hermeneutics, speech act theory, semiotics, structuralism, Marxism, the Frankfurt School, and poststructuralism. Readings in Auerbach, Spitzer, Brooks, Wimsatt, Schleiermacher, Gadamer, Ricoeur, Austin, Burke, Frye, Propp, Saussure, Jakobson, Lévi-Strauss, Barthes, Jameson, Adorno, Derrida, de Man. One three-hour seminar. C. Brodsky

COM 303 Comparative History of Literary Theory (also ENG 302) Not offered this year LA
A historical introduction to literary theory from Plato to the present. By reading philosophers, critics, and creative writers, students consider issues such as mimesis, imagination, religion, sexuality, and ethics, noting how each casts light on our understanding of literature and its cultural roles. Past terms and current problems are related to an inquiry into the nature--and the power--of literature through the ages. Students will read critical works from Plato and Aristotle, through Nietzsche, Beauvoir, Benjamin, Derrida, and Achebe, as well as poetry and plays by Sophocles, Shakespeare, Eliot, and Brecht. One three-hour seminar. S. Bermann

COM 304 The East European Novel of the 20th Century Not offered this year LA
Caught between Russia and the West, traded off among European empires, the peoples of Eastern Europe are again independent in the postcommunist era. For them, surviving the 20th century became, literally, an art. After a geopolitical introduction to the region, students will read modern prosweworks from the Polish, Czech, and Serbo-Croatian traditions, including novels cast as national epics during times of total war, as fantasy or science fiction, and as the tragicomedy of everyday life. Five films built off these novels will be screened during the course. Two lectures, one preceptorial. C. Emerson

COM 305 The European Novel: Cervantes to Tolstoy Not offered this year LA
The emergence and development of the major forms of the novel as seen in the works of Cervantes, Mme. de Lafayette, Diderot, Laclos, Goethe, Balzac, Stendhal, Gogol, Turgenev, Flaubert, and Tolstoy. Emphasis is placed on the novel as the expression of human relationships with individuals and with society. Two lectures, one preceptorial. M. Wood

COM 306 The Modern European Novel (also ENG 317) Not offered this year LA
Using Flaubert's Madame Bovary as a paradigm of the major thematic and technical preoccupations of the novel, lectures offer detailed interpretations of Ulysses, The Magic Mountain, Swann's Way, and theoretical speculations on symbolism, stream-of-consciousness, linguistic structures, psychoanalysis. Two lectures, one preceptorial. M. DiBattista

COM 309 The Lyric (also ENG 420 / SPA 349) Not offered this year LA
The lyric as a form of literary art, as distinct from narrative or drama. Readings encompass a variety of lyrical forms and a number of different cultures. Translations will be used. One lecture, one two-hour seminar. *S. Bermann*

**COM 310 The Literature of Medieval Europe (also MED 308)**  
Not offered this year LA  
An introductory survey of major representative Latin and vernacular texts in modern English versions, including hagiography, romance, lyric and philosophical poetry, allegory, religious and secular prose, and drama. Special attention will be paid to Christian transformations of classical traditions and to the emergence of the Continental vernaculars of the late Middle Ages. Lecture and preceptorials. *D. HellerRoazen*

**COM 311 Special Topics in Performance History and Theory (See THR 331)**

**COM 314 The Renaissance (also ART 334)**  
Not offered this year LA  
An introduction to the literature of the Renaissance in Europe and in England. Emphasis upon major genres--lyric, drama, pastoral, and prose-fiction--as they arise in Italy, France, Spain, and England. Readings from Boccaccio, Castiglione, Lope de Vega, Sidney, Shakespeare, Erasmus, Rabelais, and Cervantes. Two 90-minute seminars. *L. Barkan*

**COM 315 Cervantes and His Age (See SPA 306)**

**COM 318 The Modern Period (also ECS 319)**  
Not offered this year LA  
Modern Western literature in the perspective of its development since the Industrial Revolution. The peculiarity of "modernist" style exemplified by various genres. Significant philosophical trends that define the parallel development of modern art and thought. Texts from English, German, French, and other literatures. Two lectures, one preceptorial. *S. Draper*

**COM 320 Masterworks of European Literature: The Romantic Quest (See GER 320)**

**COM 321 Modern Drama I (See ENG 364)**

**COM 323 Self and Society in Classical Greek Drama (See CLA 323)**

**COM 324 The Classical Tradition (also HLS 324)**  
Spring LA  
Classical mythology in the arts from Ovid to Shakespeare, from Zeuxis to Titian, with a particular emphasis on the subject of love. Introductory discussions on the nature of myth in its relation to the literary and visual arts. Readings will include major literary works from antiquity to the Renaissance integrated with the study of mythological painting, principally from 15th- and 16th-century Italy, including the works of Botticelli, Correggio, and Titian. One three-hour seminar. *L. Barkan*

**COM 325 Experimental Fiction (also ENG 342)**  
Not offered this year LA  
A study of the more experimental, self-conscious narratives in modernist literature with emphasis on the major formal and stylistic innovations of representative modern texts. *M. DiBattista*

**COM 326 Tragedy (also HLS 326)**  
Not offered this year LA
The tragic vision as expressed by Greek, Renaissance, and modern writers who dramatize the relationship between human suffering and human achievement. Readings in Aeschylus, Sophocles, the Old Testament, Shakespeare, Milton, Chekhov, Ibsen, Sartre, Brecht, Beckett, and T. S. Eliot. One lecture, one two-hour seminar. Staff

COM 327 Modernism in Fiction (also LAS 327) Not offered this year LA
A study of early to mid-20th century fiction, focusing on the question of modernity both as a literary and a historical-philosophical problem. Attention will be given especially to experimentation with literary form and the relation of narrative forms to specific cultural practices. Authors read in the course include Joyce, Woolf, Kafka, Proust, Beckett, Borges. Students will also study essays reflecting the debates of the period (Brecht, Adorno, Lukács, Benjamin). One three-hour seminar. Staff

COM 328 Modernism in Poetry Not offered this year LA
A study of the relation between the writing of poetry and the question of modernity as a theoretical and cultural problem. The course will take into account the various experimental movements that opted for poetry as their primary medium (imagism, dadaism, surrealism, futurism), as well as the work of certain poets who have indelibly marked the 20th century's poetic landscape (Yeats, Brecht, Neruda, Cavafy, and others). Students are expected to know at least one of the foreign languages involved well enough to read the original texts. One three-hour seminar. M. Wood

COM 330 Literature and Law Not offered this year LA
An introduction to literature as a vehicle of thought about law, morality, and the tensions between them. Readings include ancient legal codes, selected biblical texts, Greek tragedies, Norse sagas, medieval satirical epics, Renaissance drama, 18th-century drama, and modern fiction. Emphasis on revenge codes, the shift from prelegal to legal societies, the Christianization of Germanic law, equity, contract, critiques of law and legal systems. One three-hour seminar. Staff

COM 333 The Chinese Novel (See EAS 333)

COM 334 Modern Transformations of Classical Themes (See CLA 334)

COM 337 Really Fantastic Fiction Not offered this year LA
Fiction by writers of a fundamentally realist persuasion who nevertheless depict in their work the intrusion of the supernatural and the fantastic into everyday life. Gogol, Kleist, James, Olesha, Nabokov, Bradbury, García Márquez, and Calvino are among the authors read. One lecture, one two-hour seminar. E. Reeves

COM 338 Forms of Short Fiction Not offered this year LA
The short story and other forms of brief imaginative prose as they have developed in English and the European languages during the 19th and 20th centuries. The seminar discussions will examine selected works of such authors as Chekhov, Lawrence, Kafka, Joyce, Hemingway, Faulkner, Borges, Nabokov, W. C. Williams, Welty, Cheever, Flannery O'Connor, Tournier, and Barthelme. One lecture, one two-hour seminar. D. Bellos

COM 339 New Diasporas (See ENG 397)

COM 340 Literature and Photography (See ECS 340)
COM 344 Postwar Japanese Narrative: Modern to Postmodern (See EAS 344)

COM 346 Modern Latin American Fiction in Translation (See SPA 346)

COM 349 Texts and Images of the Holocaust (also JDS 349) Not offered this year EM
In an effort to encompass the variety of responses to what is arguably the most traumatic event of modern Western experience, the Holocaust is explored as transmitted through documents, testimony, memoirs, creative writing, historiography, and cinema. In this study of works, reflecting diverse languages, cultures, genres, and points of view, the course focuses on issues of bearing witness, collective vs. individual memory, and the nature of radical evil. One three-hour seminar, plus weekly film showings. Staff

COM 354 Topics in Gender and Representation (See SPA 353)

COM 355 Advanced Creative Writing (Literary Translation) (See CWR 305)

COM 356 Advanced Creative Writing (Literary Translation) (See CWR 306)

COM 357 Tales of Hospitality: France, North Africa, and the Mediterranean (See FRE 327)

COM 359 Acting, Being, Doing, and Making: Introduction to Performance Studies (See THR 300)

COM 361 The Cinema from World War II until the Present (See VIS 342)

COM 363 Philosophy of Art (See PHI 326)

COM 370 Topics in Comparative Literature (also ENV 372 / GSS 370) Not offered this year LA Study of a selected theme or topic in comparative literature. Subjects will range from historical and cultural questions (literature and politics, the literature of the avant-garde) to the study of specific literary themes or topics (feminine autobiography, the grotesque in literature). R. Bowlby

COM 372 The Gothic Tradition (also ENG 303) Spring LA
An exploration of the cultural meanings of the Gothic mode through a study of its characteristic elements, its origins in 18th-century English and German culture and thought, its development across Western national traditions, and its persistence in contemporary culture, including film, electronic media, clothing, social behavior, and belief systems, as well as literature. Films, artifacts, websites, and electronic publications will supplement readings. One three-hour seminar. A. Alliston

COM 380 Politics and Society in the Arabic Novel and Film (also NES 380) Fall LA
This course examines how Arab writers have used the craft of fiction to address major social and political issues such as displacement, labor migration, war, social repression, and dictatorship. The course covers novels from Egypt, the Sudan, Lebanon, Palestine, Morocco, and Iraq. Topics covered include the Lebanese Civil War, the Palestinian struggle, Islamic fundamentalism, and Iraq under the Baathist regime. The course will also look more
broadly at experiences of exile and migration and the postcolonial world as reflected in modern Arabic writing. All readings are in English translation. L. Levy

COM 389 Cultural Systems (See ECS 321)

COM 393 Nietzsche (See PHI 306)

COM 400 Seminar: Literary Imagination and the Image of History Not offered this year LA
Literary texts from two or more national cultures will be viewed in a historical perspective of a specific period (the Renaissance or the Enlightenment) or a significant event (the French Revolution or World War I) or a social phenomenon (the Industrial Revolution). The mutual relationship between the image of the world created by writers and the impact of writers upon the world they reflect. Staff

COM 401 Seminar. Types of Ideology and Literary Form (also ENG 419 / GSS 401 ) Fall EM
Relationships between conceptions of literary form and developments in intellectual history, spanning different genres and cultural traditions. Some examples: modernism in the context of 20th-century ideological conditions; the rise of the novel traced through philosophies of the 18th and 19th centuries. A. Alliston

COM 403 Seminar. The Aesthetic Movement: Forms of Excitement Not offered this year LA
An examination of selected works of European literature, chiefly around the turn of the 20th century, that provoke distinctive "forms of (literary) excitement." Topics will include decadence, ecstasy, ekphrasis, self-mirroring, asceticism, sadomasochism, dandyism, epiphany, and l'art pour l'art. One three-hour seminar. Staff

COM 404 Literature Across Languages Not offered this year LA
Studies in the international exchange of literary forms and ideas, intellectual and artistic movements. The topic will be drawn from among the following or others similar in scope: the literature of exile, the avantgarde, formalism and structuralism, Byronic hero and antihero, literary relations between East and West, surrealism and its legacy, the international response to individual writers. C. Emerson

COM 405 Senior Seminar Not offered this year LA
The course will deal with a theme, author, or problem in comparative literature studies. Staff

COM 409 Senior Seminar in Translation and Intercultural Communication (See TRA 400)

COM 410 Bakhtin, the Russian Formalists, and Cultural Semiotics (also SLA 410 ) Not offered this year LA
A survey (in English) of three influential schools of 20th-century Russian literary criticism: the major Russian formalists (1920s); Mikhail Bakhtin (1920s-70s), and the cultural semiotics of Yury Lotman and his "Tartu School" (1960s-80s). The course will include both primary and secondary texts; major essays will be read in conjunction with sample literature that illustrates the critical approach. Two 90-minute seminars. C. Emerson

COM 415 Leo Tolstoy, War and Peace, and the Tasks of Literature (also SLA 415 / RES 415 ) Not offered this year EM
The course is primarily about War and Peace, framed by some earlier and later fiction and by Tolstoy's essays on art and religion. Tolstoy's radical ideas on narrative have a counterpart in his radical ideas on history, causation, and
the formation of a moral self. Together, these concepts offer an alternative to "The Russian Idea," associated with Dostoevsky and marked by mysticism, apocalypse, and the crisis moment. To refute this idea, Tolstoy redefined the tasks of novelistic prose. Seminar.  C. Emerson

COM 423 Topics in Postcolonial Literature (See ENG 417)

COM 430 Film Theory (See VIS 442)

COM 444 Cinema and the Related Arts (See VIS 444)
Department of Computer Science - A.B.

Chair
Jennifer L. Rexford

Associate Chair
Szymon M. Rusinkiewicz

Departmental Representative
Brian W. Kernighan Andrea S. LaPaugh

Director of Graduate Studies
Andrew W. Appel

Professor
Andrew W. Appel
Sanjeev Arora
David August
Mark Braverman
Bernard Chazelle
David P. Dobkin
Nick Feamster
Edward W. Felten, also Woodrow Wilson School
Adam Finkelstein
Michael J. Freedman
Thomas A. Funkhouser
Aarti Gupta
Elad E. Hazan
Brian W. Kernighan
Andrea S. LaPaugh
Kai Li
Margaret R. Martonosi
Benjamin J. Raphael
Jennifer L. Rexford
Szymon M. Rusinkiewicz
Robert Sedgewick
Hyunjune Sebastian Seung, also Princeton
Neuroscience Institute
Jaswinder Pal Singh
Mona Singh, Also Lewis-Sigler Institute for Integrative Genomics
Robert E. Trajan
Olga G. Troyanskaya, also Lewis-Sigler Institute for Integrative Genomics
David P. Walker

Associate Professor
Zeev Dvir, also Mathematics

Assistant Professor
Barbara E. Englehardt
Kyle A. Jamieson
Zachary Kincaid
Gillat Kol
Arvind Narayanan
Matthew Weinberg
Mark L. Zhandry

Senior Lecturer
Kevin Wayne

Lecturer
Ibrahim Albluwi
Sandra Batista
Robert M. Dondero Jr.
Robert Fish
Donna Gabai
Maia Ginsburg
Ananda Gunawardena
Alan Kaplan
Xiaoyan Li
Daniel Leyzberg
Jeremie Lumbroso
Christopher Moretti
Iasonas Petras

Associated Faculty
Amir Ali Ahmadi, Operations Research and Financial Engineering
Mung Chiang, Electrical Engineering
Ruby B. Lee, Electrical Engineering
Han Liu, Operations Research and Financial Engineering
Prateek Mittal, Electrical Engineering
Information and Departmental Plan of Study

The Department of Computer Science curriculum encourages students to learn fundamental concepts of the discipline and to become proficient in the use of advanced computer systems. The plan provides opportunities for study in software systems, algorithms and complexity, machine architecture, computer graphics, programming languages, machine learning, and other core areas of computer science. Most computer science students enjoy programming and are given ample opportunity to do so within the curriculum.

Information for First-Year Students. Students with a general interest in the sciences or engineering are encouraged to take COS 126 in the first year or in the first semester of the second year. This provides useful background for applications work in any science or engineering major and preserves the option of later electing a computer science major.

Prerequisites

The prerequisites for AB candidates are MAT 103, 104, and 202 or 204; COS 126; COS 217 and 226. Students should plan to take both 217 and 226 before the junior year. One or both of these are required prerequisites for all later computer science courses.

Departmental Requirements

Eight additional departmental courses at or above the 300 level must be elected to fulfill the departmental requirements. These eight courses must include two each from the following three areas:

Theoretical computer science:
340 Reasoning about Computation
423 Theory of Algorithms
433 Cryptography
441 Programming Languages
445 Networks, Economics and Computing
451 Computational Geometry
487 Theory of Computation
488 Introduction to Analytic Combinatorics
510* Programming Languages (In lieu of COS 441)
516* Reasoning About Software
*If a student takes COS 510 (or 441) and COS 516 only one will count as a theory requirement.
Systems:
306 Introduction to Logic Design (see ELE 206)
318 Operating Systems
320 Compiling Techniques
333 Advanced Programming Techniques
375 Computer Architecture and Organization
418 Distributed Systems
425 Database and Information Management Systems
461 Computer Networks
475 Computer Architecture (see ELE 475)

Applications:
314 (MUS 314) Computer and Electronic Music through Programming, Performance, and Composition
323 Computing and Optimization for the Physical and Social Sciences (see ORF 363)
326 Functional Programming
401 Introduction to Machine Translation (see TRA 301)
402 Machine Learning and Artificial Intelligence
424 Fundamentals of Machine Learning
426 Computer Graphics
429 Computer Vision
432 Information Security
435 Information Retrieval, Discovery, and Delivery
436 Human-Computer Interface Technology
455 Introduction to Genomics and Computational Molecular Biology

On occasion, certain courses at the 300-or-above level with sufficient computational content taught outside the Department of Computer Science may count as COS departmentals. For information on such courses, see the Department of Computer Science requirements webpage.

Students should consult with a computer science academic adviser on their course selections after they decide to become computer science concentrators. Academic advisers are listed on the Department of Computer Science webpage.

**Independent Work**

All A.B. concentrators engage in independent work supervised by a member of the department. A junior project normally involves the study and solution of specific problems, often associated with a research project. It may require a significant programming effort, a theoretical study involving the design and analysis of algorithms, or an applications problem in some other field. The results of these efforts must be presented in two written reports and posters that correspond to the work undertaken in each of the terms. The senior thesis may be a study in greater depth of one of the subjects considered in junior independent work, or it may deal with another aspect of computer science and its application.
The department also offers a curriculum leading to the B.S.E. degree. The primary differences between the A.B. and the B.S.E. programs are in the general requirements for the degree programs, and the nature and extent of independent study.

**Senior Departmental Examination**

An oral examination, consisting of a defense of the thesis research, will be held in late April or early May.

**Integrated Science Sequence**

An alternative path into the department is through the integrated science curriculum. ISC/CHM/COS/MOL/PHY 231-4 (a double course) can be taken in the freshman year and ISC/CHM/COS/MOL/PHY 235/6 can be taken in the sophomore year. These courses can be substituted for CHM 203/204, PHY 103/104 or 105/6, and COS 126 in the freshman year and MOL 214, 342, and 345 in the sophomore year. For full course descriptions and more information, see the integrated science website.

**Interdisciplinary Studies.** The pervasive nature of modern computing has introduced many interactions between computer science and other disciplines. Basic preparation in computer science is valuable for a broad variety of careers because of the central role played by the computer in society. Professionals who understand computers are far more effective in their work. In the past, a large amount of technical preparation was required before interesting applications could be considered; today's undergraduates are able to use computers to study important problems in other disciplines.

Some possible areas for interdisciplinary study are: mathematics, music, art, economics, electrical engineering, molecular biology, cognitive studies, and linguistics.

Many Princeton undergraduates view their four years at Princeton as an opportunity to gain an education before immersing themselves in rigorous training for careers in law, business, or medicine. Computer science students are no exception. Through the choice of electives, students may create a specialized interdisciplinary program or a broad program with computer science as the core of pre-professional study. The former requires consultation with advisers in the related disciplines to determine what constitutes a reasonable cognate specialization, and the latter is constrained by the requirement of a coherent program of concentration.

**Program in Applications of Computing.** Students pursuing some other major field of study, but who are interested in the applications of computer science to that field, may wish to consider the Program in Applications of Computing.

**Program in Quantitative and Computational Biology.** The Program in Quantitative and Computational Biology (QCB) is designed for students with a strong interest in multidisciplinary and systems-level approaches to understanding molecular, cellular, and organismal behavior. The curriculum introduces the students to experimental and analytic techniques for acquisition of large-scale quantitative observations, and the interpretation of such data in the context of appropriate models. Strong emphasis is placed on using global genome-wide measurements (e.g., microarray gene expression, sequence, phenotype) to understand physiological and evolutionary processes. At the core of the curriculum is the Project Lab (QCB 301), a double laboratory course, taken during the fall of junior year, where students participate in the design, execution, and analysis of experiments. The required courses provide a strong background in modern methodologies in data analysis, interpretation, and modeling. Courses are chosen with
the help of advisers in molecular biology, ecology and evolutionary biology, physics, chemistry, computer science, and other related departments. A certificate in quantitative and computational biology is awarded to students who successfully complete the program requirements.

Courses

**COS 109 Computers in Our World (also EGR 109)**  
Fall QR  
Computers are all around us. How does this affect the world we live in? This course is a broad introduction to computing technology for humanities and social science students. Topics will be drawn from current issues and events, and will include discussion of how computers work, what programming is and why it is hard, how the Internet and the Web work, security and privacy. Two 90-minute lectures. Self-scheduled computer laboratory.  
*D. Dobkin*

**COS 116 The Computational Universe (also EGR 116)**  
Not offered this year STL  
Computers have brought the world to our fingertips. This course explores at a basic level the science "old and new" underlying this new computational universe: propositional logic of the ancient Greeks (microprocessors); quantum mechanics (silicon chips); network and system phenomena (internet and search engines); computational intractability (secure encryption); and efficient algorithms (genomic sequencing). Ultimately, this study makes us look anew at ourselves: our genome; language; music; "knowledge"; and, above all, the mystery of our intelligence. Two 90-minute lectures, one three-hour laboratory.  
*A. Finkelstein*

**COS 126 Computer Science: An Interdisciplinary Approach (also EGR 126)**  
Fall/Spring QR  
An introduction to computer science in the context of scientific, engineering, and commercial applications. The course will teach basic principles and practical issues, and will prepare students to use computers effectively for applications in computer science, physics, biology, chemistry, engineering, and other disciplines. Topics include: hardware and software systems; programming in Java; algorithms and data structures; fundamental principles of computation; and scientific computing, including simulation, optimization, and data analysis. No prior programming experience required. Video lectures, one or two classes, two preceptorials.  
*K. Wayne*

**COS 217 Introduction to Programming Systems**  
Fall/Spring QR  
An introduction to computer organization and system software. The former includes topics such as processor and memory organization, input/output devices, and interrupt structures. The latter includes assemblers, loaders, libraries, and compilers. Programming assignments are implemented in assembly language and C using the UNIX operating system. Three lectures. Prerequisite: 126 or instructor's permission.  
*A. Appel*

**COS 226 Algorithms and Data Structures**  
Fall/Spring QR  
This course surveys the most important algorithms and data structures in use on computers today. Particular emphasis is given to algorithms for sorting, searching, and string processing. Fundamental algorithms in a number of other areas are covered as well, including geometric algorithms, graph algorithms, and some numerical algorithms. The course will concentrate on developing implementations, understanding their performance characteristics, and estimating their potential effectiveness in applications. Two online lectures, two class meetings, one precept.  
*R. Sedgewick*

**COS 231 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 231)**

**COS 232 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 232)**

**COS 233 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 233)**

**COS 234 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 234)**

**COS 235 An Integrated, Quantitative Approach to Biochemistry and Neuroscience (See ISC 235)**

**COS 236 An integrated, Quantitative Approach to Genetics and Genomics (See ISC 236)**
COS 306 Contemporary Logic Design (See ELE 206)

COS 314 Computer and Electronic Music through Programming, Performance, and Composition (See MUS 314)

COS 318 Operating Systems Fall
A study of the design and analysis of operating systems. Topics include: processes, mutual exclusion, synchronization, semaphores, monitors, deadlock prevention and detection, memory management, virtual memory, processor scheduling, disk management, file systems, security, protection, distributed systems. Two 90-minute lectures. Prerequisites: 217 and 226 or instructor's permission. J. Singh

COS 320 Compiling Techniques Spring
The principal algorithms and concepts associated with translator systems. Topics include lexical analysis, syntactic analysis, parsing techniques, symbol table management, code generation and optimization, run time system design, implementation issues related to programming language design. Course will include a large-scale programming project utilizing the above topics. Three lectures. Prerequisites: 217 and 226 or instructor's permission. D. August

COS 325 Transforming Reality by Computer (also MUS 315) Not offered this year LA
Capturing and transforming sound by computer for artistic purposes. Emphasis is on the student's own creative use of aural material from the real world, on providing a basic foundation in the signal processing theory and technique most useful for computer music, and on the interaction between the artistic and scientific aspects of the endeavor. Two 90-minute lectures, one preceptorial, one laboratory. Prerequisites: 217 and MAT 104. Offered alternate years. Staff

COS 333 Advanced Programming Techniques Spring
The practice of programming. Emphasis is on the development of real programs, writing code but also assessing tradeoffs, choosing among design alternatives, debugging and testing, and improving performance. Issues include compatibility, robustness, and reliability, while meeting specifications. Students will have the opportunity to develop skills in these areas by working on their own code and in group projects. Two 90-minute lectures. Prerequisites: 217 and 226 (as corequisite). B. Kernighan

COS 340 Reasoning about Computation Fall/Spring QR
An introduction to mathematical topics relevant to computer science. Combinatorics and probability will be covered in the context of computer science applications. The course will present a computer science approach to thinking and modeling through such topics as dealing with uncertainty in data and handling large data sets. Students will be introduced to fundamental concepts such as NP-completeness and cryptography that arise from the world view of efficient computation. Prerequisites COS 126 and 226 (or sufficient mathematical background), and MAT 202 or MAT 204 or MAT 217. COS 226 can be taken along with COS 340 in the same term. B. Chazelle

COS 342 Introduction to Graph Theory (See MAT 375)

COS 351 Information Technology and Public Policy (See WWS 351)

COS 375 Computer Architecture and Organization (also ELE 375) Fall STN
An introduction to computer architecture and organization. Instruction set design; basic processor implementation techniques; performance measurement; caches and virtual memory; pipelined processor design; design trade-offs among cost, performance, and complexity. Two 90-minute classes, one selfscheduled hardware laboratory. Prerequisites: COS 217. M. Martonosi

COS 381 Networks: Friends, Money and Bytes (See ELE 381)

COS 396 Introduction to Quantum Computing (See ELE 396)

COS 397 Junior Independent Work (B.S.E. candidates only) Fall
Offered in the fall, juniors are provided with an opportunity to concentrate on a "state-of-the-art" project in computer science. Topics may be selected from suggestions by faculty members or proposed by the student. B.S.E. candidates only.  

A. LaPaugh

COS 398 Junior Independent Work (B.S.E. candidates only)  
Offered in the spring, juniors are provided with an opportunity to concentrate on a "state-of-the-art" project in computer science. Topics may be selected from suggestions by faculty members or proposed by the student. B.S.E. candidates only.  

Staff

COS 402 Machine Learning and Artificial Intelligence  
This course will provide a basic introduction to the core principles, algorithms and techniques of modern artificial intelligence and machine learning research and practice. Main topics will include: 1. Problem solving using search, with applications to game playing 2. Probabilistic reasoning in the presence of uncertainty 3. Hidden Markov models and speech recognition 4. Markov decision processes and reinforcement learning 5. Machine learning using decision trees, neural nets and more. 6. Basic principles of mathematical optimization for learning. Prerequisites-COS 226 and COS 340  

E. Hazan

COS 423 Theory of Algorithms  
Design and analysis of efficient data structures and algorithms. General techniques for building and analyzing algorithms. Introduction to NP-completeness. Two 90-minute lectures. Prerequisites: 226 and 340 or instructor's permission.  

R. Tarjan

COS 424 Fundamentals of Machine Learning (also SML 302 )  
Computers have made it possible, even easy, to collect vast amounts of data from a wide variety of sources. It is not always clear, however, how to use those data, and how to extract useful information from them. Course will focus on some of the most useful approaches to this broad problem, exploring both theoretical foundations and practical applications. Students will gain experience analyzing many kinds of data, including text, images, and biological data. Topics include classification, clustering, prediction, and dimensionality reduction. Two 90-minute lectures. Prerequisites: MAT 202 and COS 126 or equivalent, or instructor's permission.  

Staff

COS 425 Database and Information Management Systems  
Theoretical and practical aspects of database systems and systems for accessing and managing semistructured information (e.g., Web information repositories). Topics include: relational and XML models, storage and indexing structures, query expression and evaluation, concurrency and transaction management, search effectiveness. Two 90-minute lectures. Prerequisites: 217 and 226.  

A. LaPaugh

COS 426 Computer Graphics  
The principles underlying the generation and display of graphical pictures by computer. Hardware and software systems for graphics. Topics include: hidden surface and hidden line elimination, line drawing, shading, half-toning, user interfaces for graphical input, and graphic system organization. Two 90-minute lectures. Prerequisites: 217 and 226.  

S. Rusinkiewicz

COS 429 Computer Vision  
An introduction to the concepts of 2D and 3D computer vision. Topics include low-level image processing methods such as filtering and edge detection; segmentation and clustering; optical flow and tracking; shape reconstruction from stereo, motion, texture, and shading. Throughout the course, there will also be examination of aspects of human vision and perception that guide and inspire computer vision techniques. Prerequisites: 217 and 226. Two 90-minute lectures.  

S. Rusinkiewicz

COS 432 Information Security (also ELE 432 )  
Security issues in computing, communications, and electronic commerce. Goals and vulnerabilities; legal and ethical issues; basic cryptology; private and authenticated communication; electronic commerce; software security; viruses and other malicious code; operating system protection; trusted systems design; network security; firewalls;
COS 433 Cryptography (also MAT 473) Not offered this year
An introduction to modern cryptography with an emphasis on fundamental ideas. The course will survey both the basic information and complexity-theoretic concepts as well as their (often surprising and counter-intuitive) applications. Among the topics covered will be private key and public key encryption schemes, digital signatures, pseudorandom generators and functions, chosen ciphertext security; and time permitting, some advanced topics such as zero knowledge proofs, secret sharing, private information retrieval, and quantum cryptography. Prerequisites: 226 or permission of instructor. Two 90-minute lectures. Z. Dvir

COS 435 Information Retrieval, Discovery, and Delivery Spring
This course studies both classic techniques of indexing documents and searching text, and also new algorithms that exploit properties of the World Wide Web, digital libraries, and multimedia collections. There is significant emphasis on current methods employed by Web search engines, including methods of employing user profiles to enhance search results. Pragmatic issues of handling very large amounts of information that may be widely dispersed--caching, distributed storage, and networking technology--are also covered. Prerequisite: COS 226 and MAT 202. Two 90-minute lectures. A. LaPaugh

COS 436 Human-Computer Interface Technology (also ELE 469) Not offered this year
This course covers hardware, sensors, displays, software, signal processing, pattern recognition, real-time computing, systems, and architectures for human computer interfacing. Labs supplement lectures and readings, and final group projects are executed and tested. Prerequisite: COS 217 or ELE 302. Two 90-minute lectures. Staff

COS 441 Programming Languages Not offered this year
How to design and analyze programming languages and how to use them effectively. Functional programming languages, object-oriented languages; type systems, abstraction mechanisms, operational semantics, safety and security guarantees. Implementation techniques such as object representations and garbage collection will also be covered. Prerequisites: COS 217 and 226. Three lectures. Staff

COS 448 Innovating Across Technology, Business, and Marketplaces (also EGR 448) Spring
This course introduces engineering students to the types of issues that are tackled by leading and innovative Chief Technology Officers: the technical visionaries and/or managers at companies who innovate at the boundaries of technology, business, and marketplaces by understanding all of these areas deeply. These individuals are true partners to the business leaders of the organization, not merely implementers of business goals. The focus will be on software technologies and businesses based on them. To use specific contexts, we will emphasize two complementary areas as examples: businesses based on cloud computing and on marketplaces. J. Singh

COS 451 Computational Geometry Not offered this year
Introduction to basic concepts of geometric computing, illustrating the importance of this new field for computer graphics, solid modelling, robotics, databases, pattern recognition, and statistical analysis. Algorithms for geometric problems. Fundamental techniques, for example, convex hulls, Voronoi diagrams, intersection problems, multidimensional searching. Two 90-minute lectures. Prerequisites: 226 and 340 or 341, or equivalent. B. Chazelle

COS 455 Introduction to Genomics and Computational Molecular Biology (See QCB 455)

COS 461 Computer Networks Spring
This course studies computer networks and the services built on top of them. Topics include packet-switch and multi-access networks, routing and flow control, congestion control and quality-of-service, Internet protocols (IP, TCP, BGP), the client-server model and RPC, elements of distributed systems (naming, security, caching) and the design
of network services (multimedia, peer-to-peer networks, file and Web servers, content distribution networks). Two lectures, one preceptorial. Prerequisite: 217. N. Feamster

COS 462 Design of Very Large-Scale Integrated (VLSI) Systems (See ELE 462)

COS 475 Computer Architecture (See ELE 475)

COS 487 Theory of Computation (also MAT 407 ) Fall
Studies the limits of computation by identifying tasks that are either inherently impossible to compute, or impossible to compute within the resources available. Introduces students to computability and decidability, Godel's incompleteness theorem, computational complexity, NP-completeness, and other notions of intractability. This course also surveys the status of the P versus NP question. Additional topics may include: interactive proofs, hardness of computing approximate solutions, cryptography, and quantum computation. Two lectures, one precept. Prerequisite: 340 or 341, or instructor's permission. R. Tarjan

COS 488 Introduction to Analytic Combinatorics (also MAT 474 ) Spring
Analytic Combinatorics aims to enable precise quantitative predictions of the properties of large combinatorial structures. The theory has emerged over recent decades as essential both for the scientific analysis of algorithms in computer science and for the study of scientific models in many other disciplines. This course combines motivation for the study of the field with an introduction to underlying techniques, by covering as applications the analysis of numerous fundamental algorithms from computer science. The second half of the course introduces Analytic Combinatorics, starting from basic principles. R. Sedgewick

COS 495 Special Topics in Computer Science Not offered this year
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COS 497 Senior Independent Work (B.S.E. candidates only) Fall
Offered in the fall, seniors are provided with an opportunity to concentrate on a "state-of-the-art" project in computer science. Topics may be selected from suggestions by faculty members or proposed by the student. B.S.E. candidates only. A. LaPaugh

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Department of Computer Science - B.S.E.

Chair
Jennifer L. Rexford

Associate Chair
Szymon M. Rusinkiewicz

Departmental Representative
Brian W. Kernighan
Andrea S. LaPaugh

Director of Graduate Studies
Andrew W. Appel

Professor
Andrew W. Appel
Sanjeev Arora
David August
Mark Braverman
Bernard Chazelle
David P. Dobkin
Nick Feamster
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Adam Finkelstein
Michael J. Freedman
Thomas A. Funkhouser
Aarti Gupta
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Neuroscience Institute
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Mona Singh, also Lewis-Sigler Institute for Integrative Genomics
Robert E. Tarjan
Olga G. Troyanskaya, also Lewis-Sigler Institute for Integrative Genomics

Associate Professor
Zeev Dvir, also Mathematics

Assistant Professor
Barbara E. Engelhardt
Kyle A. Jamieson
Zachary Kincaid
Gillat Kol
Arvind Narayanan
Matthew Weinberg
Mark L. Zhandry

Senior Lecturer
Kevin Wayne

Lecturer
Ibrahim Albluwi
Sandra Batista
Robert M. Dondero Jr.
Robert Fish
Donna Gabai
Maia Ginsburg
Ananda Gunawardena
Alan Kaplan
Xiaoyan Li
Daniel Leyzberg
Jeremie Lumbroso
Christopher Moretti
Iasonas Petras

Associated Faculty
Amir Ali Ahmadi, Operations Research and Financial Engineering
Mung Chiang, Electrical Engineering
Ruby B. Lee, Electrical Engineering
Han Liu, Operations Research and Financial Engineering
Prateek Mittal, Electrical Engineering
Warren Powell, Operations Research and Financial Engineering
Paul D. Seymour, Mathematics
Information and Departmental Plan of Study

The Department of Computer Science curriculum encourages students to learn fundamental concepts of the discipline and to become proficient in the use of advanced computer systems. The plan provides opportunities for study in software systems, algorithms and complexity, machine architecture, computer graphics, programming languages, machine learning, and other core areas of computer science. Most computer science students enjoy programming and are given ample opportunity to do so within the curriculum.

Information for First-Year Students. Students with a general interest in the sciences or engineering are encouraged to take COS 126 in the first year or in the first semester of the second year. This provides useful background for applications work in any science or engineering major and preserves the option of later electing a computer science major.

Prerequisites

All BSE students must meet the School of Engineering and Applied Science general requirements. Students must complete 126, 217, and 226. Students should plan to take both 217 and 226 before the junior year. One or both of these are required prerequisites for all later computer science courses.

Departmental Requirements

Eight additional departmental courses at or above the 300 level must be elected to fulfill the departmental requirements. These eight courses must include two each from the following three areas:

Theoretical computer science:
340 Reasoning about Computation
423 Theory of Algorithms
433 Cryptography
441 Programming Languages
445 Networks, Economics and Computing
451 Computational Geometry
487 Theory of Computation
488 Introduction to Analytic Combinatorics
510* Programming Languages (In lieu of COS 441)
516* Reasoning About Software
* If a student takes COS 510 (or 441) and COS 516 only one will count as a theory requirement.

Systems:
306 Introduction to Logic Design (see ELE 206)
318 Operating Systems
320 Compiling Techniques
333 Advanced Programming Techniques
375 Computer Architecture and Organization
418 Distributed Systems
425 Database and Information Management Systems
461 Computer Networks
475 Computer Architecture (see ELE 475)

Applications:
314 (MUS 314) Computer and Electronic Music through Programming, Performance, and Composition
323 Computing and Optimization for the Physical and Social Sciences (see ORF 363)
326 Functional Programming
401 Introduction to Machine Translation (see TRA 301)
402 Machine Learning and Artificial Intelligence
424 Fundamentals of Machine Learning
426 Computer Graphics
429 Computer Vision
432 Information Security
435 Information Retrieval, Discovery, and Delivery
436 Human-Computer Interface Technology
455 Introduction to Genomics and Computational Molecular Biology

On occasion, certain courses at the 300 level with sufficient computational content taught outside the Department of Computer Science may count as COS departmentals. For information on such courses, refer to the Department of Computer Science requirements webpage.

Students should consult with a computer science academic adviser on their course selections after they decide to become computer science concentrators. Academic advisers are listed on the Department of Computer Science webpage.

**Independent Work**

All B.S.E. concentrators engage in independent work supervised by a member of the department, often associated with a research project. It may require a significant programming effort, a theoretical study involving the design and analysis of algorithms, or an applications problem in some other field. The results of these efforts must be presented in a written report and poster session. B.S.E. students must elect one semester of independent work by enrolling in 397, 398, 497, or 498. One additional semester of independent work may be counted as one of the departmental courses.

The department also offers a curriculum leading to an AB degree. The primary differences between the A.B. and B.S.E. programs are in the general requirements for the degree programs, and the nature and extent of independent study.
Integrated Science Sequence

An alternative path into the department is through the integrated science curriculum. ISC/CHM/COS/MOL/PHY 231-4 (a double course) can be taken in the freshman year, and ISC/CHM/COS/MOL/PHY 235/6 can be taken in the sophomore year. These courses can be substituted for CHM 203/204, PHY 103/104 or 105/6, and COS 126 in the freshman year and MOL 214, 342, and 345 in the sophomore year. For full course descriptions and more information, see the integrated science website.

Interdisciplinary Studies. The pervasive nature of modern computing has introduced many interactions between computer science and other disciplines. Basic preparation in computer science is valuable for a broad variety of careers because of the central role played by the computer in society. Professionals who understand computers are far more effective in their work. In the past, a large amount of technical preparation was required before interesting applications could be considered; today's undergraduates are able to use computers to study important problems in other disciplines.

Some possible areas for interdisciplinary study are: mathematics, music, art, economics, molecular biology, cognitive studies, and linguistics, and any of the departments and programs within the School of Engineering and Applied Science.

Many Princeton undergraduates view their four years at Princeton as an opportunity to gain an education before immersing themselves in rigorous training for careers in law, business, or medicine. Computer science students are no exception. Through the choice of electives, students may create a specialized interdisciplinary program or a broad program with computer science as the core of pre-professional study. The former requires consultation with advisers in the related disciplines to determine what constitutes a reasonable cognate specialization, and the latter is constrained by the requirement of a coherent program of concentration.

Program in Applications of Computing. Students pursuing some other major field of study, but who are interested in the applications of computer science to that field, may wish to consider a certificate in the Program in Applications of Computing.

Program in Quantitative and Computational Biology. The Program in Quantitative and Computational Biology (QCB) is designed for students with a strong interest in multidisciplinary and systems-level approaches to understanding molecular, cellular, and organismal behavior. The curriculum introduces the students to experimental and analytic techniques for acquisition of large-scale quantitative observations, and the interpretation of such data in the context of appropriate models. Strong emphasis is placed on using global genome-wide measurements (e.g., microarray gene expression, sequence, phenotype) to understand physiological and evolutionary processes. At the core of the curriculum is the Project Lab (QCB 301), a double laboratory course, taken during the fall of junior year, where students participate in the design, execution, and analysis of experiments. The required courses provide a strong background in modern methodologies in data analysis, interpretation, and modeling. Courses are chosen with the help of advisers in molecular biology, ecology and evolutionary biology, physics, chemistry, computer science, and other related departments. A certificate in quantitative and computational biology is awarded to students who successfully complete the program requirements.
Courses

**COS 109 Computers in Our World (also EGR 109)** Fall QR
Computers are all around us. How does this affect the world we live in? This course is a broad introduction to computing technology for humanities and social science students. Topics will be drawn from current issues and events, and will include discussion of how computers work, what programming is and why it is hard, how the Internet and the Web work, security and privacy. Two 90-minute lectures. Self-scheduled computer laboratory. *D. Dobkin*

**COS 116 The Computational Universe (also EGR 116)** Not offered this year STL
Computers have brought the world to our fingertips. This course explores at a basic level the science "old and new" underlying this new computational universe: propositional logic of the ancient Greeks (microprocessors); quantum mechanics (silicon chips); network and system phenomena (internet and search engines); computational intractability (secure encryption); and efficient algorithms (genomic sequencing). Ultimately, this study makes us look anew at ourselves: our genome; language; music; "knowledge"; and, above all, the mystery of our intelligence. Two 90-minute lectures, one three-hour laboratory. *A. Finkelstein*

**COS 126 Computer Science: An Interdisciplinary Approach (also EGR 126)** Fall/Spring QR
An introduction to computer science in the context of scientific, engineering, and commercial applications. The course will teach basic principles and practical issues, and will prepare students to use computers effectively for applications in computer science, physics, biology, chemistry, engineering, and other disciplines. Topics include: hardware and software systems; programming in Java; algorithms and data structures; fundamental principles of computation; and scientific computing, including simulation, optimization, and data analysis. No prior programming experience required. Video lectures, one or two classes, two preceptorials. *K. Wayne*

**COS 217 Introduction to Programming Systems** Fall/Spring QR
An introduction to computer organization and system software. The former includes topics such as processor and memory organization, input/output devices, and interrupt structures. The latter includes assemblers, loaders, libraries, and compilers. Programming assignments are implemented in assembly language and C using the UNIX operating system. Three lectures. Prerequisite: 126 or instructor's permission. *A. Appel*

**COS 226 Algorithms and Data Structures** Fall/Spring QR
This course surveys the most important algorithms and data structures in use on computers today. Particular emphasis is given to algorithms for sorting, searching, and string processing. Fundamental algorithms in a number of other areas are covered as well, including geometric algorithms, graph algorithms, and some numerical algorithms. The course will concentrate on developing implementations, understanding their performance characteristics, and estimating their potential effectiveness in applications. Two online lectures, two class meetings, one precept. *R. Sedgewick*

**COS 231 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 231)**

**COS 232 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 232)**

**COS 233 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 233)**

**COS 234 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 234)**

**COS 235 An Integrated, Quantitative Approach to Biochemistry and Neuroscience (See ISC 235)**

**COS 236 An integrated, Quantitative Approach to Genetics and Genomics (See ISC 236)**

**COS 306 Contemporary Logic Design (See ELE 206)**
COS 314 Computer and Electronic Music through Programming, Performance, and Composition (See MUS 314)

COS 318 Operating Systems Fall
A study of the design and analysis of operating systems. Topics include: processes, mutual exclusion, synchronization, semaphores, monitors, deadlock prevention and detection, memory management, virtual memory, processor scheduling, disk management, file systems, security, protection, distributed systems. Two 90-minute lectures. Prerequisites: 217 and 226 or instructor's permission. J. Singh

COS 320 Compiling Techniques Spring
The principal algorithms and concepts associated with translator systems. Topics include lexical analysis, syntactic analysis, parsing techniques, symbol table management, code generation and optimization, run time system design, implementation issues related to programming language design. Course will include a large-scale programming project utilizing the above topics. Three lectures. Prerequisites: 217 and 226 or instructor's permission. D. August

COS 325 Transforming Reality by Computer (also MUS 315) Not offered this year LA
Capturing and transforming sound by computer for artistic purposes. Emphasis is on the student's own creative use of aural material from the real world, on providing a basic foundation in the signal processing theory and technique most useful for computer music, and on the interaction between the artistic and scientific aspects of the endeavor. Two 90-minute lectures, one preceptorial, one laboratory. Prerequisites: 217 and MAT 104. Offered alternate years. Staff

COS 333 Advanced Programming Techniques Spring
The practice of programming. Emphasis is on the development of real programs, writing code but also assessing tradeoffs, choosing among design alternatives, debugging and testing, and improving performance. Issues include compatibility, robustness, and reliability, while meeting specifications. Students will have the opportunity to develop skills in these areas by working on their own code and in group projects. Two 90-minute lectures. Prerequisites: 217 and 226 (as corequisite). B. Kernighan

COS 340 Reasoning about Computation Fall/Spring QR
An introduction to mathematical topics relevant to computer science. Combinatorics and probability will be covered in the context of computer science applications. The course will present a computer science approach to thinking and modeling through such topics as dealing with uncertainty in data and handling large data sets. Students will be introduced to fundamental concepts such as NP-completeness and cryptography that arise from the world view of efficient computation. Prerequisites COS 126 and 226 (or sufficient mathematical background), and MAT 202 or MAT 204 or MAT 217. COS 226 can be taken along with COS 340 in the same term. B. Chazelle

COS 342 Introduction to Graph Theory (See MAT 375)

COS 351 Information Technology and Public Policy (See WWS 351)

COS 375 Computer Architecture and Organization (also ELE 375) Fall STN
An introduction to computer architecture and organization. Instruction set design; basic processor implementation techniques; performance measurement; caches and virtual memory; pipelined processor design; design trade-offs among cost, performance, and complexity. Two 90-minute classes, one selfscheduled hardware laboratory. Prerequisites: COS 217. M. Martonosi

COS 381 Networks: Friends, Money and Bytes (See ELE 381)

COS 396 Introduction to Quantum Computing (See ELE 396)

COS 397 Junior Independent Work (B.S.E. candidates only) Fall
Offered in the fall, juniors are provided with an opportunity to concentrate on a "state-of-the-art" project in computer science. Topics may be selected from suggestions by faculty members or proposed by the student. B.S.E. candidates only. *A. LaPaugh*

**COS 398 Junior Independent Work (B.S.E. candidates only) Spring**
Offered in the spring, juniors are provided with an opportunity to concentrate on a "state-of-the-art" project in computer science. Topics may be selected from suggestions by faculty members or proposed by the student. B.S.E. candidates only. *Staff*

**COS 402 Machine Learning and Artificial Intelligence Fall**
This course will provide a basic introduction to the core principles, algorithms and techniques of modern artificial intelligence and machine learning research and practice. Main topics will include: 1. Problem solving using search, with applications to game playing 2. Probabilistic reasoning in the presence of uncertainty 3. Hidden Markov models and speech recognition 4. Markov decision processes and reinforcement learning 5. Machine learning using decision trees, neural nets and more. 6. Basic principles of mathematical optimization for learning. Prerequisites: COS 226 and COS 340 *E. Hazan*

**COS 423 Theory of Algorithms Spring**
Design and analysis of efficient data structures and algorithms. General techniques for building and analyzing algorithms. Introduction to NP-completeness. Two 90-minute lectures. Prerequisites: 226 and 340 or instructor's permission. *R. Tarjan*

**COS 424 Fundamentals of Machine Learning (also SML 302) Spring**
Computers have made it possible, even easy, to collect vast amounts of data from a wide variety of sources. It is not always clear, however, how to use those data, and how to extract useful information from them. Course will focus on some of the most useful approaches to this broad problem, exploring both theoretical foundations and practical applications. Students will gain experience analyzing many kinds of data, including text, images, and biological data. Topics include classification, clustering, prediction, and dimensionality reduction. Two 90-minute lectures. Prerequisites: MAT 202 and COS 126 or equivalent, or instructor's permission. *Staff*

**COS 425 Database and Information Management Systems Not offered this year**
Theoretical and practical aspects of database systems and systems for accessing and managing semistructured information (e.g., Web information repositories). Topics include: relational and XML models, storage and indexing structures, query expression and evaluation, concurrency and transaction management, search effectiveness. Two 90-minute lectures. Prerequisites: 217 and 226. *A. LaPaugh*

**COS 426 Computer Graphics Spring**
The principles underlying the generation and display of graphical pictures by computer. Hardware and software systems for graphics. Topics include: hidden surface and hidden line elimination, line drawing, shading, half-toning, user interfaces for graphical input, and graphic system organization. Two 90-minute lectures. Prerequisites: 217 and 226. *S. Rusinkiewicz*

**COS 429 Computer Vision Fall**
An introduction to the concepts of 2D and 3D computer vision. Topics include low-level image processing methods such as filtering and edge detection; segmentation and clustering; optical flow and tracking; shape reconstruction from stereo, motion, texture, and shading. Throughout the course, there will also be examination of aspects of human vision and perception that guide and inspire computer vision techniques. Prerequisites: 217 and 226. Two 90-minute lectures. *S. Rusinkiewicz*

**COS 432 Information Security (also ELE 432) Fall**
Security issues in computing, communications, and electronic commerce. Goals and vulnerabilities; legal and ethical issues; basic cryptology; private and authenticated communication; electronic commerce; software security; viruses and other malicious code; operating system protection; trusted systems design; network security; firewalls; policy, administration and procedures; auditing; physical security; disaster recovery; reliability; content protection; privacy. Prerequisites: 217 and 226. Two 90-minute lectures. *N. Feamster*
COS 433 Cryptography (also MAT 473) Not offered this year
An introduction to modern cryptography with an emphasis on fundamental ideas. The course will survey both the basic information and complexity-theoretic concepts as well as their (often surprising and counter-intuitive) applications. Among the topics covered will be private key and public key encryption schemes, digital signatures, pseudorandom generators and functions, chosen ciphertext security; and time permitting, some advanced topics such as zero knowledge proofs, secret sharing, private information retrieval, and quantum cryptography. Prerequisites: 226 or permission of instructor. Two 90-minute lectures. Z. Dvir

COS 435 Information Retrieval, Discovery, and Delivery Spring
This course studies both classic techniques of indexing documents and searching text, and also new algorithms that exploit properties of the World Wide Web, digital libraries, and multimedia collections. There is significant emphasis on current methods employed by Web search engines, including methods of employing user profiles to enhance search results. Pragmatic issues of handling very large amounts of information that may be widely dispersed--caching, distributed storage, and networking technology--are also covered. Prerequisite: COS 226 and MAT 202. Two 90-minute lectures. A. LaPaugh

COS 436 Human-Computer Interface Technology (also ELE 469) Not offered this year
This course covers hardware, sensors, displays, software, signal processing, pattern recognition, real-time computing, systems, and architectures for human computer interfacing. Labs supplement lectures and readings, and final group projects are executed and tested. Prerequisite: COS 217 or ELE 302. Two 90-minute lectures. Staff

COS 441 Programming Languages Not offered this year
How to design and analyze programming languages and how to use them effectively. Functional programming languages, object-oriented languages; type systems, abstraction mechanisms, operational semantics, safety and security guarantees. Implementation techniques such as object representations and garbage collection will also be covered. Prerequisites: COS 217 and 226. Three lectures. Staff

COS 448 Innovating Across Technology, Business, and Marketplaces (also EGR 448) Spring
This course introduces engineering students to the types of issues that are tackled by leading and innovative Chief Technology Officers: the technical visionaries and/or managers at companies who innovate at the boundaries of technology, business, and marketplaces by understanding all of these areas deeply. These individuals are true partners to the business leaders of the organization, not merely implementers of business goals. The focus will be on software technologies and businesses based on them. To use specific contexts, we will emphasize two complementary areas as examples: businesses based on cloud computing and on marketplaces. J. Singh

COS 451 Computational Geometry Not offered this year
Introduction to basic concepts of geometric computing, illustrating the importance of this new field for computer graphics, solid modelling, robotics, databases, pattern recognition, and statistical analysis. Algorithms for geometric problems. Fundamental techniques, for example, convex hulls, Voronoi diagrams, intersection problems, multidimensional searching. Two 90-minute lectures. Prerequisites: 226 and 340 or 341, or equivalent. B. Chazelle

COS 455 Introduction to Genomics and Computational Molecular Biology (See QCB 455)

COS 461 Computer Networks Spring
This course studies computer networks and the services built on top of them. Topics include packet-switch and multi-access networks, routing and flow control, congestion control and quality-of-service, Internet protocols (IP, TCP, BGP), the client-server model and RPC, elements of distributed systems (naming, security, caching) and the design of network services (multimedia, peer-to-peer networks, file and Web servers, content distribution networks). Two lectures, one preceptorial. Prerequisite: 217. N. Feamster

COS 462 Design of Very Large-Scale Integrated (VLSI) Systems (See ELE 462)

COS 475 Computer Architecture (See ELE 475)

COS 487 Theory of Computation (also MAT 407) Fall
Studies the limits of computation by identifying tasks that are either inherently impossible to compute, or impossible to compute within the resources available. Introduces students to computability and decidability, Gödel's incompleteness theorem, computational complexity, NP-completeness, and other notions of intractability. This course also surveys the status of the P versus NP question. Additional topics may include: interactive proofs, hardness of computing approximate solutions, cryptography, and quantum computation. Two lectures, one precept. Prerequisite: 340 or 341, or instructor's permission. R. Tarjan

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Program in Contemporary European Politics and Society

**Director**
Philip G. Nord

**Executive Committee**
Sandra L. Bermann, Comparative Literature
Carles Boix, Woodrow Wilson School, Politics
John W. Borneman, Anthropology
Jan T. Gross, History
Harold James, History, Woodrow Wilson School

Andrew Moravcsik, Politics, Woodrow Wilson School
Jan-Werner Müller, Politics
Philip G. Nord, History
Grigore Pop-Eleches, Politics, Woodrow Wilson School
Ezra N. Suleiman, Politics

The Program in Contemporary European Politics and Society, an affiliate of the Princeton Institute for International and Regional Studies, encourages the interdisciplinary study of modern Europe, with a particular focus on politics, economics, and society in western and central Europe since World War I. The program sponsors a core course and a noncredit thesis writers' colloquium for seniors. In addition, it sponsors lectures, seminars, and other programs for the entire University community. The program offers a certificate in contemporary European politics and society.

**Admission to the Program**

Successful completion of EPS 300, 301, or 302, typically by the end of sophomore year.

**Program of Study**

Students who will receive a certificate in contemporary European politics and society must meet the following requirements:

1. Take one of the following gateway courses: EPS 300, 301, or 302.

2. Take at least four other courses from the list of core courses that have an emphasis on European politics and society. Other courses may be approved by the director.

3. Of the four courses, at least one must be chosen from among offerings in history and at least one must be chosen from among offerings in the other social sciences.

4. Fulfill a language requirement by doing one of the following.
   a) Take a 200- or 300-level course in a European language.

   b) Demonstrate fluency in a European language by taking a test administered by the program. Any national language spoken in a European country may be used to satisfy the requirement. The expectation is that students will have sufficient linguistic competence to use research materials in the foreign language for their senior thesis research.
5. Participate in a senior thesis colloquium sponsored by the program.

6. Write a senior thesis on a subject related to contemporary European politics and society. Students majoring in departments where a senior thesis on modern Europe is not possible may petition the director to have another piece of independent research meet this requirement.

**Study Abroad**

Studying abroad at a European university is very strongly encouraged by the program. Living overseas is a critical part of gaining a perspective on a foreign society and in developing language fluency. Princeton participates in the Berlin Consortium, has linkages with the Fondation Nationale des Sciences Politiques Institut d'études (Sciences Po) and the University of Oxford, and also allows students to study at many other European universities. The program allows students to count up to two of the courses they take at a European university toward their course requirement, if those courses pertain to modern European politics, economics, sociology, or 20th-century history.

**Certificate of Proficiency**

A student who has met the requirements of the program and of the home department and has maintained satisfactory standing will receive a certificate of proficiency in contemporary European politics and society upon graduation.

**Courses**

**EPS 227 Contemporary Issues in Spain (See SPA 227)**

**EPS 300 European Politics and Society in the 20th Century (also POL 384)  Spring SA** The critical developments of 20th-century Europe and the consolidation of democracy in European countries, including the legacy of the two world wars, Nazism, Stalinism, the Cold War, colonialism and decolonization, the birth and development of the European Community, the development of the welfare state, the problems confronting the European Union (immigration, enlargement, political institutions, military role), and the varieties of democratic institutions in Europe. Two lectures, one preceptorial. *J. Müller, P. Nord*

**EPS 302 Landmarks of European Identity (also ECS 302)  Fall HA**

This course gives a broad and interdisciplinary perspective on some of the very diverse cultural and historical roots of European identity. It examines contemporary debates over contested identity in the light of long historical trajectories in which identities were continually defined and reshaped. It is conceived as an introduction to many of the courses in Princeton dealing with European issues. The landmarks include, but are not restricted to, written texts. They include Machiavelli, Montesquieu, Marx, and J.S. Mill, but also Fra Angelico, Beethoven and Thomas Mann. One three-hour seminar. *H. James*

**EPS 322 Memory, Democracy, and Public Culture: Berlin and Its Pasts (See POL 402)**

**EPS 342 Economics of Europe (See ECO 372)**

**EPS 452 Communism and Dissent in Eastern Europe (See HIS 452)**
The Council of the Humanities was established in 1953 by the trustees and faculty of the University for the purpose of fostering significant teaching and research in the humanities. In all of its endeavors the council aims to encourage cooperation among departments, both within the humanities and across the University; to foster interdisciplinary teaching and scholarship; to focus attention on the core concerns of humanistic scholarship; and to forge enduring links between the humanities at Princeton and the wider culture.

Membership in the Council of the Humanities is open to chairs and directors of all humanities departments, programs, and committees; the dean of the School of Architecture; the dean of the School of Engineering and
Applied Science; the director of the Lewis Center for the Arts; and one representative each from the natural and social sciences. This group meets periodically to discuss matters affecting the humanities at Princeton and to advise the chair, the deans, and the president on policy issues.

The ongoing programs of the council are overseen by an executive committee consisting of members of the faculty appointed by the dean of the faculty and representing a broad spectrum of the council's activities. These activities include a program of visiting fellows--distinguished scholars from around the world who spend a period of time in residence in Princeton participating in the life of the University; the Old Dominion Professors, a small group of faculty members in the humanities and the humanistic social sciences who devote a year to intensive research and discussion; the Behrman Professors who dedicate three years to teaching in the Humanistic Studies Program; the Old Dominion Faculty Fellows, members of the faculty from all four divisions who come together for monthly seminars; and the Behrman Fellows, associate professors who meet regularly for discussion. The council serves as a forum for a number of interdepartmental programs and committees, including American Studies, the Program in the Ancient World, Canadian Studies, Classical Philosophy, Digital Humanities, the East Asian Studies Program.

European Cultural Studies, Film Studies, Gender and Sexuality Studies, Hellenic Studies, the Interdisciplinary Doctoral Program in the Humanities (IHUM), the Program in Humanistic Studies, Irish Studies, Italian Studies, Judaic Studies, Latin American Studies, Linguistics, Medieval Studies, Near Eastern Studies, Political Philosophy, Renaissance and Early Modern Studies, the Study of Late Antiquity, and the University Center for Human Values. The council sponsors the Belknap Visitors in the Humanities, the Eberhard L. Faber IV Lectures, the Gauss Seminars in Criticism, the Stewart Seminars in Religion, and a series of faculty seminars taught by visiting fellows and other scholars. The Edmund N. Carpenter II Class of 1943 Chair in the Humanities brings a senior scholar to Princeton on a permanent shared appointment between a department and the council. The Council of the Humanities is also home to the Princeton Society of Fellows in the Liberal Arts, in which postdoctoral fellows spend three years on campus, teaching and pursuing research.

The Council of the Humanities oversees the Ferris Professorship of Journalism, the Harold W. McGraw Jr. Seminar in Writing and Publishing, and the Robbins Seminar in Writing, under whose auspices distinguished journalists and nonfiction writers teach undergraduate seminars each year. The council also sponsors interdisciplinary courses under the aegis of the Program in Humanistic Studies. For information about these HUM and JRN courses, see the description under the Program in Humanistic Studies.

Committee for the Fund for Canadian Studies. Established through the generous support of Princeton's Canadian alumni and the government of Canada to encourage and support expanded teaching and research on Canada at Princeton University, the Fund for Canadian Studies is administered by an advisory committee of interested faculty members under the auspices of the Council of the Humanities.

The fund serves as a resource for Canada-focused academic activities, such as the development of new courses (including those of an interdisciplinary and comparative nature), individual research projects, conferences, guest lecturers, and speaker and seminar series.

Advisory Committee for Canadian Studies: Jeremy Adelman, History; Gary Bass, Woodrow Wilson School; Janet Currie, Economics; Eric S. Gregory, Religion and Council of the Humanities; Simon A. Morrison, Music, director; Alan Patten, Politics; James M. Stone, Astrophysical Sciences; Nicholas TurkBrowne, Psychology.

Committee for the Fund for Irish Studies. The Fund for Irish Studies affords all Princeton students, and the community at large, a wider and deeper sense of the languages, literatures, drama, visual arts, history, politics, and
economics not only of Ireland but of "Ireland in the world." The mission is twofold: to rationalize and expand existing courses taught by current members of the faculty, and to offer a series of public lectures, literary readings, conferences, exhibitions, screenings, and theatrical performances.

Advisory Committee for the Fund for Irish Studies: Michael Cadden, Theater, Lewis Center for the Arts; Linda Colley, History; Maria DiBattista, English and Comparative Literature; Eric S. Gregory, Religion and Council of the Humanities; Philip Pettit, Politics and University Center for Human Values; R. Sean Wilentz, History; Clair Wills, English, chair.
The Council on Science and Technology fosters education, research, and intellectual exchange that deepen and broaden understanding, experience, and appreciation of science, technology, engineering, and mathematics (STEM). The Council partners with engineering, mathematics, natural sciences, the arts, humanities, and social sciences to explore and promote the relation of STEM with culture and the course of public affairs.

The Council encourages and helps facilitate the development of high-quality courses through which undergraduates can satisfy the University Science and Technology (ST) distribution requirement. The Council has responsibility for approving the STL (science and technology with laboratory) and the STN (non-laboratory science and technology course) designations for science and engineering courses that are appropriate for students concentrating in the humanities and social sciences. The council staff partners with faculty members to develop new courses and to revise existing courses. The Council hosts events for faculty to share best practices and develop ways to explore the relation of STEM with the humanities, social sciences, and the arts. New STN and STL courses are designed to be of interest to all undergraduate students irrespective of their concentration by integrating the science and engineering content with societal applications.

The Council on Science and Technology likewise sponsors an array of activities for students to explore intersections of STEM with the humanities, social sciences, and the arts. The Council hosts events for students as well as faculty to discuss shared interests across the disciplinary divisions. The Council's Evnin Lecture series features prominent scientists, engineers and mathematicians who engage a wide audience both inside and outside the University community. The Council awards the Pope Prize for Science Writing to a graduating senior who has shown a keen interest in science and demonstrated an outstanding ability to communicate that enthusiasm to a wide audience through journalism.

All STN and STL courses are listed in Course Offerings. Many STL and STN courses have prerequisites or are core courses for the science and engineering disciplines. Those STL and STN courses that do not carry significant prerequisites in science or engineering are listed in a separate menu item in Course Offerings (STL, STN, and QR Courses for General Education). For more information about the Council, please visit our website.

Courses

STC 101 From DNA to Human Complexity (See MOL 101)
STC 102 Neuroscience and Everyday Life (See NEU 101)

STC 115A Physics for Future Leaders (See PHY 115A)

STC 115B Physics for Future Leaders (See PHY 115B)

STC 201A Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy (See ENV 201A)

STC 201B Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy (See ENV 201B)

STC 349 Writing about Science (also ENV 349) Fall STN
This course will teach STEM & non-STEM majors how to write about research in STEM fields with clarity and a bit of flair. Goal will be to learn to convey technical topics to non-experts in a compelling, enjoyable way while staying true to the underlying facts, context and concepts. We'll do this through readings, class discussion, encounters with professional writers and journalists of all sorts, across several different media. Most important of all, students will practice what they learn in frequent writing assignments that will be critiqued extensively by an experienced science journalist. M. Lemonick

STC 398 Health and Human Rights in the World Community Not offered this year SA
This seminar will examine the relationship between health and human rights. It will provide an overview of human rights violations in the world today and an analysis of their health consequences. The course will consider how individual and community health can be improved by protecting and promoting human rights. It will also evaluate the role of health professionals in caring for victims of human rights abuses, documenting the health consequences of human rights violations, and participating in human rights advocacy and education. One three-hour seminar. Staff

STC 460 Diseases in Children: Causes, Costs, and Choices (See MOL 460)
The Program in Creative Writing, part of the Lewis Center for the Arts, allows undergraduates to work with practicing writers while pursuing a regular liberal arts course of study. Students develop their writing skills; learn the possibilities of modern poetry, fiction, nonfiction, screenwriting, and translation; and gain a special access to the critical understanding of literature through their involvement in the creative process.

Small workshop courses in poetry, fiction, nonfiction, screenwriting, and translation are taught by the program faculty, and visiting writers. These courses are limited in enrollment to ensure the benefits of working closely with faculty. Students begin the creative writing course sequence in either the fall or spring with 201, 202, 203, 204, 205, 206, 348, 349, or 448. (Any of these may be repeated for credit with a different instructor.) Students who have taken two 200-level courses in poetry, fiction, and translation may apply for the 300 level. All creative writing courses require an application process. Screenwriting students may apply to intermediate and advanced screenwriting classes after one introductory screenwriting class, or any other two CWR courses.

Each workshop focuses on one genre only (poetry, fiction, nonfiction, screenwriting, or translation). Workshops meet for up to three hours weekly and are devoted primarily to discussion of student work.
All creative writing program courses are graded pass/D/fail but are not counted in the pass/D/fail budget.

**Program of Study**

Students may earn a certificate in creative writing by successfully completing the following requirements:

1. Candidates for the certificate normally take two 200-level courses in creative writing by the end of sophomore year and two 300-level courses by the end of junior year, though a portion of this requirement may be waived in unusual circumstances. The courses need not be in a single genre; students are encouraged to experiment with kinds of writing new to them. Applicants for a screenwriting thesis must have taken one course in poetry, fiction, or translation; and at least two courses in screenwriting.

2. Students may earn a certificate in creative writing by writing a creative senior thesis in one genre (e.g., collections of poems, stories, one feature or several short form screenplays, a novel, or literary translations in poetry or fiction) under the direction of program faculty.

During the spring term of junior year, candidates for the certificate apply to the Program in Creative Writing for permission to write a creative thesis. The application consists of a short form and an extensive portfolio of work in the relevant genre. Successful applicants are assigned specific deadlines and an adviser they meet with throughout senior year.

Accepted students seek permission from their home departments to use the creative thesis to satisfy departmental thesis requirements. For students in the Department of English creative writing track and Comparative Literature Program D, approval is routine, and several other departments have welcomed creative theses, but some students undertake the creative thesis as a "second thesis." Unlike creative writing workshops, which are pass/D/fail, theses receive letter grades.

**Certificate of Proficiency**

Students who fulfill the requirements of the program receive a certificate of proficiency in creative writing upon graduation.

**Courses**

**CWR 201 Creative Writing (Poetry) Fall LA**
Practice in the original composition of poetry supplemented by the reading and analysis of standard works. Each student is expected to prepare a manuscript each week. There will be a weekly workshop meeting and occasional individual conferences. Prerequisite: by application. *Staff*

**CWR 202 Creative Writing (Poetry) Spring LA**
Practice in the original composition of poetry supplemented by the reading and analysis of standard works. Each student is expected to prepare a manuscript each week. There will be a weekly workshop meeting and occasional individual conferences. Prerequisite: by application. *Staff*
CWR 203 Creative Writing (Fiction) Fall LA
Practice in the original composition of fiction supplemented by the reading and analysis of standard works. Each student is expected to prepare a manuscript at least every other week. There will be a weekly workshop meeting and occasional individual conferences. Prerequisite: by application. Staff

CWR 204 Creative Writing (Fiction) Spring LA
Practice in the original composition of fiction supplemented by the reading and analysis of standard works. Each student is expected to prepare a manuscript at least every other week. There will be a weekly workshop meeting and occasional individual conferences. Prerequisite: by application. Staff

CWR 205 Creative Writing (Literary Translation) Fall LA
Practice in the translation of literary works from another language into English supplemented by the reading and analysis of standard works. Each student is expected to prepare a manuscript each week. There will be a weekly workshop meeting and occasional individual conferences. Prerequisite: fluency in a language other than English and by application. J. Lahiri

CWR 206 Creative Writing (Literary Translation) Spring LA
Practice in the translation of literary works from another language into English supplemented by the reading and analysis of standard works. Each student is expected to prepare a manuscript each week. There will be a weekly workshop meeting and occasional individual conferences. Prerequisite: fluency in a language other than English and by application. J. Lahiri

CWR 211 How to Write A Song (also MUS 212) Spring LA
An introduction to the art of writing words for music, an art at the core of almost every literary tradition from Homer through Beowulf to W.B Yeats and beyond. Composers and writers will have the opportunity to work in small songwriting teams to respond to such emotionally charged themes as Contempt, Gratitude, Revenge, Desire, Disgust, Joyousness, Remorse, Loneliness, Despair and Defiance. Assignments are based on study of a range of works in the popular song tradition. The final exercise will be a public showcase of work from the semester. P. Muldoon

CWR 212 The Lyric Essay Fall LA
This course is an introduction to the reading and writing of "the lyric essay," a variety of non-fiction prose that refuses to obey the truth-telling, reality-capturing and argumentative priorities often associated with the essay. We will look at and produce essayistic writing that exists at the borders and intersections of traditionally separate forms, including poetry, fiction and journalism, and that integrates obsession, fragmentation, meditation, idiosyncrasy and hallucination into the creation of new prose shapes. R. Rutkoff

CWR 214 Graphic Design (See VIS 214)

CWR 215 Graphic Design: Typography (See VIS 215)

CWR 240 Creative Non-Fiction (See JRN 240)

CWR 301 Advanced Creative Writing (Poetry) Fall LA
Advanced practice in the original composition of poetry for discussion in regularly scheduled workshop meetings. Prerequisites: 201 or 202 and by application. Staff

CWR 302 Advanced Creative Writing (Poetry) Spring LA
Advanced practice in the original composition of poetry for discussion in regularly scheduled workshop meetings. Prerequisites: 201 or 202 and by application. Staff

CWR 303 Advanced Creative Writing (Fiction) Fall LA
Advanced practice in the original composition of fiction for discussion in regularly scheduled workshop meetings. Prerequisites: 203 or 204 and by application. Staff

CWR 304 Advanced Creative Writing (Fiction) Spring LA
Advanced practice in the original composition of fiction for discussion in regularly scheduled workshop meetings. Prerequisites: 203 or 204 and by application. Staff

CWR 305 Advanced Creative Writing (Literary Translation) (also COM 355) Fall LA
Advanced practice in the translation of literary works from another language into English supplemented by the reading and analysis of standard works. Prerequisites: 205 or 206 and by application. Staff

CWR 306 Advanced Creative Writing (Literary Translation) (also COM 356) Spring LA
Advanced practice in the translation of literary works from another language into English supplemented by the reading and analysis of standard works. Prerequisites: 205 or 206 and by application. Staff

CWR 315 Life Is Short, Art is Really Short Spring LA
All literature is short - compared to our lives, anyway - but we'll be concentrating on poetry and prose at their very shortest. The reading will include proverbs, aphorisms, greguerias, one-line poems, riddles, jokes, fragments, haiku, epigrams and microlyrics. Imagism, contemporary shortists, prose poems, various longer works assembled from small pieces, and possibly even flash fiction. Students will take away from the thrill and edge of these literary microorganisms a new sense of what can be left out of your work and new ideas about how those nebulae of pre-draft in your notebooks might condense into stars and constellations. J. Richardson

CWR 316 Special Topics in Poetry: Race, Identity and Innovation (also AAS 336 / AMS 396 / LAO 316) Fall LA
This workshop explores the link between racial identity and poetic innovation in work by contemporary poets of color. Experimental or avant-garde poetry in the American literary tradition has often defined itself as "impersonal," "against expression" or "post-identity." Unfortunately, this mindset has tended to exclude or downplay poems that engage issues of racial identity. This course explores works where poets of color have treated racial identity as a means to destabilize literary ideals of beauty, mastery and the autonomy of the text while at the same time engaging in poetic practices that subvert conceptions of identity or authenticity. M. Youn

CWR 317 From Script to Screen (See VIS 317)CWR 345 Special Topics in Creative Writing (also AMS 395 / GSS 343) Fall LA
Students gain special access to the critical understanding of literature through their involvement in the creative process. Topics include autobiography, prosody, non-fiction, revision and point of view. Students are expected to prepare a manuscript at least every other week. Specific topics and prerequisites will vary. By application. Staff

CWR 348 Introduction to Screenwriting: Writing the Short Film (also VIS 348) Fall LA
This course will introduce students to core screenwriting principles and techniques. Questions of thematic cohesiveness, plot construction, logical cause and effect, character behavior, dialogue, genre consistency and pace will be explored as students gain confidence by completing a number of short screenplays. The course will illustrate and analyze the power of visual storytelling to communicate a story to an audience, and will guide students to create texts that serve as "blueprints" for emotionally powerful and immersive visual experiences. Final portfolio will include one short exercise and two short screenplays. By application. C. Lazaridi

CWR 349 Introduction to Screenwriting: Writing for a Global Audience (also VIS 349) Spring LA
How can screenwriters prepare for the evolving challenges of our global media world? What types of content, as well as form, will emerging technologies make possible? Do fields like neuroscience help us understand the universal principals behind screenwriting and do tech advances that alter the distance between audience and creator, man and machine, also influence content of our stories? This class will use fairytales, films, games and new media to illustrate universal script principles while creating a rich interdisciplinary lens to explore the innovative intersection of narrative screenwriting, science and technology. C. Lazaridi

CWR 401 Advanced Creative Writing Tutorial Not offered this year LA
Tutorials in the original composition of fiction, poetry, or translations, open to those who have demonstrated unusual commitment and talent through four terms of creative writing or who provide equivalent evidence of their capacity for advanced work. Open also to qualified graduate students. Individual conferences to be arranged. **Staff**

CWR 402 **Advanced Creative Writing Tutorial**  
Not offered this year  
LA  
Tutorials in the original composition of fiction, poetry, or translations, open to those who have demonstrated unusual commitment and talent through four terms of creative writing or who provide equivalent evidence of their capacity for advanced work. Open also to qualified graduate students. Individual conferences to be arranged. **Staff**

CWR 403 **Special Topics in Screenwriting (also VIS 406)**  
Spring LA  
This class will familiarize students with the complex use of metaphorical, emotional, and visual threads in long form screenplay writing. Analyzing examples of international, independent, and classical structures, students will be exposed to the rhythms and demands of the process of conceiving and writing a long form narrative film.  
Prerequisite: Introduction to Screenwriting and by application. **Staff**

CWR 405 **Advanced Screenwriting: Writing for Television (also VIS 405)**  
Fall LA  
This advanced screenwriting course will introduce students to the post 1990's "golden age of television" and outline the differences between writing for film and a scripted TV series. Students will be required to watch a television pilot each week and engage in an in-depth discussion about its structure, pacing, character development, etc. Each student will formulate and pitch an original series idea and write their own pilot, (50-60 pages) due by the end of the semester. **Staff**

CWR 448 **Introduction to Screenwriting: Adaptation (also VIS 448)**  
Fall LA  
Introduction to screenwriting adaptation techniques, focusing primarily on the challenges of adapting "true stories" pulled from various non-fiction sources. The class will address the ethics of adaptation, questions and techniques surrounding the need to fictionalize truth for dramatic purposes, as well as touching on the differences between fictional and nonfictional original materials. Students will be exposed to various contemporary non-fiction adaptations, and will write a short film and one longer project. By application. **C. Lazaridi**
Program in Dance

Director
Susan Marshall

Executive Committee
Michael W. Cadden, Lewis Center for the Arts, Theater
Jeffrey K. Eugenides, Lewis Center for the Arts, Creative Writing
Su Friedrich, Lewis Center for the Arts, Visual Arts
Judith Hamera, Lewis Center for the Arts
Brian E. Herrera, Lewis Center for the Arts, Theater
Jhumpa Lahiri, Lewis Center for the Arts, Creative Writing
Deana Lawson, Lewis Center for the Arts, Visual Arts
Susan Marshall, Lewis Center for the Arts
Paul B. Muldoon, Lewis Center for the Arts, Creative Writing
Kirstin Valdez Quade, Lewis Center for the Arts, Creative Writing
James Richardson, Lewis Center for the Arts, Creative Writing
Joseph S. Scanlan, Lewis Center for the Arts, Visual Arts
Tracy K. Smith, Lewis Center for the Arts, Creative Writing
Susan Wheeler, Lewis Center for the Arts, Creative Writing
Jeffrey Whetstone, Lewis Center for the Arts, Visual Arts
Edmund V. White, Lewis Center for the Arts, Creative Writing
Stacy E. Wolf, Lewis Center for the Arts, Theater

Professor
Judith Hamera, also Lewis Center for the Arts
Susan Marshall, also Lewis Center for the Arts

Senior Lecturer
Rebecca J. Lazier

Lecturer
Tina Fehlandt
Aynsley Vandenbroucke
Pavel Zustiak

The Program in Dance, part of the Lewis Center for the Arts, familiarizes students with creative, performative, and analytical approaches to dance through exposure to professional choreographers, dancers, critics, and scholars. While pursuing a liberal arts education, students have the opportunity to undertake demanding, studio-based courses with dance professionals. The program provides advanced courses for the pre-professional dancer in addition to offering courses open to students who have never danced. The creation of original work, both choreographic and written, is emphasized alongside rigorous technical training. The program supports multiple performance opportunities each year, ranging from full professional productions in the Berlind Theatre with choreography by faculty, guests, and students to sitespecific interdisciplinary thesis projects and independent experimental work. Students with a special, perhaps even a career, interest in dance can choose to earn a program certificate.

The curricular wing of the program offers courses in modern, contemporary, ballet, experimental, African dance techniques, repertory, and choreography, as well as in dance history, analysis, anatomy, and criticism. The program
also provides interdepartmental performance collaborations as well as yearly interdisciplinary opportunities with the Atelier program. In addition, co-curricular ballet, modern, and conditioning classes are offered on a daily basis. Yearly short- and long-term visiting artists enhance curricular offerings by choreographing original work and staging the work of seminal choreographers for dance concerts, or by offering special workshops, seminars, and master classes.

**Admission to the Program**

Program courses are open to all undergraduates. Past experience in dance is not a requirement for admission to introductory courses, and the program also offers sufficient intermediate and advanced classes, as well as co-curricular opportunities, such that the serious student will, upon graduation, be prepared for advanced study in the field.

**Program of Study**

A certificate from the Program in Dance will be awarded to students who successfully complete a substantial amount of work in the practical and academic areas of the discipline. Students should enroll in the certificate program during the second term of the sophomore year, but no later than the start of the second term of the junior year. At least two of the required courses should be completed before enrollment in the certificate program.

To obtain a certificate in dance, students must complete: (1) four studio courses above the introductory level, two of which must be performance courses: DAN 319/320/419/420, and one must be a spring studio course: DAN307, DAN408, DAN431 or DAN432; (2) one seminar course in dance studies; (3) two additional performances during the junior and/or senior year with a guest choreographer, in a dance-based Atelier, or in a senior thesis production; (4) two semesters of twice-weekly co-curricular classes; (5) Junior Seminar for those intending to complete a Senior Choreographic Thesis; and (6) 20 hours of technical work in assisting the dance program's productions.

Students may choose to concentrate their studies on performance, choreography, dance scholarship, or an interdisciplinary focus. Substitution of requirements, if necessary, will be based on faculty recommendation and in consultation with the program director.

Advanced Creative Work. The program offers all students the opportunity to do advanced creative work under the supervision of its faculty. These projects may be pursued as extracurricular activities or as independent work related to their certificate completion. With permission of the student's department of concentration, such a project may also satisfy one of the requirements for independent work in the department, in which case it must consist of or be accompanied by written work, such as a scholarly or critical evaluation. Past independent projects have included performances in the Berlind Theatre, sitespecific productions in the Chancellor Green rotunda, and video installations. Often, senior certificate dancers choose dance to be the topic of their departmental theses. For example, an anthropology concentrator chose as her thesis subject Sri Lankan dance; a comparative literature thesis explored links between poetry and dance theories; and other certificate students have looked at dance from the viewpoints of computer science, mathematics, neuroscience, and music.

**Certificate of Proficiency**

Students who fulfill the requirements of the program receive a certificate of proficiency in dance upon graduation.
Courses

DAN 201 Dance Appreciation: Seeing Dance in New York City/Articulating the Elusive LA
In this introductory course we will make six field trips to view live dance in a variety of NYC performance venues. Students will develop the ability to articulate their experiences as viewers starting in a thoughtful and active engagement with the dance works then in a discussion and writing while analyzing the form, content and contexts of the works in a group setting. We will study the historical, cultural, social and interdisciplinary contexts of contemporary dance forms. Guest writers and scholars will visit the class to reflect on diverse approaches to dance criticism and analysis and their role in the current cultural landscape.

P. Zustiak

DAN 207 Introduction to Ballet Fall LA
From grand plié to grand jeté, Introduction to Ballet is for students with a curiosity for the study of classical ballet. No prior dance experience necessary and beginners are welcome. In this studio course students will learn the fundamentals of ballet, gaining an understanding of its physicality, artistry, and principles of alignment. Students will examine the historical origins of ballet and its absorption of cultural influences. Live music will be featured in this class and key in exploring the inextricable link between music and dance.

T. Fehlandt

DAN 209 Introduction to Movement and Dance Spring LA
Designed for people with little or no previous training in dance, the class will be a mixture of movement techniques, improvisation, choreography, observing, writing, and discussing. Students will investigate their own movement patterns and delve into many facets of dance and the cultural questions surrounding it. We will explore the role of dancer, choreographer, audience member, and critic in relation to such topics as aesthetic questions, politics, identity, religion, and complex views of the human body. Two two-hour classes.

A. Vandenbroucke

DAN 211 The American Dance Experience and Africanist Dance Practices (also AAS 211) Fall/Spring LA
A studio course introducing students to American dance aesthetics and practice, with a focus on how American dance has been influenced by African American choreographers and dancers. An ongoing study of movement practices from traditional African dances and those of the African diaspora, touching on American jazz dance, modern dance, and American ballet. Studio work will be complemented by readings, video viewings, guest speakers, and dance studies. Two two-hour classes.

D. Harvey Salaam

DAN 213 Introduction to Contemporary Dance Fall LA
Designed for students with minimal dance experience who are curious about contemporary dance techniques and choreography. Perfect for students who have taken other intro level dance courses and who want to broaden their dance knowledge and deepen their physical skill and experience. Working with aspects of modern, jazz, ballet and improvisation, students will develop movement articulation, coordination, strength, flexibility and increased knowledge about their own physical potential. Readings and viewings will inform the creation of choreographic studies and invite students to consider issues debated by today's dance artists.

Staff

DAN 214 Being and Doing: Dance for Every Body Fall LA
This studio course is open to everyone. We'll explore dance as a way to deepen both our self-knowledge and engagement with others. We'll delve into dance as meditation, using tools from ecstatic dance, yin yoga, and improvisation to establish a personal practice. We'll examine genre-bending performances occurring outside of theaters and study how dance reflects- and can change (and whether it should try to change) -contemporary issues, taking up such topics as power, class, race and gender. In final creative projects, students take aspects of being and/or doing further into their own lives and communities.

A. Vandenbroucke

DAN 215 Introduction to Dance Across Cultures (also ANT 355) Spring LA
Bharatanatyam, butoh, hip hop, and salsa are some of the dances that will have us travel from temples and courtyards to clubs, streets, and stages throughout the world. Through studio sessions, readings and viewings, field research, and discussions, this seminar will introduce students to dance across cultures with special attention to issues of migration, cultural appropriation, gender and sexuality, and spiritual and religious expression. Students will also learn basic elements of participant observation research. Guest artists will teach different dance forms. No prior dance experience is necessary.

J. Hamera

DAN 220 Contemporary Technique and Choreography LA
Incorporating aspects of jazz, modern and ballet, this contemporary dance class focuses on strengthening fundamental alignment and coordination. Technique class will start with exercises designed to organize the body and build in physical intensity to culminate in phrase work that is vigorous and challenging. In choreography, students will
develop their understanding of the ways in which structural elements and movement vocabularies contribute to a
dance's impact and content. Two two-hour classes in technique, one two-hour class in choreography. **Staff**

**DAN 222 Introduction to Hip-Hop Dance (also AAS 222) Spring LA**
This introductory survey course gives equal weight to scholarly study and embodied practice, using both approaches
to explore a range of hip-hop dance techniques, as well as the cultural and historical contexts from which these
dances emerged. Special attention will be given to breaking - the most prominent hip-hop form - as a foundation for
exploring other forms of movement. By critically exploring these physical and historical connections, individuals will
adapt and apply their own philosophies to dance in order to develop a personalized style. **J. Schloss**

**DAN 300 Body and Object: Making Art That Is both Sculpture and Dance LA**
Beyond spoken text and physical action, is the all-important performance of a work. How something is done is as
crucial as what is done. This course encourages you to push your limits and range as mover, dancer and/or actor.
Exercises support the practice of clear intention, committed choice-making, embodied character, physical response
and the ability to modulate the intensity of action and emotion. You will perform dance and theater repertory scenes
and perform your own works that fully utilize your ability to join thought, experience and action. Readings and
views on contemporary artists of dance/physical theater support studio work. **S. Marshall**

**DAN 304 Special Topics in Contemporary Practice (also MTD 301 / MUS 325) Fall LA**
Offers students the opportunity to gain a working knowledge of the ways in which dance, dance/theater, and body-
based art are created and performed today. Primarily a studio course that stresses learning through doing. Students
will have the opportunity to work with leading experimental creators. Topics, prerequisites, and formats will vary
from year to year. **Staff**

**DAN 307 Dance Technique and Anatomy of Movement LA**
This course provides laboratories and cross-genre dance technique to facilitate a somatic understanding of
kinesiology. Students identify limitations and expand individual expression. Technique class will integrate ballet and
modern techniques while emphasizing values of exploration and risk-taking. Movement labs will integrate research in
functional anatomy/kinesiology and diverse systems of somatic education to understand both the potential of neuro-
motor development and physiological systems. Classes will provide freedom of exploration in all genres of dance and
give students knowledge to strengthen physicality and movement repertoire. **Staff**

**DAN 309 Modern Dance: Intermediate Technique and Choreography LA**
In technique, students will be encouraged to expand movement range and increase technical mastery as related to
modern and contemporary dance practices. In choreography, students will be encouraged to create dances that
articulate their independent vision in solo and group works. Readings and viewings will supplement studio work and
expand knowledge of historical and contemporary trends in the arts. Two two-hour classes in technique, one two-hour
class in choreography. **Staff**

**DAN 310 The Arts of Urban Transition (also ARC 380 / THR 323 / URB 310) Fall LA**
This course uses texts and methods from history, theatre, performance studies, and dance to examine artists and
works of art as agents of change in New York (1960-present) and contemporary Detroit. Issues addressed include
relationships between artists, changing urban economies, and the built environment; the role of the artist in
gentrification and creative placemaking; the importance of local history in art interventions; and assessing impacts of
arts initiatives. Fall break trip to Detroit, and visits to key sites in New York and Philadelphia, are included. Students
will use data and methods from the course to produce final projects. **J. Hamera, A. Landsman, A. Shkuda**

**DAN 312 FAT: The F-Word and the Public Body (also AMS 398 / GSS 346) Fall LA**
This seminar investigates discourses and politics around the fat body from a performance studies perspective. How
does this "f-word" discipline and regulate bodies in/as public? How do dancers reveal these politics with special
clarity? How might fat be a liberating counterperformance? We will examine the changing history, aesthetics,
politics, and meanings of fatness using dance, performance, and media texts as key case studies. Intersectional
dimensions of the fat body are central to the course. Emphasis primarily on the US. Assignments include written
work and group performances. No dance experience necessary. **J. Hamera**

**DAN 319A Choreography Workshop I Fall LA**
Choreography Workshop I exposes students to diverse methods of dance-making by tracing the evolution of
choreographic thought. Varying approaches to improvisation will be taught to warm-up, discover movement material,
and challenge movement habits. Classes will workshop compositional tasks that set limitations to spark creativity.
Students will present their choreography weekly and learn to discuss, critique, and evaluate work shown in class.
Selected readings and performances (both on video and live) will expose students to varying choreographic
philosophies, processes, and aesthetics. **R. Lazier**
DAN 319B Dance Performance Workshop: Repertory I Fall LA
Technique and repertory course that focuses on developing technical expertise, expressive range, and stylistic clarity. In technique, students will examine concepts such as skeletal support, sequential movement, rhythm, and momentum to emphasize efficiency in motion. In repertory, students will learn and perform dances that represent diverse approaches to dance-making either through collaboration with faculty or by learning significant dances from modern and contemporary choreographers. The course encourages rich, subtle, and stylistically accurate renditions of choreography and engages students in collaborative learning. T. Fehlandt

DAN 320A Choreography Workshop II Fall LA
This contemporary dance technique class emphasizes fundamentals of proper alignment to achieve increased movement efficiency, strength and flexibility. Working with aspects of modern, jazz and ballet, students will explore dancing to different rhythms, tempos and styles of music. Phrase work teaches strong movement in space and musicality. Students will understand how structural elements and movement vocabularies contribute to a dance's overarching impact and content. Readings and viewings broaden students' understanding of dance's position in the world of art and ideas. Two 2-hour classes in technique, one 2-hour class in choreography. R. Lazier

DAN 320B Dance Performance Workshop: Repertory II Fall LA
Technique and repertory course that focuses on developing technical expertise, expressive range, and stylistic clarity. In technique, students will examine concepts such as skeletal support, sequential movement, rhythm, and momentum to emphasize efficiency in motion. In repertory, students will learn and perform dances that represent diverse approaches to dance-making either through collaboration with faculty or by learning significant dances from modern and contemporary choreographers. The course encourages rich, subtle, and stylistically accurate renditions of choreography and engages students in collaborative learning. Staff

DAN 321 Special Topics in Dance History, Criticism, and Aesthetics (also AMS 361 / GSS 387 ) Spring LA
This course focuses on the history, criticism, and aesthetics of dance as a theatrical art form and/or a social practice. Topics might include an examination of dance through personal, aesthetic, religious, social, and/or political lenses. Classes will be augmented by film, videos, music, guest speakers, occasional demonstrations, and studio work. One three-hour seminar. J. Hamera

DAN 322 Special Topics In Urban Dance (also AAS 312 ) LA
This advanced studio/seminar topics course explores the artistic, social, and cultural implications of hip-hop dance through an intensive focus on the concept of style. Using master classes, academic study, and embodied practice in the studio to develop a physical understanding and detailed social analysis of four specific hip-hop dance genres, we will explore the distinctive cultural influences that shaped each of these diverse forms, as well the deeper movement principles that they share. These principles will then be placed in the larger historical, political and performative context of the Afro-Diasporic experience in the Americas. Staff

DAN 381 Physical Language: Knowing Through Movement EC
This class will focus on expanding dancers' movement choices through experiential anatomy. Using both movement laboratories and lectures, the class will conduct an in-depth analysis of dance and movement from many angles including: research in cognitive studies, neuroscience, multiple somatics modalities, and functional anatomy. We will focus on seeking physical knowledge to generate new movement languages and acquire efficient movement patterns within our bodies, our minds, and ourselves. One two-hour lecture, one two-hour movement lab, and one two-hour seminar. Offered periodically. R. Lazier

DAN 408 Approaches to Contemporary Dance and Movement Practices Spring LA
This advanced studio course compares approaches to contemporary dance and movement techniques to explore how training fuels choreographic process and aesthetic research. Students will train intensively in Contact Improvisation, Gaga, Forsythe Technologies, and contemporary African dance, learning each form's origin and theory to facilitate physical transformation. Workshops in modern and non-western forms will widen historic and global perspectives. Knowledge gained through a comparative embodied practice allows students to form research built on a synthesis of the influences that have shaped current movement research and choreography. R. Lazier

DAN 409 Contemporary Dance: Advanced Technique and Choreography LA
Advanced dance technique and choreography. In technique, students will be challenged to expand their movement range and increase their mastery of various styles required by today's dance world. Students will work to develop approaches to technique that emphasize ease and efficiency in motion. In choreography, students will work together on group objectives in movement-based laboratories that focus on collaboration and choreographic choice-making skills. Two two-hour classes in technique, one two-hour class in choreography. Staff

DAN 419A Choreography Workshop III Fall LA
Choreography Workshop III extends students' approaches to choreographic research by asking them to create complete works on dancers other than themselves. Students will consider how to transfer their vision to an ensemble and learn to give directives to groups that further their process. By focusing on developing an initial idea into a complete work, students will question their understanding of development and challenge themselves in new directions. Readings and viewings inform studio practice and invite students to wrestle with issues debated by today's dance artists. P. Zustiak

DAN 419B Dance Performance Workshop: Repertory III Fall LA
Technique and repertory course that focuses on developing technical expertise, expressive range, and stylistic clarity. In technique, students will examine concepts such as skeletal support, sequential movement, rhythm, and momentum to emphasize efficiency in motion. In repertory, students will learn and perform dances that represent diverse approaches to dance-making either through collaboration with faculty or by learning significant dances from modern and contemporary choreographers. The course encourages rich, subtle, and stylistically accurate renditions of choreography and engages students in collaborative learning. Staff

DAN 420A Choreography Workshop IV Fall LA
Students workshop their senior thesis projects either creating a choreographic production or enhancing their artistry as a performer. Classes workshop varying approaches to dance making, including examining practices from modern and post-modern dance, as well as diverse genres and cultural forms. Students generate personal assignments and work together to establish a critical language to describe choreography and provide feedback to peers. Workshops in lighting and costume design help to better understand the contributions of these forms and enhance the collaborative process. Required for seniors pursuing a Certificate in Dance. R. Lazier

DAN 420B Dance Performance Workshop: Repertory IV Fall LA
Technique and repertory course that focuses on developing technical expertise, expressive range, and stylistic clarity. In technique, students will examine concepts such as skeletal support, sequential movement, rhythm, and momentum to emphasize efficiency in motion. In repertory, students will learn and perform dances that represent diverse approaches to dance-making either through collaboration with faculty or by learning significant dances from modern and contemporary choreographers. The course encourages rich, subtle, and stylistically accurate renditions of choreography and engages students in collaborative learning. Staff

DAN 431 Approaches to Ballet: Technique and Repertory Spring LA
A studio course in ballet technique and repertory for advanced and high intermediate students. This course will consist of a pre-professional ballet class and learning selections of classical, neo-classical, and contemporary ballet. It will be divided into four units, each focusing on a different ballet choreographer. Students will be coached by internationally known guest artists to master and understand the diverse styles of each piece of repertory learned. Readings and viewings of live and videotaped performances. Three two-hour classes. T. Fehlandt

DAN 432 Ballet as an Evolving Form: Technique and Repertory Spring LA
A studio course in contemporary ballet technique for advanced students. The course will consist of an advanced ballet class and explorations into contemporary choreography through readings, viewings, and the learning of repertory. The course will focus on three renowned choreographers, and prominent guest artists will coach students in the style and repertory of each choreographer. Readings and viewings of live and videotaped performances. Three two-hour classes. T. Fehlandt

DAN 497 Princeton Atelier (See ATL 497)
The Department of East Asian Studies (EAS) provides undergraduate concentrators with a broad-ranging knowledge of the languages and cultures of China, Japan, and Korea.

Information and Departmental Plan of Study

Concentrators are required to achieve proficiency in one East Asian language through the third-year level, and take eight departmental courses. The departmentals must include the junior seminar, at least two of the five courses HIS/EAS 207-208, HUM/EAS.COM 233-234, or EAS 229 and at least one of the following methodology courses EAS 240, HIS/EAS 282, TRA/EAS 304, or EAS 328. A single course may not be used to satisfy two requirements, with the exception of HIS 207 and HUM 233, either of which may be used to satisfy the requirement of a course on premodern Asia. A minimum of six of the eight
departmentals must be EAS-prefixed courses. The remaining two may be language-courses at or above the 300 level (after the three-year proficiency requirement is fulfilled), or any language courses in a second East Asian language.

**Advanced Placement**

Students seeking advanced placement should consult the departmental representative.

**Prerequisites**

1. One year of language study in one East Asian language  
2. One 200-level EAS course

**Early Concentration**

Students who meet the prerequisites for entrance into the department may be admitted and begin their Studies as EAS concentrators in the second term of their sophomore year.

**General Requirements**

1. Language proficiency through the third year in one East Asian language  
2. Eight departmental courses (departmentals)  
   The eight departmentals must satisfy the following requirements:

   a. Six EAS-prefixed courses.

   The other two may be:

   EAS courses including courses cross-listed with EAS

   Cognate courses approved by the Departmental Representative

   Language courses at or above the 300 level (after the three-year proficiency requirement is fulfilled)

   Any second East Asian language courses

   b. The Junior Seminar (EAS 300) as an introductory methods survey course
   c. At least one course on pre-modern East Asia
   d. Two of the following transnational courses:
History of East Asia to 1800 (HIS/EAS 207)
East Asia since 1800 (HIS/EAS 208)
East Asian Humanities I (HUM/EAS/COM 233)
East Asian Humanities II (HUM/EAS/COM 234)
Contemporary East Asia (EAS 229)
e. One methodology course, such as:

The Perception of China and Asia in the West (EAS 240)
Documents-based Approach to Asian History (HIS/EAS 282)
Translating East Asia (TRA/EAS 304)
Global Spectacle and East Asian Cinema (EAS 328)

A single course may not be used to satisfy two requirements, with the exception of HIS 207 and HUM 233, either of which may be used to satisfy the pre-modern course requirement.

Independent work that consists of two junior papers (one in fall and one in spring) and the senior thesis (including senior comprehensive examination).

Independent Work

Junior Year. In the fall term the student participates in the departmental junior seminar (EAS 300), and also writes a junior independent work. In the spring, the student writes a second junior independent work under the supervision of an appropriate faculty member. At the end of the junior year, the student begins to draft a proposal for the senior thesis.

Senior Year. Each student prepares a senior thesis in consultation with an appropriate member of the faculty. The senior thesis represents the culmination of the undergraduate curriculum. It should be an original contribution to scholarship on East Asia, based at least in part on source materials in the student's language of specialization.

Senior Departmental Examination

At the end of the spring term, the student appears before a faculty committee for an oral defense of the thesis. In addition, each senior will take written comprehensive examinations in two fields selected from the core areas of history, literature, culture, and society taught in the department. If the two fields concern the same country, one must be premodern and one modern. Sample questions will be provided.

Study Abroad

The Department of East Asian Studies offers varied opportunities for overseas study in East Asia. Concentrators, certificate students, and non-concentrators are encouraged to take advantage of intensive summer or year-long language study and/or internships. The programs hosted by East Asian studies are the intensive Chinese and Japanese language programs in Beijing, China, and Kanazawa, Japan. Upon graduation, students will normally find themselves prepared to begin graduate work at a higher level because of such foreign language experience and training. The department also encourages students to participate in extended internships or study programs in East Asia.
Scholarship aid is available to concentrators and non-concentrators for both summer and year-long programs. Students should contact the East Asian studies program office for these funding opportunities. Students should also contact the Office of International Programs about other sources of funding. Application deadlines are early in the academic year. More information is available from the directors of the Chinese, Japanese, and Korean language programs, or from the Department of East Asian Studies website.

Certificate in Language and Culture

1. Seven language courses, three or more of which must be beyond the second-year level.
2. At least one EAS or cognate course in linguistics, religion, history, or anthropology.
3. Independent research (20 to 25 pages) based at least in part on Chinese, Japanese, or Korean sources dealing with aspects of East Asia. The topic must be in the humanities or social sciences. The paper could be either an original piece of research or a junior paper or senior thesis. If the paper or thesis is written for another department, at least half of the work must be on East Asia.

EAS Program Certificate

1. Two years (four courses) of study of Chinese, Japanese, or Korean. At least two of the four courses must be at the second-year level or higher.
2. Four East Asia content courses, one of them being a 200-level course.
3. Written work, which may be a senior thesis, a junior paper, or an independent research paper with an East Asian topical component.

East Asian studies concentrators focusing on one language can earn a language and culture certificate in the other, but may not also earn an East Asian studies program certificate.

Cognates. A list of cognate courses in other departments can be found on the departmental website.

Courses

CHI 101 Elementary Chinese I Fall
An introductory course in modern spoken and written Chinese, stressing oral-aural facility and the use of language structure for communication. Five hours of class. No credit given for CHI 101 unless followed by CHI 102. Staff

CHI 102 Elementary Chinese II Spring
Continued study of modern spoken and written Chinese, stressing listening, speaking, reading, and writing. Five hours of class. Staff

CHI 103 Intensive Elementary Chinese Fall
An intensive course covering 101 and 102 in one semester for beginning heritage learners and students with fair fluency and limited ability in reading and writing skills. The course will emphasize reading and writing skills. Prerequisite: instructor's permission (oral interview in Chinese). Five hours of class. Staff

CHI 105 Intermediate Chinese I Fall
A study of modern spoken and written Chinese, this course shifts the emphasis to the reading of contemporary Chinese dialogue. Five hours of class. Staff
CHI 107 Intermediate Chinese II  
Spring  
Continuing the study of modern spoken and written Chinese, this course shifts the emphasis to the reading of contemporary Chinese cultural and social issues. Five hours of class.  
Staff

CHI 108 Intensive Intermediate Chinese  
Spring  
An intensive course that covers 105 and 107 in one semester for students who have completed 103. Conducted in Chinese, with emphasis on reading and writing. Prerequisite: 103 or instructor's permission. Five hours of class.  
Staff

CHI 301 Introduction to Classical Chinese I  
Fall HA  
CHI 301 not only provides basic training for students in classical Chinese, but also introduces students to theme-based readings about important cultural aspects of pre-modern China, such as the concept of Dao, life and death, etc. Each theme is consisted of passages selected from Chinese classics and short essays or stories full of wisdom and wit from later dynasties. This course will not only improve your four skills in Chinese language but also enhance your understanding of traditional Chinese philosophy and culture in general. Three hours of classes conducted in Chinese.  
C. Chou

CHI 302 Introduction to Classical Chinese II  
Spring HA  
Following CHI 301, the readings for CHI 302 is also theme-based and includes more philosophical and cultural topics of pre-modern China such as debates between various philosophical schools, military and political strategies, law, etc. Three hours of classes conducted in Chinese.  
C. Chou

CHI 303 Third-Year Modern Chinese I  
Fall  
Designed to develop further the student's overall language skills through reading and discussion of contemporary affairs published in Chinese newspapers. Four hours of class, conducted in Chinese. Prerequisite: CHI 105-107, or instructor's permission.  
Staff

CHI 304 Third-Year Modern Chinese II  
Spring  
A continuation of CHI 303, designed to improve the student's facility in written and oral expression through a close study of newspaper essays and commentaries. Four hours of class, conducted in Chinese. Prerequisite: CHI 303 or instructor's permission.  
Staff

CHI 305 Intensive Third-Year Modern Chinese I  
Fall  
CHI 305 is an intensive intermediate class designed for heritage learners and students who are interested in current political and social issues in Chinese affairs.  
Staff

CHI 306 Intensive Third-Year Modern Chinese II  
Spring  
A continuation of 305, designed to further improve the student's facility in written and oral expression through a close study of essays published in contemporary Chinese newspapers and magazines. Four hours of class, conducted in Chinese. Prerequisite: 305 or instructor's permission.  
Staff

CHI 401 Advanced Classical Chinese I  
Not offered this year LA  
Intensive introduction to classical Chinese through the study of selections from ancient texts. Four classes conducted in Chinese.  
Staff

CHI 402 Advanced Classical Chinese II  
Not offered this year LA  
Continuation of 401. Intensive introduction to classical Chinese through the study of selections from ancient texts. Four classes conducted in Chinese.  
Staff

CHI 403 Fourth-Year Modern Chinese I  
Fall  
Reading and discussion of selections from Chinese scholarly journals and newspapers on contemporary Chinese political, economic, and social issues. Four hours of class, conducted in Chinese. Prerequisite: 304 or instructor's permission.  
Staff

CHI 404 Fourth-Year Modern Chinese II  
Spring  
A continuation of 403. Reading and discussion of scholarly writings in the fields of Chinese literature and modern Chinese intellectual history. Four hours of class, conducted in Chinese. Prerequisite: 403, or instructor's permission.  
Staff

CHI 405 Intensive Fourth-Year Modern Chinese I  
Fall  
CHI 405 is an intensive advanced Chinese class designed for heritage learners. It focuses on reading and discussion based on Chinese scholarly journals, popular essays, and newspaper articles. Students are exposed to a variety of modern Chinese literary genres, as well as some of the major substantive issues that modern Chinese intellectuals have faced. Four hours of class conducted in Chinese. Prerequisite: 306 or instructor's permission.  
Staff

CHI 406 Intensive Fourth-Year Modern Chinese II  
Spring
Continued reading and discussion of scholarly writings on modern Chinese literature. This course also exposes students to the social issues China has faced in recent years, while discussing various aspects of contemporary Chinese society. Four hours of class, conducted in Chinese. Prerequisite: 405 or instructor's permission. Staff

EAS 207 History of East Asia to 1800 (See HIS 207)
EAS 208 East Asia since 1800 (See HIS 208)
EAS 217 The Arts of Japan (See ART 217)
EAS 221 Introduction to Modern Japanese Literature Fall/Spring LA
The course will cover major writers and works of the 20th century. We will examine how Japanese writers responded to modern fictional and linguistic forms imported from the West, how they negotiated what they had inherited from their long and illustrious literary past, and how postwar writers view their newly "democratized" world. A. Ueda

EAS 225 Japanese Society and Culture (also ANT 323 ) Fall SA
An exploration of Japanese labor, gender and feminism, crime and social control, race and notions of homogeneity, nationalism and youth culture. The course considers Japan's struggle to come to terms with the West while at the same time integrating its past. It also looks at American misperceptions of Japanese society and economics. Two lectures, one preceptorial. A. Borovoy

EAS 226 The Religions of China (See REL 226)
EAS 228 Religion in Japanese Culture (See REL 228)
EAS 231 Chinese Martial Arts Classics: Fiction, Film, Fact Not offered this year LA
This course provides an overview of Chinese martial arts fiction and film from earliest times to the present day. The focus will be on the close-reading of literary, art-historical, and cinematic texts, but will also include discussion of the significance of these works against their broader historical and social background. Topics to be discussed: the literary/cinematic pleasure of watching violence, the relationship between violence and the law, gender ambiguity and the woman warrior, the imperial and (trans)national order of martial arts cinema, and the moral and physical economy of vengeance. P. Keulemans

EAS 232 Introduction to Chinese Literature Spring LA
The development of classical Chinese literature, traced through close readings of original texts in English translation. Topics include the nature of the Chinese language and writing system, classical literary thought, religious and philosophical influences, dominance of poetry, emergence of historical writing, and vernacular fiction. Two lectures, one preceptorial. Staff

EAS 233 East Asian Humanities I: The Classical Foundations (See HUM 233)
EAS 234 East Asian Humanities II: Traditions and Transformations (See HUM 234)
EAS 240 The Perception of China and Asia in the West (also HIS 240 ) HA
Presents some of the major themes in the Western perception of China since 1250, from Marco Polo to Chairman Mao, and introduces students to the nature of history and historical writing. Students will be challenged to conduct their own critical historiographical analysis. Readings will focus on primary sources in translation and relevant secondary studies. Two lectures, one preceptorial. B. Elman

EAS 282 A Documents-based Approach to Asian History (See HIS 282)
EAS 300 Junior Seminar Fall
Designed to introduce departmental majors, in the fall of their junior year, to the tools, methodologies, and topics related to the study of East Asian history and culture. The focus of the course will vary each year, and will be cross-national and multidisciplinary, covering both premodern and modern periods. One threehour seminar. P. Keulemans

EAS 308 Communism and Beyond: China and Russia (See SOC 308)
EAS 320 Early Japanese History (also HIS 320 ) Not offered this year HA
The history of Japan from the origins of the Japanese people to the establishment of Tokugawa rule in 1600, using the epic war tale The Tale of the Heike as a lens. Particular emphasis will be placed on institutional and cultural history. One three-hour seminar. T. Conlan

EAS 321 Early Modern Japan (also HIS 321 ) Not offered this year HA
The history of Japan during the period of Samurai rule. Distinctive features of Tokugawa society and culture from the foundation of the regime in 1600 to its decline in the 19th century, the opening of Japan to Western contact, the course of economic development, and the consolidation of the Meiji State. Two lectures, one preceptorial. Staff

EAS 322 Buddhism in Japan (See REL 322)
EAS 324 20th-Century Japan (See HIS 322)
EAS 333 The Chinese Novel (also COM 333 ) Not offered this year LA
Extensive readings in the six "classic" Chinese novels: *Romance of the Three Kingdoms, Water Margin, Golden Lotus, Journey to the West (Monkey), Story of the Stone (Dream of the Red Chamber), and The Scholars*, in English translations. Discussions will focus on interpretive and comparative issues. One three-hour seminar.

Alternates with 433. *Staff*

EAS 334 Modern Chinese Literature and Film  
*Spring LA*
Analysis through selected literary and cinematic works of authors' ideas, hopes, and worries about the fate of modern China. Consideration of literary and cinematic technique as well as the larger historical context.
Readings in English. *P. Keulemans*

EAS 335 Early Chinese History to 221 (also HIS 318)  
*Not offered this year HA*
History of China from the earliest times until the end of the first unified empire in A.D. 200. Political developments will be related to the underlying social and economic changes and the development of early systems of thought. Primary documents will be read in translation, where possible, and the results of recent archaeological discoveries will be related to the written record. Two lectures, one preceptorial. *Staff*

EAS 336 The Making and Transformation of Medieval China: 300-1200 (also HIS 319)  
*Not offered this year HA*
This course provides a survey of the history of China from the dissolution of the first unified empire to the eve of the Mongol invasion. Key issues include the Tang-Song transformation, influence of Buddhism and Neo-Confucianism, the rise of literati culture, the development of autocratic rulership, and commercialism. Two lectures, one preceptorial. *Staff*

EAS 340 Culture and Society in Late Imperial China: 1000-1900 (also HIS 340)  
*Not offered this year HA*
A survey of the major cultural and social developments from early Song to high Qing that have particular relevance for understanding China in its modern predicament. Emphasis will be placed on the interplay between ideas and society, growth of new social institutions, emergence of classical elites and religious groups. Two lectures, one preceptorial. *B. Elman*

EAS 341 The Tale of Genji in the World  
*Spring LA*
Examination of selected literary texts from premodern and modern Japan and from contemporary Western critical writings. Topics will include modern interpretations of tradition, narrative as a mode of knowledge, translation and interpretation, and the general problems involved in the study of a non-Western literature. One three-hour seminar.
Knowledge of Japanese is not required. *Staff*

EAS 342 Southeast Asia's Global History (See HIS 342)

EAS 343 Modern Japanese Literature: Early Years  
*Spring LA*
An introduction to major literary works in the early modern period when Japanese literature was attempting to reestablish itself through Western influences. Readings in English translation include works by Ogai, Soseki, Ichiyo, Toson, and Shiga. Topics include the evolution of modern Japanese fiction vis-avis the modernization of Japan, representations of self, individualism, and nationalism. *Staff*

EAS 344 Postwar Japanese Narrative: Modern to Postmodern (also COM 344)  
*Fall LA*
A critical survey of important literary, critical, and popular texts in postwar Japan. Readings and discussion of translated texts by writers and thinkers such as Kawabata, Oe, Maruyama, and Abe as well as by lesser-known women writers, avant-garde poets, and comic writers. Topics include the impact of war and urbanization, existentialism, ethnicity, postmodernism, and feminism. One three-hour seminar. *Staff*

EAS 345 Sexuality and Desire in Modern Japan  
*Spring LA*
An examination of texts written by women in Japan during the premodern and modern periods in the context of feminist and cross-cultural criticism. The premodern period will focus on how we read products of a culture in which women had their own gendered discursive style. The modern period will focus on what happened when women found themselves negotiating a field dominated by a male- and Western-oriented writing establishment. Offered in alternate years. One three-hour seminar. *Staff*

EAS 346 The Chinese Economy (See ECO 379)

EAS 354 Early Modern China (See HIS 324)

EAS 355 China, 1850 to the Present (See HIS 325)

EAS 356 Chinese Cinema (See ART 350)

EAS 357 Traditional Chinese Architecture (See ART 351)

EAS 362 Chinese Politics (See POL 362)

EAS 401 Readings in Modern Japanese I (See JPN 401)

EAS 402 Readings in Modern Japanese II (See JPN 402)
EAS 405 Readings in Modern Korean I (See KOR 405)
EAS 406 Readings in Modern Korean II (See KOR 407)
EAS 411 Readings in Modern Chinese Intellectual History (See CHI 411)
EAS 412 Readings in Classic Chinese Short Stories (See CHI 412)
EAS 415 Intellectual History of China to the Fifth Century (also HIS 415) Fall EM Considers the developing repertoire of ideas in China to the end of the Chin period, with key philosophical, political, ethical, and scientific concepts treated in terms of their social context and subsequent influence. One three-hour seminar. A prior course in East Asian studies is desirable but not required. W. Peterson
EAS 416 Intellectual History of China from the Ninth to the 19th Century (also HIS 416) Spring HA The main facets and changes in the outlook of the intellectual elite in society and politics from the establishment of the literati in the 11th century to their survival under the Manchu conquest and incursions from Western powers. The focus is on the preservation of cultural integrity in the face of internal and external political and ideological challenges. One three-hour seminar. A prior course in East Asian studies is desirable but not required. W. Peterson
EAS 417 Modern Chinese Thought Fall HA A systematic study of problems and concepts connected with the development of modern Chinese thought: antitraditionalism, the rise of Communism, the emancipation of women, the promotion of Western ideologies, and the process of modernization. Readings in English, with supplementary materials for students with reading knowledge of Chinese. One three-hour seminar. C. Chou
EAS 423 Landscape Art in China (See ART 423)
EAS 425 The Japanese Print (See ART 425)
EAS 447 Introduction to Japanese Linguistics Not offered this year SA Introduction to the theories and techniques of linguistic analysis as applied to modern Japanese, with a focus on interface between language and culture. The course examines similarities and differences between Japanese and English. Knowledge of Japanese at least to the 105 level, or concurrent enrollment, is desirable. Two 90-minute classes. Staff
EAS 462 International Relations of East Asia (See WWS 317)
JPN 101 Elementary Japanese I Fall
An introduction to modern Japanese stressing oral-aural facility but including an introduction to written Japanese. Two classes, three hours of drill and conversation. No credit is given for JPN 101 unless followed by JPN 102. S. Sato
JPN 102 Elementary Japanese II Spring
A continuation of 101. An introduction to modern Japanese still stressing oral-aural facility but including an introduction to written Japanese. Prerequisite: 101. Two classes, three hours of drill and conversation. S. Sato

JPN 105 Intermediate Japanese I Fall
Continued study of modern Japanese by consistent review and reinforcement of major grammatical points and more advanced vocabulary and grammar. This course will develop conversational as well as reading and writing skills. In addition to the main textbook, audio and visual materials will also be used for aural comprehension. Prerequisite: 102 or equivalent. Five 50-minute classes. H. Matsui
JPN 107 Intermediate Japanese II Spring
A continuation of 105. The course aims at a thorough mastery of modern Japanese by consistent review and reinforcement of major grammatical points covered in JPN 101, 102, and 105. Emphasis will increasingly be on reading; however oral work will still comprise fundamental aspect of the course. In addition to the main textbooks, audio and visual materials will also be used for aural comprehension. Prerequisite: 105 or equivalent. Five 50-minute classes. H. Matsui
JPN 301 Advanced Japanese I Fall
Further reading in modern written Japanese with subsidiary grammatical and oral-aural training. The course covers some authentic materials and includes videotaped materials to increase oral-aural comprehension. Three 90-minute classes. Staff
JPN 302 Advanced Japanese II Spring
A continuation of 301. Further reading in modern written Japanese with subsidiary grammatical and oralaural training. The course covers some authentic materials and includes videotaped materials to increase oral-aural comprehension. Prerequisite: 301. Three 80-minute classes. C. Schad

**JPN 305 Integrative Advanced Japanese I  Fall**
Designed to enhance reading, writing, and oral skills of students who need class work to achieve proficiency. Prerequisites: 302 or its equivalent. Two 90-minute classes. T. Shibata

**JPN 306 Integrative Advanced Japanese II  Spring**
A continuation of 305. Designed to enhance reading, writing, and oral skills of students who need class work to achieve advanced proficiency level. Prerequisites: 305 or its equivalent. Three hours. T. Shibata

**JPN 403 Introduction to Classical Japanese  Not offered this year**
Introduction to the fundamentals of classic Japanese grammar. This course trains students to read premodern Japanese historical and literary texts. Texts: *Taketori monogatari, Makura no soshi, Tosa nikki*, etc. Prerequisite: two years of modern Japanese. Three hours. K. Ono

**JPN 404 Readings in Classical Japanese  Not offered this year**
Close reading of selected premodern Japanese texts from Nara to Meiji. Texts: *Oku no hosomichi, Uji shui monogatari*, etc. Prerequisite: 403 or instructor's permission. Three hours. K. Ono

**JPN 405 Readings in Selected Fields I  Not offered this year**
Designed to give students who have had advanced training in modern Japanese an opportunity for directed readings in their own fields. Three classes. Prerequisite: 402 or instructor's permission. Staff

**JPN 406 Readings in Selected Fields II  Not offered this year**
Designed to give students who have had advanced training in modern Japanese an opportunity for directed readings in their own fields. Three classes. Prerequisite: 402 or instructor's permission. Staff

**KOR 101 Elementary Korean I  Fall**
Elementary Korean is designed for beginning students who intend to build a solid foundation for further study in the Korean language. The course provides four balanced language skills - listening, speaking, reading, and writing - needed for basic communication. It emphasizes the ability to use Korean appropriately and introduces students to useful information concerning culture and daily life in Korea. J. Suh, Y. Yun, E. Ji

**KOR 102 Elementary Korean II  Spring**
A continuation of KOR 101. Continued development of proficiency in basic communication by balancing four language skills - listening, speaking, reading, and writing. J. Suh, Y. Yun, E. Ji

**KOR 105 Intermediate Korean I  Fall**
Intermediate Korean is designed for students who have learned the basics of the Korean language and want to improve their competence to a higher level. Complex sentences and grammar are covered while the basics are reviewed. Balancing four language skills -- listening, speaking, reading, and writing -- is emphasized. H. Choi, E. Ji

**KOR 107 Intermediate Korean II  Spring**
A continuation of KOR 105. Continued development of four skills (speaking, listening, reading, and writing) in Korean. Complex grammatical structures and irregularities are taught while the basics are reviewed. Idiomatic expressions are introduced. Journals are kept for writing practice. H. Choi, E. Ji

**KOR 301 Advanced Korean I  Fall**
Advanced Korean is designed to develop fluency in both oral and literary skills. Expansion of vocabulary, practice in reading comprehension as well as active skills of conversation and writing are stressed through short readings and class discussion. Readings include different styles of writings on various topics including Korean culture, society, and history. H. Choi

**KOR 302 Advanced Korean II  Spring**
A continuation of KOR 301. Continued development of proficiency in speaking and reading through short readings and class discussion. Vocabulary learning and discourse skills are emphasized. H. Choi

**KOR 401 Contemporary Korean Language and Culture I  Fall**
The 4th-year language course designed to accelerate students' Korean proficiency to the high advanced level and to promote a deeper understanding of Korea and its people. A wide range of sociolinguistic and sociocultural issues are covered through the use of various media resources (e.g., dramas, films, songs, commercials, newspapers, websites) as well as short essays. Classroom discussions are conducted in Korean. Y. Yun
KOR 402 Contemporary Korean Language and Culture II  Spring LA
Reading and discussion of thoughts and issues related to the contemporary Korean society. Readings drawn from a variety of sociocultural and historical as well as sociolinguistic topics include family, marriage, education, technology and changes in the Korean language. Class discussions are conducted in Korean. Y. Yun
The Program in East Asian Studies is an interdepartmental plan of study directed by representatives of the cooperating departments--anthropology, art and archaeology, comparative literature, East Asian studies, economics, history, politics, religion, and sociology--as well as the Woodrow Wilson School of Public and International Affairs. It provides an opportunity for students who plan to major in the humanities, social sciences, or other disciplines to simultaneously pursue the study of East Asian language and culture. The program's purpose is to educate internationally minded men and women with basic competence in an Asian area as well as to enhance the student's understanding of Western civilization through perspectives gained from the study of the non-Western world. The student's work is supervised by the appropriate representative of a cooperating department in consultation with the East Asian studies program director. For the purposes of this program, East Asia is defined as those areas where Chinese, Korean, or Japanese is the dominant language.

Students pursuing the program certificate are encouraged to take advantage of intensive summer language programs and of the numerous opportunities for study or travel in Asia, including an intervening year abroad. A limited amount of scholarship aid for this purpose is available. Applications for summer funding and a list of approved centers in East Asia can be found on the program's website; deadlines usually fall in late December or January. Students contemplating an intervening year of study should aim to complete at least two years' study of the relevant language before the junior year or earlier and should consult with the program director.

Admission to the Program

Students must satisfy the established requirements for admission to one of the cooperating departments, or to some other department with whose plan of study this interdepartmental program may, by special arrangement, be combined. Application materials should be filed in the East Asian studies program office by the senior thesis deadline in early May of the applicant's senior year, but preferably earlier, by the end of the fall semester of the senior year.
Program of Study

Students enrolled in the program must complete eight one-term courses in East Asian studies. At least two of these must be language courses at the second-year level or higher; no more than four of the eight courses may be language courses. Applicable language and cognate courses are listed in the East Asian studies section of this announcement; successful completion of at least one 200-level East Asian studies content course is required. Additional courses, including those taken abroad, may count toward the certificate, but must be approved in advance by the program office.

In addition to the coursework, the student will submit a paper dealing with an area of East Asia, for which the use of East Asian-language sources is strongly recommended. The student may submit the senior thesis or junior paper or substitute another substantial piece of original research that meets the same standards of relevance to East Asia and use of East Asian-language sources. If the junior paper or independent research paper was written for a course, that course cannot count toward the course requirements for the certificate; it must be a ninth course.

Certificate of Proficiency

A student who has met the requirements of the program and of the cooperating department and has maintained satisfactory standing will receive a certificate of proficiency in East Asian studies.

Interested students are advised to contact the program office. For the most-current information, see the program's website.
Courses in the biological sciences at Princeton are offered in two departments. Students with an interest in whole-organism and large-scale processes--evolution (including molecular evolution and developmental evolution), physiology, disease, behavior, neuroscience, ecology, ecosystem biology, conservation, and climate change--should enroll in the Department of Ecology and Evolutionary Biology (EEB). Those with interests in molecular, cellular, and developmental processes should enroll in the Department of Molecular Biology (MOL). Both departments provide an excellent background for medical school.

The EEB department emphasizes research and teaching from an evolutionary perspective, combining theory and empiricism and linking areas that are often treated as separate disciplines. Many of the research projects and courses are interdisciplinary. A description of these core areas, faculty interests, and unique features of the program, including details about the department's field programs, can be found on the department's website.

Every student considering majoring in EEB should attend the departmental open house held in the spring term. It introduces potential majors to departmental courses, faculty, and the wide-ranging research and field-course opportunities open to students. See the department's website for examples of recent student research activities.

**Advanced Placement**

Advanced placement will be granted to students who received a 5 on the Biology AP exam. Nevertheless, all students planning on majoring in EEB must take EEB 211.
**Prerequisites**

The Department of Ecology and Evolutionary Biology requires the following prerequisites, which should normally be completed by the end of sophomore year.

Two terms of introductory biology: EEB 211 and either EEB/MOL 214 or EEB/MOL 215; Mastery of calculus to the level of MAT 103 or above, or advanced placement (an AP score of 5 on the AB test or an AP score of 4 on the BC test);
Two terms of introductory chemistry (or equivalent, or an AP score of 5);
The first term of introductory physics (or the equivalent, or an AP score of 5). [Note that medical schools require two terms of physics. Physics can be delayed to senior year if necessary.]. The Health Profession advisers recommend that students wanting to study abroad, especially in EEB’s field semesters, should do so. They recommend contacting them early to formulate a plan of study that allows students to fulfill the pre-medical prerequisites and allows them to study abroad during spring of the junior year.
A statistics course: ECO 202, ORF 245, POL 345, PSY 251, SML 201, or WWS 332. It is best to fulfill the statistics requirement before junior year, but it must be fulfilled by the end of fall term senior year.

Prerequisite courses may not be taken using the P/D/F grading option.

**Early Concentration**

Students who are passionate about solving problems in the areas of ecology, evolution, behavior, conservation, and disease may apply for early concentration in ecology and evolutionary biology. Students having advanced placement in biology and having taken at least one upper-level EEB course, in addition to having completed many of the department's required pre- and co-requisite courses with grades of at least B+, are eligible. Early concentrators will begin independent work during the spring of their sophomore year. Students interested in early concentration should contact a departmental representative at the end of the freshman year or at the start of the sophomore year.

**Program of Study**

Requirements. Students in ecology and evolutionary biology must successfully complete at least eight upper-level departmental courses, at least six of which must be EEB or MOL courses. One of the eight must be an EEB lab course; 314, 324, 417B, or MOL 350 and all field courses count as lab courses. Students should consult the department for a list of courses in other departments that may count as departmentals for students interested in mathematical biology.

*Choice of Courses.* Students must take at least one course from each of the following three general areas:

Behavior and Physiology: 311, 313, 314, 329, 403, 404;
Evolution and Genetics: 309, ISC 326;

Students may take 309, 313, and 321 in the fall term of junior year to sample all three areas. Pay particular attention to the timing of the courses that are taught in alternate years.
**Organic Chemistry**: EEB no longer requires majors to take organic chemistry. Those planning on attending medical school should take the year-long sequence. Please note that both semesters of organic chemistry can count as departmentals.

**Integrated Biology Sequence**: Students who have completed the two-year sequence need to meet with the EEB departmental representative to discuss placement in upper-level EEB courses.

No course taken P/D/F can be counted as a departmental or to satisfy requirements of the major. The minimum grade for a course to count as a departmental is C-. Only one course with a policy perspective can be counted as a departmental. Only Princeton courses can count as departmentals; the one exception is for pre-approved courses taken during a study-abroad term – these can be counted as departmentals, but the grades do not transfer.

**Special Features of the Plan of Study.** EEB offers two tropical field study programs: a semester in Panama, and a semester in Kenya. Four courses, built around experiential learning, are taken in sequence at each location typically during the spring of junior year. Please note that seniors, who are well along with the thesis are encouraged to consider fulfilling their last two courses spring of senior year by attending the first half of the semester in Kenya or Panama. Seniors who choose to do this would return to campus at spring break to complete the senior thesis. Details of these programs can be found on the department's website.

**Independent Work**

**Junior Independent Work.** During the fall semester, students will attend periodic meetings on Tuesday evenings that will include presentations by the faculty on their work and the research opportunities open for senior independent work. After the faculty presentations, which will take place early in the semester, students will identify those faculty with whom they are interested in working. If the faculty member agrees to take on a particular student, together they will develop a plan of study. During the second half of the fall term, students participate in a tutorial working closely with one faculty member to investigate a problem using the current literature, and then writing a paper. In the spring semester, students carry out a program of independent work with a faculty adviser. In some instances this may include empirical or theoretical work. Either a paper summarizing this project or a research proposal for the senior thesis is due in early May.

**Senior Independent Work.** During the fall of the junior year each student selects a senior thesis adviser (see above). The adviser and the student choose a research project that the student generally pursues during the summer preceding the senior year and both terms of the senior year. The research project can involve primarily laboratory, field, data mining, theoretical, or library study that will be written and presented as a senior thesis.

**Senior Departmental Examination.** A one-hour oral examination, consisting of a defense of the thesis research and general questions in the biological sciences will be held in May.
Tropical Field Programs. Students interested in learning about or undertaking research in the tropics have a number of options.

1. Panama. The department offers a spring term in Panama in conjunction with the Smithsonian Tropical Research Institute. Students take four intensive three-week courses in sequence, beginning with an introduction of key concepts in tropical ecology and conservation. The program also includes courses on coral reefs, parasitology, and anthropology (focusing on Pre-Columbian peoples and their land-use practices). Prerequisite: EEB 321, an equivalent introductory ecology course, or a collection of foundational readings.

2. Kenya. This four-course program on Tropical Biology and Sustainability, also taught in three-week segments, takes place at Princeton University's Mpala Research Centre in central Kenya and other sites in Kenya, in collaboration with scientists there, EEB faculty, other appropriate faculty from Princeton University, and faculty from Columbia University; Columbia students participate in the program. The courses delve into the ecology of savannas, conservation in Africa, the natural history of mammals, tropical agriculture and engineering and field hydrology. Prerequisite: EEB 321, an equivalent introductory ecology course, or a collection of foundational readings.

3. Other. Individual students are welcome to pursue other independent field opportunities, with scientists from the Smithsonian Institution and the Bermuda Institute of Ocean Sciences, or other research institutions, such as the School for Field Studies at the University of Cape Town in South Africa, or James Cook University in Australia.

Program in Teacher Preparation. As the need for qualified science teachers increases, some students may wish to earn a teaching certificate. Working with the departmental representative and the teacher preparation program, an appropriate course of study can be arranged.

Courses

EEB 211 Life on Earth: Chaos and Clockwork of Biological Design (also MOL 211) Fall STL
An examination of how life evolved and how organisms function. Design--'intelligent' and otherwise--will provide a unifying theme. Why do some microbes produce slime and others do not? Why are males brightly colored in some species, but in others females are the showy sex? Why do humans have knees that fail whereas horses and zebras do not? These and other 'why is it so' questions related to the origin and history of life, genetic code, biochemistry, physiology, morphology and body plans, sex and reproduction, cooperation, and ecosystems will be explored. This course is required of all EEB majors and fulfills a requirement for medical school. D. Rubenstein

EEB 214 Introduction to Cellular and Molecular Biology (See MOL 214)

EEB 215 Quantitative Principles in Cell and Molecular Biology (See MOL 215)

EEB 255A Life in the Universe (See GEO 255A)
EEB 255B Life in the Universe (See GEO 255B)

EEB 301 Evolution and the Behavior of the Sexes (also GSS 301) Not offered this year STN Psychological, biological, and cross-cultural approaches to the study of sex and gender. Topics include biological components and development of sex differences; acquisitions of gender identity; social organization of key life cycle events; evolutionary considerations in the study of sex differences. One 90-minute lecture, one 90-minute class. Staff

EEB 304 Disease Ecology, Economics, and Policy (See ENV 304)
EEB 305 Water, Energy, and Ecosystems (See CEE 307)
EEB 306 Human Evolution (See ANT 206B)
EEB 308 Conservation Biology Fall STN
A detailed application of ecological principles to the conservation of biological resources, including island biogeography, population genetics and viability, and landscape ecology. Analysis of case studies in conservation. Individual project on a conservation issue of the student's choice. Two lectures, one preceptorial. Staff

EEB 309 Evolutionary Biology Fall
All life on Earth has evolved and continues to evolve. This course will explore evolution at both the molecular and organismal level. We will examine the features that are universal to all life and that document its descent from a common ancestor that lived over 3 billion years ago. Topics include the origin of life, the evidence for natural selection, methods for reconstructing evolutionary history using DNA, population genetics, genome evolution, speciation, extinction, and human origins. This course will provide you with the basic tools to understand how evolution works and can produce the incredible diversity of life on our planet. B. vonHoldt

EEB 311A Animal Behavior Spring STN
An examination of the mechanisms and evolution of the behavior of humans and other animals. Topics include the sensory worlds of animals, the nature of instinct, neural mechanisms of perception, comparative studies of communication, learning, cognition, mate choice, and social behavior, and the biology of human development and language acquisition. Two 90-minute lectures, one preceptorial. J. Gould

EEB 312 Marine Biology (also ENV 312) Not offered this year STL
An intensive four-week course during June in Bermuda. Covers elements of the ecology, evolution, physiology, and behavior of marine organisms and ecosystems. Habitats examined will include the intertidal zone, seagrass beds, mangroves, and the open ocean, with special attention to coral reefs. Topics range from the physiology and behavior of individuals in the habitat, to the flow of energy, predator/prey interactions, symbioses, and population dynamics. Prerequisites: 210 or 211, ability to swim. Three hours of lectures, three hours of laboratory and field trips per day. J. Gould

EEB 314 Comparative Physiology Spring
The study of how animals function with emphasis on the integration of physiological processes at the cellular, organ, and whole organism levels in ecological and evolutionary contexts. Comparisons among species and higher taxa are used to illustrate general physiological principles and their evolutionary correlates. Three lectures, one three-hour laboratory. Prerequisite: 210 or 211. Staff

EEB 315 Human Adaptation (See ANT 215)
EEB 320 Molecular Evolution (also MOL 330) Not offered this year
How and where did life evolve? This advanced seminar will discuss the evolution of the molecules that sustain life (DNA, RNA and proteins) at both the micro and macro evolutionary levels. We will explore the role of these molecules in the origin and continued evolution of life. Topics include the origin of eukaryotes and organelles, comparative genomics, population genetics, the microbiome, and human evolution. Prerequisites: 214, 215, or CHM 236. One three-hour seminar. Note that students new to either evolution or genetics will find 309 more appropriate. L. Landweber

EEB 321 Ecology: Species Interactions, Biodiversity and Society Fall STL
How do wild organisms interact with each other, their physical environments, and human societies? Lectures will examine a series of fundamental topics in ecology -- herbivory, predation, competition, mutualism, species invasions, biogeographic patterns, extinction, climate change, and conservation, among others--through the lens of case studies drawn from all over the world. Readings will provide background information necessary to contextualize these case studies and clarify the linkages between them. Precepts and fieldwork will explore the process of translating observations and data into an understanding of how the natural world works. R. Pringle

EEB 322 Advanced Ecology Not offered this year
An advanced overview of the structure of ecological communities, particularly temperate and tropical forests. Emphasis will be on factors governing species diversity and abundance on both local and global scales. Other topics will include the impact of humans on biodiversity at global scales, and the effects of biodiversity on the regulation of climate and the cycling of key elements such as carbon and nitrogen. Prerequisite: 321; one year of calculus recommended. Two 90-minute lectures, one preceptorial. S. Pacala

EEB 323 Integrative Dynamics of Animal Behavior Not offered this year
An exploration of the fundamental principles underlying the organization and function of animal behavior. This course will examine how complex actions emerge from simple rules. Since forces shaping behavior naturally cross
scales and disciplinary boundaries, this course will draw on information from neuroscience, evolutionary biology, ecology, physiology, genetics, and the biology of complex systems. Two 90-minute lectures, one preceptorial. Staff

EEB 324 Theoretical Ecology Spring QR
Current and classical theoretical issues in ecology and evolutionary biology. Emphasis will be on theories and concepts and on mathematical approaches. Topics will include population and community ecology, epidemiology and evolutionary theory. Two lectures, one preceptorial/computer laboratory. Prerequisite: one year of calculus. S. Levin

EEB 325 Mathematical Modeling in Biology and Medicine Fall
How can mathematical modeling help to illuminate biological processes? This course examines major topics in biology through the lens of mathematics, focusing on the role of models in scientific discovery. Students will learn how to build and analyze models using a variety of mathematical tools. Particular emphasis will be placed on evolutionary game theory. Specific topics will include: the evolution of cooperation and of social behavior from bacteria to humans; the evolution of multicellularity; the somatic evolution of cancer; virus dynamics (within host and within populations); and multispecies interactions and the evolution of mutualisms. C. Tarnita

EEB 327 Immune Systems: From Molecules to Populations (also MOL 327) Not offered this year
STN
Why is there immunological polymorphism in animal populations? Why do immune systems work as they do? This course examines the theories of host-parasite coevolution, including optimal host resource allocation to immune defense in light of parasite counter-strategies, and assesses the empirical evidence by which these theories are tested. Students look at the evolutionary ecology of mechanisms used by immune systems to recognize and kill parasites, finding similarities across animal taxa. Finally, students will map immune mechanisms onto host phylogenies to understand the order in which different mechanisms arose over evolutionary time. A. Graham

EEB 328 Ecology and Epidemiology of Parasites and Infectious Diseases Spring STL
An introduction to the biology of viruses, bacteria, fungi, protozoa, worms, arthropods, and plants that are parasitic upon other animal and plant species. The major emphasis will be on the parasites of animals and plants, with further study of the epidemiology of infectious diseases in human populations. Studies of AIDS, anthrax, and worms, and their role in human history, will be complemented by ecological and evolutionary studies of mistletoe, measles, myxomatosis, and communities of parasitic helminths. Limited to students in the Tropical Ecology Program in Panama. A. Dobson

EEB 332 Pre-Columbian Peoples of Tropical America and Their Environments (also LAS 350) Spring SA
An intensive course on the pre-European history of Amerind cultures and their environments in the New World tropics. Topics include the people of tropical America; development of hunting/gathering and agricultural economies; neotropical climate and vegetation history; and the art, symbolism, and social organization of native Americans. Daily lectures, field trips, and laboratory experiences and incorporates methods and problems in field archaeology, paleoethnobotany and paleoecology, and archaeozoology. Limited to students in the Tropical Ecology Program in Panama. This course does not count as an EEB departmental. Prerequisite: EEB 321. Staff

EEB 336 The Diversity of Brains (See PSY 336)

EEB 338 Tropical Biology (also LAS 351) Spring STL
This intensive field course, at various sites in Panama, examines the origins, maintenance, and major interactions among elements of the tropical-terrestrial biota. Study topics include identification of common orders and families of neotropical organisms; tropical climate and hydrology; biotic interactions; and contemporary and historical factors in shaping tropical landscapes, with emphasis on the Isthmian Landbridge and subsequent floral and faunal interactions. Two hours of lecture/discussion, six hours of laboratory, and two hours of data analysis daily. Limited to students in the Tropical Ecology Program in Panama. Prerequisite: 321. Y. Basset

EEB 346 Biology of Coral Reefs Spring STL
This intensive field course provides an in-depth introduction to the biology of tropical coral reefs, with an emphasis on reef fish ecology and behavior. Students learn to identify fishes, corals, and invertebrates, and learn a variety of field methods including underwater censusing, mapping, videotaping, and the recording of inter-individual interactions. Two hours of lecture/discussion, six hours of laboratory, and two hours of data analysis daily. Snorkeling in open ocean and walking in wild terrain is common. Limited to students in the Tropical Ecology Program in Panama. Prerequisite: 321. Staff

EEB 350 Vertebrate Tropical Ecology Not offered this year
This intensive field course addresses the life-history characteristics of tropical vertebrates and the physiological traits that underlie them. Students will learn how tropical life histories differ from those in the temperate zone and
will use eco-physiological techniques while conducting experiments and observations at a Smithsonian Institute field station. Two hours of lecture/discussion, six hours of laboratory, and two hours of data analysis daily. Limited to students in the Tropical Ecology Program in Panama. Prerequisite: 321. Staff

EEB 355 Introduction to Statistics for Biology (also MOL 355) Not offered this year QR
An applied introduction to probability and statistical methods in biology. Topics include data visualization, parameter estimation, frequentist hypothesis testing, Bayesian hypothesis testing, useful statistical tests, linear models, and an introduction to data-driven modeling. Analyses will use an appropriate statistical computer package. J. Storey, P. Andolfatto

EEB 404 Natural History of Mammals Spring STL
Students examine how mammals interact with diverse and potentially conflicting features of their environment in order to understand the concepts, methods, and material of comparative natural history. Perspectives include morphology, identification, evolution, ecology, behavior, habitat, and conservation. Original observations and experiments culminate in class, group, and individual research projects. This intensive field course entails two hours of lecture/discussion, six hours of laboratory, and two hours of data analysis daily. Limited to students in the Tropical Ecology Program in Kenya. Prerequisite: 210 or 211. D. Rubenstein

EEB 414 Genetics of Human Populations (also MOL 414) Not offered this year
This seminar surveys the evolutionary history of modern humans and the genetic basis of variation in our species through reading and discussion of classic and contemporary primary literature. Topics include the evolutionary origins of modern human populations, signatures of natural selection in the human genome, and approaches for discovering genetic variants that affect disease susceptibility and variation in normal traits. Significant emphasis is placed on recent advances made possible by the human genome project. Prerequisites: 309, or 320, or MOL 342, or CHM 236. One three-hour seminar. P. Andolfatto

EEB 417A Ecosystems and Global Change (also ENV 417A) Not offered this year STN
An introduction to the concepts, approaches, and methods for studying complex ecological systems, from local to global scales. Students will examine nutrient cycling, energy flow, and evolutionary processes, with emphasis on experimental approaches and comparisons between terrestrial, freshwater, and marine ecosystems. Particular attention will be on effects of human activities, including climate change, biodiversity loss, eutrophication, and acid rain. Prerequisites: 210 or 211 or equivalent; CHM 301 or equivalent. Two 90-minute classes. L. Hedin

EEB 417B Ecosystems and Global Change (also ENV 417B) Fall STL
An introduction to the concepts, approaches, and methods for studying complex ecological systems, from local to global scales. Students will examine nutrient cycling, energy flow, and evolutionary processes, with emphasis on experimental approaches and comparisons between terrestrial, freshwater, and marine ecosystems. Particular attention will be on effects of human activities, including climate change, biodiversity loss, eutrophication, and acid rain. Prerequisites: 210 or 211 or equivalent; CHM 301 or equivalent. Two 90-minute classes, one three-hour laboratory. L. Hedin

EEB 419 Environmental Microbiology (See GEO 417)
Department of Economics

Chair
Janet M. Currie

Associate Chair
Ulrich K. Mueller

Departmental Representative Bo
Honorable
Smita B. Brunnermeier

Director of Graduate Studies
Stephen E. Morris

Professor
Dilip J. Abreu
Mark A. Aguiar
Yacine Aït-Sahalia
Orley C. Ashenfelter
Roland J. Benabou, also Woodrow Wilson School
Alan S. Blinder, also Woodrow Wilson School
Markus K. Brunnermeier
Anne C. Case, also Woodrow Wilson School
Janet M. Currie, also Woodrow Wilson School
Jan De Loecker, also Woodrow Wilson School
Henry S. Farber
Mikhail Golosov
Gene M. Grossman, also Woodrow Wilson School
Faruk R. Gul
Bo E. Honoré
Jakub Kastl
Nobuhiro Kiyotaki
Alan B. Krueger, also Woodrow Wilson School
Ilyana Kuziemko
David S. Lee, also Woodrow Wilson School
Alexandre Mas, also Woodrow Wilson School
Atif R. Mian, also Woodrow Wilson School
Stephen E. Morris
Ulrich K. Mueller
Wolfgang Pesendorfer
Stephan J. Redding, also Woodrow Wilson School
Uwe E. Reinhardt, also Woodrow Wilson School
Richard Rogerson, also Woodrow Wilson School
Harvey S Rosen
Esteban A. Rossi-Hansberg, also Woodrow Wilson School
Cecilia E. Rouse, also Woodrow Wilson School
Harold T. Shapiro, also Woodrow Wilson School
Christopher A. Sims
Mark W. Watson, also Woodrow Wilson School
Wei Xiong
Motohiro Yogo

Associate Professor
Oleg Itskhoki, also Woodrow Wilson School

Assistant Professor
Will Dobbie, also Woodrow Wilson School
Kirill Evdokimov
Maryam Farboodi
Thomas Fujiwara
Michal Kolesár, also Woodrow Wilson School
Benjamin Moll, also Woodrow Wilson School
Eduardo Morales, also Woodrow Wilson School
Christopher A. Neilson, also Woodrow Wilson School
Ezra Oberfield
Tom S. Vogl, also Woodrow Wilson School
Juan Pablo Xandri

Instructor
David Schoenherr

Senior Lecturer
Elizabeth C. Bogan

Lecturer with Rank of Professor
Roman L. Weil

Lecturer
Swati Bhatt
Smita B. Brunnermeier
Jean Baldwin Grossman
Thomas C. Leonard, also Council of the Humanities
Leonardo Pejsachowicz
Andres Maggi
Kelly Noonan
Jean-Christophe de Swaan
Silvia Weyerbrock
Information and Departmental Plan of Study

Further details and updates regarding undergraduate requirements and procedures may be found at the website of the Department of Economics.

Advanced Placement

Students who scored 5 on the AP microeconomics exam are exempted from ECO 100. Students who scored 5 on the AP macroeconomics exam are exempted from ECO 101. Students who scored 5 on the AP statistics exam are exempted from ECO 202. (Note: Exemption from 100 and 101 will be accorded to students who pass the British A-levels with a grade of A, and to those who earn a 7 on the higher-level International Baccalaureate.)

Students exempted from ECO 100, ECO 101, and/or ECO 202 may still benefit from taking these courses, which provide important basic materials for the study of economics.

The department will permit freshmen to enroll in ECO 310, 311, or 312, subject to the approval of the instructor for the course. The requirements are: (1) completion of, or exemption from, ECO 100, 101, and/or 202, as appropriate in each case, and (2) sufficient knowledge of multivariable calculus and vector and matrix algebra. For the latter, ask the mathematics department officer concerned (currently Vlad Vicol, vvicol@princeton.edu) to certify that your previous knowledge of mathematics is regarded as equivalent to completion of MAT 175, or MAT 201-202, or better.

Prerequisites

To enter the department, a student must complete, by the end of sophomore year, the prerequisite courses ECO 100, 101, 202 (or equivalent), earning a letter grade of C or better in each and a letter grade of C or better in MAT 175. ORF 245 can be substituted for 202; PSY 251, WWS 200 and SOC 301 are not acceptable. The statistics requirement cannot be satisfied with summer courses taken after the student has begun studies at Princeton, except in unusual circumstances approved by the departmental representative, Professor Henry S. Farber (farber@princeton.edu).

Students who wish to take ECO 312 or upper-level finance certificate courses (such as ECO 462, 465 or 466), or pursue graduate studies in economics or finance should take the two-semester sequence MAT 201 + 202 (or MAT 203 + 204) rather than MAT 175.

A meeting for sophomores interested in joining the department will be announced in the spring.
Underclass students are welcome to discuss department requirements with the departmental representative. Students considering study abroad are urged to meet with the departmental representative at the earliest opportunity in their freshman year.

Program of Study

General Requirements. The department requires concentrators to complete, and pass on a graded basis, the following:

- Core Courses: Microeconomics (ECO 300 or 310), Macroeconomics (ECO 301 or 311), and Econometrics (ECO 302 or 312), to be completed during or before the junior year.

- Elective courses: Five other departmentals (see Other Departmentals for details).

- Junior independent work.
- Senior thesis.
- Senior comprehensive exam.

Furthermore, the student must have a departmental average of at least C.

Note: The calculation of the departmental average is described in Departmental Average. The treatment of failed courses is described in Advancement to Senior Standing.

Core Courses. All concentrators must pass, on a graded basis, core courses in microeconomics (ECO 300 or 310), macroeconomics (ECO 301 or 311), and econometrics (ECO 302 or 312). These courses must be completed during or before the junior year. Each of the three core courses is offered in two versions to accommodate different levels of preparation in mathematics: ECO 300, 301, and 302 require MAT 175; ECO 310 and 311 require MAT 175 or MAT 201; and ECO 312 requires MAT 201 + MAT 202.

Qualified students are encouraged to take the more mathematical versions of our core courses. It is not necessary to take all three core courses in the same version.

Other Departmentals. In addition to the three core courses, concentrators must pass, on a graded basis, five other departmental courses. Departmentals can be any 300-, 400-, or 500-level economics courses, or an approved cognate (see Cognates).

Students planning a senior thesis with empirical emphasis are strongly encouraged to take ECO 313; students planning a theoretical senior thesis are strongly encouraged to take ECO 317 and/or ECO 418.

Cognates. Economics majors are allowed to count a maximum of two courses from other departments as cognates. These courses need to have substantial economics content. A course with an economics crosslisting (indicated by an ECO 3XX, ECO 4XX, or ECO 5XX number in its first or second listing) counts as a regular departmental, not as a cognate. Courses that will be automatically recognized by TigerHub as cognates are listed below. No application is necessary for these courses.
If you would like us to consider a course that is not on the previous, routinely approved list, please complete a cognate approval form and submit it, along with a copy of the course syllabus, to Noelina Hall, 001 Fisher Hall. To be approved as a cognate, a course must have substantial content in theoretical or empirical economic analysis. Permission should be obtained before the semester's deadline for the grading option change (usually in week eight or nine of each term).

Independent Work

**Junior Independent Work and Senior Thesis.** Independent work is designed to afford concentrators the opportunity to identify and explore their research interests in depth. Students are expected to develop a carefully reasoned exposition that critically analyzes a problem using basic principles of economics. Juniors complete a year-long research project, which consists of a research prospectus submitted in December and a final paper submitted in April. The senior thesis is expected to be more extensive, with a topic of greater scope and correspondingly broader analysis and interpretation. Further details, from the assignment of advisers to the final deadlines, are available in the junior independent work and senior thesis sections of the department's website.
Senior Departmental Examination

The senior comprehensive examination is a written exam that covers the department's required courses (intermediate microeconomics, macroeconomics, and econometrics). The senior comprehensive exam grade will appear on the student's transcript.

Study Abroad

Potential economics concentrators who expect to study abroad for one or two semesters must plan well ahead. Because the department only rarely permits core courses to be taken abroad, and because core courses may not be postponed to senior year, potential economics concentrators planning study abroad must complete the appropriate core courses in their sophomore year. It is almost never feasible to spend a semester abroad in the senior year.

Economics courses taken abroad may be preapproved as departmentals by the departmental representative, ordinarily up to one per semester. Plans for junior independent work must also be approved in advance.

Preparation for Graduate Study

Graduate study in economics requires special preparation and advance planning, starting as early as the freshman year. Students contemplating graduate study in economics should see the departmental representative as early as possible. Preparation for graduate school should include the following: the more mathematical versions of the core courses (310, 311, and 312), two years of calculus (up through MAT 202, 204, or 218), an upper-level mathematics course such as MAT 320; Operations Research courses such as ORF 309, 311, or 405; and an advanced econometrics or economic theory course such as ECO 313, 317 or 418. Students may find the Program in Applied and Computational Mathematics or the Program in Engineering and Management Systems an interesting option. It is not necessary to be an economics concentrator to enter a graduate economics program, but the economics courses listed above are highly recommended. Graduate courses in economics (500 level) are open to qualified undergraduates. These courses are very demanding and must be started in the fall term. Taking one of these courses can be useful for students who intend to enter an economics graduate program, because it begins the student's advanced training, gives the student a flavor of graduate school, and provides evidence during the admissions process of the ability to do advanced work in economics.

Courses

ECO 100 Introduction to Microeconomics Fall/Spring SA
Economics is the study of how people and societies deal with scarcity. The subject of this course is microeconomics, which examines the decision-making of individuals and firms in the presence of scarcity, and how these decisions are coordinated. We focus on the advantages and disadvantages of market systems for allocating scarce resources. Two lectures, one class. H. Rosen

ECO 101 Introduction to Macroeconomics Fall/Spring SA
The theory, and some of the evidence, of how and why national economies fluctuate, with periods of boom and bust, and periods of high and low inflation. Substantial emphasis is given to fiscal policy and monetary policy including the novel policy responses to the 2007-2009 financial crisis and the ensuing recessions in the US and abroad. Attention is also paid to international economic issues and to problems of economic growth. Two lectures, one class. E. Bogan
ECO 202 Statistics and Data Analysis for Economics  
Spring QR
An introduction to probability and statistical methods for empirical work in economics. Descriptive statistics, probability, random variables, sampling, estimation, confidence intervals, hypothesis testing, introduction to the regression model. The class uses STATA as statistical software package. Two 90-minute classes, one preceptorial. Prerequisites: MAT 103. U. Mueller

ECO 300 Microeconomic Theory  
Fall SA
This class is about markets. When do they work? When do they fail? And what can be done about it? Over the course of study the class will cover (1) choices made by consumers and firms, (2) competitive equilibrium, and (3) market failures. It will also touch on game theory and information economics. Two lectures, one class. Prerequisites: 100, MAT 175 or equivalent. Staff

ECO 301 Macroeconomics  
Spring SA
The determinants of national income, unemployment, inflation, interest rates and exchange rates. Includes analyses of business cycles, monetary and fiscal policies, consumption, investment, economic growth, and issues in international monetary macroeconomics. Two lectures, one precept. Prerequisites: ECO100 and ECO101. I. Zaidi

ECO 302 Econometrics  
Fall QR
The objective of this course is to prepare students for basic empirical work in economics. In particular, topics will include basic data analysis, regression analysis, testing, and forecasting. Students will be provided with the opportunity to use actual economic data to test economic theories. Prerequisites: 100 or 101, and 202, or ORF 245; MAT 103 or equivalent. Two 90-minute classes, one preceptorial. K. Evdokimov

ECO 310 Microeconomic Theory: A Mathematical Approach  
Fall/Spring SA
Topics include consumer and firm behavior, market equilibrium, efficiency, an introduction to game theory, and information economics. Uses multivariable calculus and linear algebra to treat the topics in greater depth and to better prepare for advanced courses. Two lectures, one class. Prerequisites: ECO 100 or equivalent; MAT 175 or 201 or equivalent. W. Pesendorfer, S. Morris

ECO 311 Macroeconomics: A Mathematical Approach  
Spring SA
This course examines the determinants of economic growth, business cycle fluctuations, and the conduct of monetary and fiscal policy. The first part of the course develops a framework for the analysis of households' consumption and savings behavior and firms' production decisions, and uses that to analyze long-run growth and financial crises. The second part of the course extends that analysis to examine business cycle fluctuations, including inflation, unemployment. Current issues in macroeconomic and financial policy are discussed throughout. Two lectures, one class. Prerequisites: 100 and 101; MAT 175 or 201 or equivalent. E. Oberfield

ECO 312 Econometrics: A Mathematical Approach  
Fall/Spring QR
Statistical analysis of economic data. The two-variable regression model, multiple regression. Techniques for dealing with violations of the regression model's assumptions, including autocorrelation, heteroscedasticity, specification error, and measurement error. Dummy variables, discrete-choice models, time series models, and forecasting. Introduction to simultaneous equations. Estimation and testing of economic models will be an important part of the course. Prerequisites: 100 and 101 and 202 (or ORF 245); MAT 175 or 201 or equivalent. Two 90-minute lectures, one class. B. Honoré

ECO 313 Econometric Applications  
Spring QR
This course provides hands-on experience in econometric analysis designed to help students to acquire the skills necessary to carry out their own empirical analyses in economics. Various aspects of empirical research in economics will be covered, including development of testable economic models, appropriate use of data, identification and causal inference, and specification and techniques for estimation of econometric models. Prerequisites: 302 or 312; and calculus. Two lectures, one preceptorial. H. Farber
ECO 315 Topics in Macroeconomics Spring SA
By extending ECO300-level macroeconomics, we develop alternative macroeconomic frameworks with financial frictions to understand business cycles, financial crises and public policy. The lecture begins with a historical overview of financial crises and basic financial accelerator models which emphasizes the interaction between borrowing constraint, asset prices and aggregate production. We then introduce financial intermediaries and government to study banking crisis, credit policy and macro prudential policy. Two 90-minute lectures, one preceptorial. N. Kiyotaki

ECO 317 The Economics of Uncertainty Not offered this year SA
The microeconomic theory of individual decision making under uncertainty and economic interaction under asymmetric information. Topics include expected utility, value of information, risk-sharing in insurance and asset markets, contracting with moral hazard and adverse selection, and auctions. Applications include health insurance and finance. Two lectures, one preceptorial. Prerequisites: 300, MAT 175 or equivalent, and basic probability. Staff

ECO 321 Industrial Organization Fall SA
An economic analysis of the structure of markets and of corporate behavior. The development and interpretation of public policies, including antitrust legislation and direct regulation related to market structure, corporate mergers, restrictive and discriminatory practices, advertising, and research and development. Two lectures, one class. Prerequisites: 300 or 310, and MAT 175 or equivalent. J. Kastl

ECO 324 Law and Economics Fall SA
An introduction to the economics of law. Application of price theory and welfare analysis to problems and actual cases in the common law, property, contracts, torts and to criminal and constitutional law. Topics include the Coase Theorem, intellectual property, product liability, deterring crime, incarceration as punishment, and social choice. Prerequisite: 100. Two 90-minute lectures. T. Leonard

ECO 328 Disease Ecology, Economics, and Policy (See ENV 304)

ECO 329 Environmental Economics (See WWS 306)

ECO 331 Economics of the Labor Market Fall SA
Applies microeconomic analysis to the demand for labor, labor supply, and the determination of wages. Examines investments in human capital, unemployment, discrimination, unions, government intervention in the labor market. Empirical findings as well as theoretical models are studied. Two lectures, one preceptorial. Prerequisites: 100, 302, and MAT 175 or equivalent. O. Ashenfelter

ECO 339 Introduction to Population Problems (also SOC 351 ) Not offered this year SA A survey of demographic trends throughout the world, the factors underlying them, and their social and economic implications, including the analysis of mortality, fertility, migration, changes in composition, problems of prediction, and issues of policy. Two lectures, one preceptorial. Prerequisite: 100. Staff

ECO 341 Public Finance Fall SA
This course develops a conceptual framework for examining government taxing and spending, and uses this framework to analyze current public policy issues. We focus on both the efficiency and equity aspects of the government H. Rosen

ECO 342 Money and Banking Fall SA
This course explores the role that money, financial markets and institutions, and monetary policy play in shaping the economic environment. The class investigates why these markets and institutions arise and may lubricate the resource allocation analytically (rather than descriptively), using tools of economic theory. Two lectures, one class. Staff
ECO 349 Public Economics (See WWS 307)

ECO 351 Economics of Development Not offered this year SA
Surveys development economics including current issues, historical background, growth theories, trade and development, markets and planning, strategies for poverty alleviation, agriculture, technology, employment, industry, population, education, health, and internal and external finance. Selective attention to particular countries and regimes. Two lectures, one class. Prerequisites: 101 and 300 or 310, or instructor's permission. Staff

ECO 352 International Trade (See WWS 301)

ECO 353 International Monetary Economics Fall SA
Foreign exchange markets and balance-of-payments accounts. Effects of incomes, prices, interest rates, and exchange rates on trade and capital flows. Effects of exchange rate arrangements and capital mobility on macroeconomic policies. Current policy issues: exchange rate management, macroeconomic policy coordination, managing currency crises, the roles of international institutions. I. Zaidi

ECO 354 International Finance Fall SA

ECO 362 Financial Investments Fall SA
A survey of the field of investments with special emphasis on the valuation of financial assets. Issues studied include how portfolios of assets should be formed, how to measure and control risk, how to evaluate investment performance, and how to test alternative investment strategies and asset pricing models. Prerequisites: 202, 310 and MAT 175 or equivalent. ECO 202 or equivalent may be taken concurrently, but students would remain responsible for statistical concepts as they arise in 362. Two lectures, one preceptorial. M. Yogo

ECO 363 Corporate Finance and Financial Institutions Spring SA
Investigates the financing decisions of companies and financial institutions in the wider context of the workings of financial markets. Topics include capital budgeting, capital structure choice, risk management, liquidity, corporate governance, and the interactions between corporate finance and the workings of financial institutions and markets. Prerequisite: 362. Two lectures, one class. Y. Sannikov

ECO 364 Introduction to Financial Mathematics (See ORF 335)

ECO 370 American Economic History (also HIS 378) Spring HA
Survey of the growth and development of the U.S. economy from colonial times to the present. Introduction to the use of economic models and quantitative evidence in interpreting significant historical issues. Emphasis on technological change, business cycles, credit markets, and labor markets. Two lectures, one preceptorial. Prerequisites: 100 and 101. E. Bogan

ECO 372 Economics of Europe (also EPS 342) Fall SA
Europe is at a crossroads. Political and economic integration in the European Union (EU) exceeds levels reached in the rest of the world. Economic integration affects trade, migration, agriculture, competition, regions, energy and money. Most euro area economies have been struggling with interlocking crises involving debt, banking and growth, which challenge the viability of monetary union. The EU is now facing a migration crisis. This course studies economic integration in Europe, the ongoing crises, and economic challenges facing EU member countries. It uses economic analysis to study policy issues. Two 90-minute lectures. S. Weyerbrock

ECO 379 The Chinese Economy (also EAS 346) Spring SA
Economic analysis of the Chinese economy after 1949. Economic planning, economic reform, economic growth and fluctuations, consumption, environmental problems, population and human capital, banking and financial systems, foreign trade and investment, legal and political systems and current issues. Prerequisites: 100 and 101. Two 90-minute lectures one preceptorial. G. Chow

ECO 385 Ethics and Economics (also CHV 345) Spring EM
An introduction to the ethics of market exchange and of economic regulation intended to promote ethical goals. We ask how ethical commitments evolve, and how they influence competition and cooperation. We consider the moral
dimension of outsourcing, sweatshops, wage gaps, price gouging, price discrimination, time-inconsistent preferences and policies that exploit them ("nudging"), trade in repugnant goods (such as human organs), poverty, and the inequality of income and health. Prerequisite: ECO 100. Two 90-minute seminars. T. Leonard

ECO 386 History of Economic Thought (also HIS 311) Not offered this year HA
A survey of the history of economics, with emphasis on the origins, nature, and evolution of leading economic ideas. This course will situate economic ideas in their historical context, from Aristotle to early 20th century writers, to provide a deeper understanding of economic life and theories of it, emphasizing foundational issues such as the nature of human action and the social good; the role of the state in the economy; and the social and economic consequences of property, prices, money, production, trade and other defining attributes of commercial society. Two 90-minute lectures. Prerequisite: ECO 100. T. Leonard

ECO 414 Introduction to Economic Dynamics Not offered this year QR
Mathematical analysis of the evolution of markets and economies over time. Topics include growth, business cycles, asset pricing, and responses to policy changes. Particular attention is given to expectations as a determinant of economic behavior. Mathematical methods (difference equations, dynamic optimization, time series analysis) are introduced as needed. Prerequisites: 310, 311, and 312; and either MAT 201 and 202, MAT 203 and 204, or MAT 217; or instructor's permission. Two 90-minute lectures.
Staff

ECO 418 Strategy and Information Fall SA
Explores basic themes in modern game theory and information economics. Non-cooperative solution concepts for games will be developed and applied to the study of repeated games and dynamic interaction in oligopolistic industries, reputation formation, auctions, and bargaining. Prerequisites: MAT 175 or 201, or equivalent. Some basic knowledge of probability theory is assumed. Two lectures, one preceptorial. D. Abreu

ECO 429 Issues in Environmental and Natural Resource Economics (See WWS 406)

ECO 448 Economics and Politics Not offered this year SA
Questions at the intersection of politics and economics will be analyzed using economic methods. Particular emphasis will be placed on mathematical and game theoretic methods. The course will cover economic models of political institutions, such as elections or political parties. Topics include lobbying and interest groups, political business cycles, economic reform, and the size of government. Two 90-minute lectures. Prerequisite: MAT 203 or equivalent, or permission of instructor. Staff

ECO 462 Portfolio Theory and Asset Management Spring SA
This course studies the asset allocation decisions and overall management of the risk and return characteristics of portfolios. It focuses on quantitative approaches to portfolio optimization, including dynamic strategies to control risks and to achieve investment goals; empirical studies of asset returns; and the money management industry. Prerequisites: 202 or ORF 245; 310; 362 (no exceptions). Two 90-minute lectures, one preceptorial. Staff

ECO 463 International Financial Markets Not offered this year SA
A study of the assets and institutions of international financial markets. A key difference between these markets and others is the role of exchange rates relating the value of two or more national currencies. The course studies the market-making institutions, the market conventions and market practices as well as the interrelationships between different assets, their pricing, their trading and their use by corporations. Prerequisites: MAT 175 and ECO 202 or equivalent. Two 90-minute lectures. Staff

ECO 464 Corporate Restructuring Fall SA
This course concerns the motives and methods of corporate actions such as dividend payments, share repurchases, recapitalizations, acquisitions, divestitures, joint ventures, with a focus on the implications of such actions for the prices of a corporation's publicly traded securities. The course should be of particular interest to students
considering a career in financial services. Introductory courses in microeconomics, investments, and probability and statistics are prerequisites. One 3-hour seminar. O. Sexton

**ECO 465 Options, Futures and Financial Derivatives**  
Fall SA  
Derivative securities are assets whose value depends on the value of other more basic underlying assets. Financial derivatives are now indispensable parts of the modern financial markets. This course discusses the non-arbitrage principle for pricing financial derivatives, as well as how derivatives facilitate hedging, risk sharing and information discovery of different users. Prerequisites: 310 and 362; or instructor's permission. Two 90-minute lectures. W. Xiong

**ECO 466 Fixed Income: Models and Applications**  
Fall SA  
A study of models for the term structure of interest rates, bond prices and other contracts such as forwards and futures, swaps and options. The course develops the theory of arbitrage-free pricing of financial assets in continuous time, as well as special models that can be used to price and hedge fixed income securities. Prerequisites: ECO 362 (or FIN 501) and ECO 465. One three-hour lecture, one class. Y. Aït-Sahalia, G. Duffee

**ECO 467 Institutional Finance, Trading, and Markets**  
Fall  
The way in which financial markets work and securities are traded can often not be reconciled with the notion of a frictionless and self-equilibrating market. In this course, we try to account for this fact and cover important theoretical concepts and recent developments in market microstructure, asset pricing under asymmetric information, financial intermediation, and behavioral finance. Topics include market efficiency, market making, financial regulation, asset price bubbles, herding, and liquidity crises. Prerequisites: 300 or 310. S. Luck

**ECO 468 Behavioral Finance**  
Fall  
This course discusses how inefficiencies arise due to psychology and limits to arbitrage. The psychology of investors shapes their preferences and may impair judgment. Whether these psychological factors have an impact on financial markets ultimately depends on arbitrageurs' ability to fight against mispricing. These issues will be covered through lectures and exercises that will foster discussions about cognitive illusions and speculative bubbles. Prerequisite: 300 or 310. 362 recommended. Staff

**ECO 491 Cases in Financial Risk Management**  
Spring  
This course will teach students about financial risk management through the lens of the financial crisis that began in August 2007. Topics covered will include market risk, credit risk, liquidity risk, and systemic risk. Students will draw on their background in economics, finance, probability theory and statistics. The class will be in seminar format and active participation in the discussion is encouraged. Prerequisites: 362 and 465. Staff

**ECO 492 Asian Capital Markets**  
Spring SA  
The course explores the increasing weight of Asia in global financial markets. It frames the discussion in the context of the globalization of financial markets, with emphasis on concepts of economic development, institutional reform of markets, and public and private market investments. Discussions combine analysis of historical trends and recent events with insights from practical experience in Asian markets. Particular focus is devoted to China and Japan. The course explicitly considers China's gradual shift toward a capital market-based financial system and prospects for the development of the renminbi into an international currency. J. de Swaan

**ECO 493 Financial Crises**  
Not offered this year  
This course will use economic theory and empirical evidence to study the causes of financial crises and the effectiveness of policy responses to these crises. Particular attention will be given to some of the major economic and financial crises in the past century and to the crisis that began in August 2007. Prerequisite: 202 or equivalent, and 310. Staff
Department of Electrical Engineering

Chair
Sharad Malik

Associate Chair
Claire F. Gmachl

Departmental Representative
Andrew A. Houck

Director of Graduate Studies
Peter J. Ramadge

Professor
Ravindra N. Bhatt
Mung Chiang
Stephen Y. Chou
Claire F. Gmachl
Andrew A. Houck
Niraj K. Jha
Antoine Kahn
Sanjeev R. Kulkarni
Sun-Yuan Kung
Ruby B. Lee
Stephen A. Lyon
Sharad Malik
H. Vincent Poor
Paul R. Prucnal
Peter J. Ramadge
Mansour Shayegan
James C. Sturm
Sergio Verdú

Associate Professor
Jason W. Fleischer
Naveen Verma
Gerard Wysocki

Assistant Professor
Emmanuel A. Abbe, also Program in Applied Computational Mathematics
Minjie Chen, also Andlinger Center for Energy and the Environment Yuxin Chen
Paul W. Cuff
Nathalie P. de Leon
Prateek Mittal
Barry P. Rand, also Andlinger Center for Energy and the Environment
Alejandro W. Rodriguez
Kaushik Sengupta
Jeffrey Thompson
Hakan E. Tureci
David Wentzlaff

Associated Faculty
Craig B. Arnold, Mechanical and Aerospace Engineering
David I. August, Computer Science
Kai Li, Computer Science
Lynn Loo, Chemical and Biological Engineering
Margaret R. Martonosi, Computer Science
Jason R. Petta, Physics
Jennifer Rexford, Computer Science

Information and Departmental Plan of Study
The Department of Electrical Engineering offers an academic program of study spanning a wide range of disciplines. This program is accredited by the Engineering Accreditation Commission of ABET. All electrical engineering (ELE) students begin with a unifying foundation, after which areas of specialization range from devices to optoelectronics, to computer architecture and communication technology, to microprocessors. Students may select one of a set of suggested concentrations, or tailor their own in consultation with their faculty adviser to suit special interests.

Students enter the department with a variety of career objectives in mind. Some intend to enter industry directly upon graduation or to continue their studies in graduate school. Others wish to take an electrical engineering program as background for careers in other fields ranging from business to law to medicine. Sufficient flexibility is built into the
undergraduate program to allow a wide variety of objectives to be achieved and to allow a student to see a wide cross section of electrical engineering before deciding on an area of concentration.

A student may also formally combine electrical engineering with studies in biology, computer science, physics, materials, neuroscience, engineering and management systems, energy and environmental studies, and several other fields.

General Requirements

All candidates for the B.S.E. are required to satisfy the general University requirements and the School of Engineering and Applied Science requirements. An introductory computer science course should be taken during the freshman year if possible.

Each student's academic program must have depth in at least one area plus a reasonable degree of breadth to produce a sound basis for future development. All programs are required to have a strong design component and a strong engineering science component. The specific plan of study is determined in consultation with the student's academic adviser, taking into account ABET program guidelines. All such plans must include the following:

1. Foundations: Electrical Engineering 201, 203, 206, 208. This requirement is normally satisfied by the end of the sophomore year. These courses are all open to qualified freshmen.

2. Core: Electrical Engineering 301 and 302. This requirement is normally satisfied by the end of the junior year.

3. Mathematics: At least one upperclass mathematics course. This may be MAE 305/MAT 391, MAE 306/MAT 392, ORF 309/MAT 380, COS 340, or other 300-level or higher mathematics courses. The course selected to satisfy this requirement may not be counted toward the concentration requirement, toward the breadth requirement, or as a departmental.

4. Concentration: Three courses in a chosen concentration. (See Program of Study.) For the concentration requirement, Physics 208 and 305 count as one course only.

5. Breadth: At least one departmental elective course in an area distinct from the area of concentration. Some COS and PHY courses are also possible. Note: ORF 309 cannot be used to satisfy this requirement.

6. Engineering science: An engineering course with a significant scientific component must be taken outside ELE to satisfy this requirement. Many courses can be used to satisfy this requirement; note, however, that a course composed largely of mathematics or applied mathematics does not satisfy the requirement. The course used for satisfying the engineering science requirement cannot also be used for satisfying the concentration requirement or the breadth requirement, nor can it be counted as a departmental requirement. The following is a non-exhaustive list of possibilities: CBE: 245, 246, 341, 415, 445, 447; COS: 217, 226, 320, 402, 423, 425, 444, 451, 487; CEE: 205, 303, 305, 471; MAE: 206, 221, 222, 324, 328, 344, 345, 433, 434; MSE: 301, 302; ORF: 307, 311, 405, 406, 417.

7. Design: At least one upperclass electrical engineering course with substantial design content beyond
ELE 302 must be selected. These courses include 352, 375, 404, 454, 461, 462, 475, 482, and COS 426, 436. This requirement may also be satisfied with junior or senior independent work with a substantial design component. (See Independent Work.)

8. Balance and completeness: ELE students must take at least two upperclass technical courses in each of the last four terms. These 300-level-or-higher courses are called departmental courses. Of the eight departmental courses, at least five must be ELE courses. The remaining three courses can be taken in CEE, CHM, CBE, COS, EEB, ELE, MAE, MAT, MOL, MSE, ORF, or PHY. Courses outside electrical engineering counted toward this requirement must be closely related to the student's academic program.

9. Oral presentation: This requirement is normally satisfied during the senior thesis presentation. The independent work poster presentation does not meet the oral presentation requirement.

10. Independent work: Independent work cannot be used to fulfill the breadth or concentration requirements.

11. Senior thesis: A two-term senior thesis is required. Students must enroll in ELE 497 (Fall) and ELE 498 (Spring). A grade will be given at the end of each term. A senior thesis must include an oral presentation to the faculty at a senior thesis presentation at the end of the spring term.

Program of Study

Each student must develop depth in a coherent area of concentration in the department. Concentrations may be interdisciplinary and include courses from other departments in the School of Engineering and Applied Science, as well as from related fields such as biology, chemistry, neuroscience, physics, and others. However, the courses must form a coherent theme, and normally, two of the courses will be ELE courses or designated equivalents. ORF 309/MAT 380 may be used to satisfy either the upperclass mathematics requirement or the concentration requirement, but not both.

Graduate courses (500 level) are open to undergraduates after the completion of a permission form containing the signatures of the instructor and departmental representative.

Independent Work

Independent projects or research projects outside normal, structured lecture or laboratory courses are a valuable educational experience. The projects are intellectually challenging but also extremely fulfilling. Independent work cannot be used to fulfill the breadth or concentration requirements. Each student doing independent work will be required to give a poster and/or an oral presentation during a department organized session given at the end of each term.

Interdisciplinary Programs. Interested students may combine their work in electrical engineering with that in other departments through interdisciplinary certificate programs such as engineering and management systems, engineering physics, materials science and engineering, neuroscience, engineering biology, environmental studies, applied and computational mathematics, and the Woodrow Wilson School (the last by application only). Students fulfilling a certificate program will receive a special certificate upon graduation. Concentrators should consult with their advisors to develop an ELE program that best combines their ELE interest with the interdisciplinary program. Additional materials on a certificate program may be obtained by contacting the director of the program.
Further Information. Additional information on the departmental academic program and requirements is given in the Electrical Engineering Handbook, available from the departmental undergraduate office, Room B304, Engineering Quadrangle. Prospective concentrators in electrical engineering should consult the departmental representative as early as possible for purposes of planning an academic program.

Courses

ELE 102 New Eyes for the World: Hands-On Optical Engineering (also EGR 103 ) Not offered this year STL
This lab course introduces students to modern topics of engineering optics. Teams of students will carry out four different projects: holography, lasers, free-space optical communication, and nanotechnology. Teaches the foundations and broader societal issues of these technologies. The laboratory sessions involve hands-on training as well as experimentation and exploration. Skills acquired in this course include computer programming of user interfaces, data acquisition and interpretation, wet chemical processing, and electronics design assembly. One 90-minute lecture, one three-hour laboratory. C. Gmachl

ELE 201 Information Signals Spring STL
Signals that carry information, e.g. sound, images, sensors, radar, communication, robotic control, play a central role in technology and engineering. This course teaches mathematical tools to analyze, manipulate, and preserve information signals. We discuss how continuous signals can be perfectly represented through sampling, leading to digital signals. Major focus points are the Fourier transform—how, when, and why to use it, linear time-invariant systems, modulation, and stability. We use MatLab for design projects, such as a "Shazam" music ID system. Three lectures, one laboratory. Prerequisite: knowledge of elementary calculus P. Cuff

ELE 203 Electronic Circuit Design, Analysis and Implementation Spring STL
Introduction to electronic theory and practice. DC and AC circuit analysis theorems and passive and active components, from resistors/capacitors/inductors to operational amplifiers. Feedback, sinusoidal steady state analysis, frequency response, resonance, diodes, transistors. Creative circuit design using light and sound outputs. Final project on bio-sensing, including design and testing of an electrocardiogram circuit to sense real heartbeats. SPICE circuit simulation is introduced and leveraged in the labs and project. Three lectures, one laboratory. Prerequisite: knowledge of freshman physics and elementary calculus N. Verma

ELE 206 Contemporary Logic Design (also COS 306 ) Fall STL
Logic circuits are at the heart of modern computing and communication chips. These deliver valuable societal solutions in several key areas: in information retrieval and processing using smart phones and cloud computing; in smart sensing and control as in emerging chips for human health care; and in critical security applications such as protecting infrastructures like the internet and energy production/distribution systems. Foundational aspects of logic design; contemporary design principles and practices. Three lectures, one laboratory. Prerequisite: an introductory programming course, or equivalent programming experience. S. Malik

ELE 208B Electronic and Photonic Devices Fall STL
Explores ways in which semiconductor devices harness and control electrons and photons to generate, store or transmit information. The basics of semiconductor electronics and photonics are introduced. We look at diodes, transistors, LEDs, solar-cells, and lasers, which form the foundations of integrated circuits, microchips, displays, cameras, etc.. Nanotechnology, a recent addition to devices and systems, is introduced. Laboratory: fundamentals of micro- and nano-fabrication, fabrication of Si integrated circuits, semiconductor light emitters, quantum devices. Three lectures, one laboratory. Prerequisite: CHM 201 or 203, PHY 102 or 104. C. Gmachl

ELE 218 Learning Theory and Epistemology (See PHI 218)

ELE 222A The Computing Age (also EGR 222A ) Not offered this year
The past several decades have seen an exponential growth in computing as reflected in modern computers as well as consumer products such as music/video players and cell phones. This course will explore the reasons for this growth through studying the core principles of computing. It will cover representation of information including video and music, the design of computers and consumer devices, and their efficient implementation using computer chips. Finally, it will examine the technological factors that will likely limit future growth and discuss the societal impact of this outcome. Two 90-minute lectures, one preceptorial. Staff

ELE 222B The Computing Age (also EGR 222B ) Not offered this year STL
The past several decades have seen an exponential growth in computing as reflected in modern computers as well as consumer products such as music/video players and cell phones. This course will explore the reasons for this growth
through studying the core principles of computing. It will cover representation of information including video and music, the design of computers and consumer devices, and their efficient implementation using computer chips. Finally, it will examine the technological factors that will likely limit future growth and discuss the societal impact of this outcome. Two 90-minute lectures, one three-hour laboratory. Staff

**ELE 301 Designing Real Systems**  
Fall

This course focuses on the science, engineering, and design of the highly integrated systems that dominate many of today's devices. Analysis of systems, subsystems, and basic principles will be covered, with an emphasis on hardware-software optimization, sampling and digitization, signal and noise, feedback and control, and communication. Prerequisites: ELE 201, ELE 203, ELE 206. G. Wysocki

**ELE 302 Building Real Systems**  
Spring

Comprehensive laboratory-based course in electronic system design and analysis. Covers formal methods for the design and analysis of moderately complex real-world electronic systems. Course is centered around a semester-long design project involving a computer-controlled vehicle designed and constructed by teams of two students. Integrates microprocessors, communications, and control. Three lectures, one laboratory; open laboratory during final month. Prerequisites: 206 and 301 or permission of instructor. A. Kahn, A. Houck

**ELE 341 Solid-State Devices**  
Fall

The physics and technology of solid-state devices. Topics include: p-n junctions and two terminal devices, transistors, silicon controlled rectifiers, field effect devices, silicon vidicon and storage tubes, metal-semiconductor contacts and Schottky barrier devices, microwave devices, junction lasers, liquid crystal devices, and fabrication of integrated circuits. Three hours of lectures. Prerequisite: 208 or the equivalent. B. Rand

**ELE 342 Principles of Quantum Engineering**  
Spring

Fundamental principles of solid-state and optoelectronic device operation. Principles of quantum mechanics (Schroedinger equation, operator and matrix methods) important to a basic understanding of solid-state and quantum electronics. Topics in statistical mechanics, including distribution functions, density of states, Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein statistics. Applications to atoms, molecules, lasers, and solids, with special emphasis on semiconductors. Three hours of lectures. A. Rodriguez

**ELE 351 Electromagnetic Field Theory and Physical Optics**  
Spring

This course should provide the students with a broad and solid background in electromagnetics, including both statics and dynamics, as described by Maxwell's equations. Fundamental concepts of diffraction theory, Fourier optics, polarization of light, and geometrical optics will be discussed. Emphasis will be on basic engineering principles, and applications will be discussed throughout. Examples include cavities, waveguides, antennas, fiber optic communications, and imaging. G. Wysocki

**ELE 352 Physical Optics**

Fundamental and practical aspects of physical optics. Lenses and ray optics, lens maker's formula, wave propagation, Fourier optics, Gaussian beams are all considered. Design and use of practical optical systems including optical beam steering in medicine, fiber optics. Three hours of lectures. Prerequisite: PHY 104. J. Fleischer

**ELE 375 Computer Architecture and Organization (See COS 375)**

**ELE 381 Networks: Friends, Money and Bytes (also COS 381)**  
Fall

This course is oriented around 20 practical questions in the social, economic, and technological networks in our daily lives. How does Google sell ad spaces and rank webpages? How does Netflix recommend movies and Amazon rank products? How do I influence people on Facebook and Twitter? Why doesn't the Internet collapse under congestion, and does it have an Achilles heel? Why does each gigabyte of mobile data cost $10, but Skype is free? How come Wi-Fi is slower at hotspots than at home, and what is inside the cloud of iCloud? In formulating and addressing these questions, we introduce the fundamental concepts behind the networking industry. D. Andrews

**ELE 386 Cyber Security (also EGR 386)**  
Spring STN

The technology underlying secure transactions and safe interactions in a public Internet and wireless world. Humans interact daily with each other, with information, and with services through cyberspace. Topics include policy, economic, and social issues related to cyber security needs such as confidentiality, data integrity, user authentication, trust, non-repudiation, availability, privacy and anonymity, case studies in electronic commerce, denial of service attacks, viruses and worms, digital rights management, surveillance, and cyber-terrorism. Two 90-minute lectures. R. Lee
ELE 391 The Wireless Revolution: Telecommunications for the 21st Century (also EGR 391) Not offered this year STN
This interdisciplinary course addresses technological, regulatory, economic, and social issues arising in the rapidly developing field of wireless communications. The course introduces students to a major technological trend that will be a significant force in worldwide commercial and social development throughout the 21st century. Prerequisites: MAT 103 or permission of instructor. Two 90-minute lectures.

Staff

ELE 396 Introduction to Quantum Computing (also COS 396) Fall
This course will introduce the matrix form of quantum mechanics and discuss the concepts underlying the theory of quantum information. Some of the important algorithms will be discussed, as well as physical systems which have been suggested for quantum computing. Three lectures. Prerequisite: Linear algebra at the level of MAT 202, 204, 217, or the equivalent. A. Houck

ELE 397 Junior Independent Work Fall
Provides an opportunity for a student to concentrate on a "state-of-the-art" project in electrical engineering. Topics may be selected from suggestions by faculty members or proposed by the student. The final choice must be approved by the faculty member. P. Prucnal

ELE 398 Junior Independent Work Spring
Provides an opportunity for a student to concentrate on a "state-of-the-art" project in electrical engineering. Topics may be selected from suggestions by faculty members or proposed by the student. The final choice must be approved by the faculty member. P. Prucnal

ELE 404 Electronic Circuits for Biomedical Application Spring
Start by analyzing biological systems to understand the origins of some of the signals that they present. Develop circuit models of these systems to determine what instrumentation circuits are required at the interface so that the signals can be reliably acquired. Study analog circuit topologies based on MOSFETs for low-noise instrumentation and processing of the signals. Study digital topologies based on MOSFETs for extensive computations on the biological signals. Analyze the trade-offs between the analog and digital topologies. Emphasis is on design and analysis using circuit simulators. N. Verma

ELE 431 Solar Energy Conversion (See ENE 431)

ELE 432 Information Security (See COS 432)

ELE 441 Solid-State Physics I (also ENE 441) Fall
An introduction to the properties of solids. Theory of free electrons--classical and quantum. Crystal structure and methods of determination. Electron energy levels in a crystal: weak potential and tightbinding limits. Classification of solids--metals, semiconductors, and insulators. Types of bonding and cohesion in crystals. Lattice dynamics, phonon spectra, and thermal properties of harmonic crystals. Three hours of lectures. Prerequisite: 342, or PHY 208 and 305, or equivalent. M. Shayegan

ELE 442 Solid-State Physics II (also ENE 442) Spring

ELE 453 Optical Electronics Fall
Electromagnetic waves. Gaussian beams. Optical resonators. Interaction of light and matter. Lasers. Mode locking and Q-switching in lasers. Three hours of lectures. Prerequisites: 351 or 352 or PHY 304 or permission of instructor. J. Hodges

ELE 454 Photonics and Light Wave Communications Spring
Introduction to fiber-optic communication systems. Optical detectors and receivers. Design and performance of direct detection systems. Coherent light wave systems. Multichannel WDM communication systems. Optical amplifiers. Soliton communication systems. Three hours of lectures. Prerequisite: 351 or 352. P. Prucnal

ELE 455 Mid-Infrared Technologies for Health and the Environment (also CEE 455 / MAE 455 / MSE 455) This course is designed to give juniors, seniors, and interested graduate students a comprehensive and interdisciplinary introduction into mid-infrared sensing, its applications, and its technological foundations. Topics include: materials, light sources, lasers and detectors for the mid-infrared; spectroscopy and sensing; sensing systems and sensor networks. It addresses such important issues as global warming, policy making, engineering
solutions to global challenges, environmental sensing, breath analysis and health applications, and sensing in homeland security. Two 90-minute lectures. Staff

**ELE 461 Design with Nanotechnologies**
Introduction to nanotechnologies; threshold logic/majority logic and their applications to RTDs, QCA and SETs; nanowire based crossbars and PLAs; carbon nanotube based circuits; double-gate CMOS-based circuits; reversible logic for quantum computing; non-volatile memory; nanopipelining; testing; and defect tolerance. Two 90-minute lectures. Prerequisite: ELE 206. Staff

**ELE 462 Design of Very Large-Scale Integrated (VLSI) Systems (also COS 462)** Fall
The implementation of digital systems using integrated circuit technology. Emphasis on structured design methodologies for VLSI systems. Topics include: design rules for metal oxide semiconductor (MOS) integrated circuits, implementation of common digital components, tools for computer-aided design, novel architectures for VLSI systems. Three hours of lectures. Prerequisite: 206. N. Verma

**ELE 465 Switching and Sequential Systems**
Theory of digital computing systems. Topics include logic function decomposition, reliability and fault diagnosis, synthesis of synchronous circuits and iterative networks, state minimization, synthesis of asynchronous circuits, state-identification and fault detection, finite-state recognizers, definite machines, information lossless machines. Three hours of lectures. Prerequisite: 206. S. Kung

**ELE 466 Digital System Testing** Not offered this year
Component-level issues related to testing and design/synthesis for testability of digital systems. Topics include test generation for combinational and sequential circuits, design and synthesis for testability, and built-in self-test circuits. Three hours of lectures. Prerequisite 206. Staff

**ELE 469 Human-Computer Interface Technology (See COS 436)**

**ELE 475 Computer Architecture (also COS 475)** Fall
An in-depth study of the fundamentals of modern processor and system design. Students will develop a strong practical and theoretical background in the technical and economic issues that govern the design of computer architectures and implementations. The course will emphasize the skills required to design and evaluate current and future systems. Three hours of lectures. Prerequisites: 206, 375. D. Wentzlaff

**ELE 482 Digital Signal Processing**
The lectures will cover: (1) Basic principles of digital signal processing. (2) Design of digital filters. (3) Fourier analysis and the fast Fourier transform. (4) Roundoff errors in digital signal processing. (5) Applications of digital signal processing. Staff

**ELE 486 Transmission and Compression of Information (also APC 486)** Spring
An introduction to lossless data compression algorithms, modulation/demodulation of digital data, error correcting codes, channel capacity, lossy compression of analog and digital sources. Three hours of lectures. Prerequisites: 301, ORF 309. E. Abbe

**ELE 488 Image Processing** Spring
Introduction to the basic theory and techniques of two- and three-dimensional image processing. Topics include image perception, 2-D image transforms, enhancement, restoration, compression, tomography and image understanding. Applications to HDTV, machine vision, and medical imaging, etc. Three hours of lectures, one laboratory. P. Ramadge

**ELE 491 High-Tech Entrepreneurship (See EGR 491)**

**ELE 497 Senior Independent Work** Fall
Senior Thesis Course. The student has the opportunity to do a self driven project by proposing a topic and finding a faculty member willing to supervise the work, or, the student may do a project in conjunction with a faculty member's research. A second reader will be required for both the midterm report and final thesis report. Students will be required to enroll in ELE 498 in the spring. P. Prucnal

**ELE 498 Senior Independent Work** Spring
Senior Thesis Course. A senior thesis presentation will be held at the end of spring semester. The unbound senior thesis must be turned in to the ELE Undergraduate Office on the University's established senior thesis submission deadline. P. Prucnal
The undergraduate educational mission of the School of Engineering and Applied Science of Princeton University is to educate future leaders in engineering practice, research and education, business and finance, public service, and other professions. Students learn fundamental engineering principles and how to apply them to real-world problems whose solutions require an interdisciplinary perspective. Princeton offers its students a liberal education and encourages them to take advantage of its outstanding resources and facilities. The engineering school provides a rich educational environment that fosters interaction between talented students and an internationally renowned faculty. Through independent projects that require students to frame research questions, identify solutions, define priorities, and communicate findings, our students are uniquely prepared for challenging careers. Princeton engineering alumni are recognized for their ability, creativity, initiative, integrity, and vision for making the world a better place.

Engineering education at Princeton emphasizes the fundamental principles of mathematics and the physical and engineering sciences. It is broadened by substantial opportunities for study of the social sciences, the life sciences, and the humanities. Each engineering undergraduate can develop an academic program that reflects individual aspirations and interests within a general framework of requirements. The depth and flexibility of the program make it a sound background for engineering practice or graduate study in engineering, science, business, law, or medicine. Curricula in engineering fields are offered through six academic departments:

- Chemical and Biological Engineering
- Civil and Environmental Engineering
- Computer Science
- Electrical Engineering
- Mechanical and Aerospace Engineering
- Operations Research and Financial Engineering

Design is the primary distinction between engineering and science, connoting the application of scientific and mathematical principles not only to the understanding of physical phenomena but also to the solutions of specific problems. It is important that all B.S.E. students be exposed to technical course materials in the context of engineering design, have the opportunity for significant design experiences, and be apprised explicitly of the ways in which design is integrated within the engineering curriculum. Each department addresses this important issue in tailoring its programs to the needs of individual students, as articulated in descriptions of its courses and curriculum.

Interdepartmental curricula are presented in the following programs:

- Applications of Computing
- Architecture and Engineering
- Engineering and Management Systems
- Engineering Biology
- Engineering Physics
Students also may combine an engineering curriculum with study in depth in other fields, such as foreign area studies or public and international affairs.

Most University programs and opportunities are available to B.S.E. as well as to A.B. candidates. A description of these is contained in the "Special Features of the Undergraduate Program" section. Of particular interest to B.S.E. students are the sections concerning advanced placement, advanced standing, writing requirement, auditing courses, graduate courses, and optional additional courses. Engineering students should also be aware of their eligibility for the programs in applied and computational mathematics, creative writing, dance, environmental studies, linguistics, musical performance, teacher preparation, theater, visual arts, and women and gender, as well as many other certificate programs.

Engineering students are encouraged to obtain international experience through participation in the University's Study Abroad Program or through summer internships and language study abroad. Interested students should begin planning early by meeting with the associate dean for undergraduate affairs to discuss suitable programs at foreign universities.

Preparation for Graduate Study. The curricula of the School of Engineering and Applied Science provide a strong foundation for graduate study. Graduate courses are readily accessible to qualified undergraduates.

**Keller Center.** The Keller Center's mission is to educate leaders for a technology-driven society, by innovating education and fostering entrepreneurship, innovation and design. Through a variety of programs the Keller Center empowers students to pursue four key actions:

- **CREATE:** Students work on their startups at our summer accelerator eLab or semester long incubator, interact with experienced entrepreneurs, innovators and designers, and participate in eWorkshops throughout the year.

- **EXPLORE:** Students participate in the Keller Center summer internship programs: International Research Exchange Program (REACH), Entrepreneurial Internship Program, Preparing to Lead Program. Students are awarded funding for their projects. Students can become Keller Center Fellows in Innovation, Design, and Entrepreneurship.

- **ENGAGE:** Students connect with alumni, immerse in locals ecosystem of entrepreneurship, innovation and design, attend lecture series by experienced leaders, entrepreneurs, and other creative minds, and other events, including our annual Innovation Forum.

- **LEARN:** (1) Students take Keller Center courses in entrepreneurship, innovation and design; (2) Students take a course Engineering Projects in Community Service (EPICS); (3) BSE freshmen take a course Integrated Introduction to Engineering, Mathematics, Physics (EMP). (4) Students pursue a crossdisciplinary undergraduate certificate program in Technology and Society, with concentrations available along two tracks Information Technology and
Energy, in partnership with the Center for Information Technology Policy and the Andlinger Center for Energy and the Environment at Princeton.(5) Students pursue an undergraduate certificate program in Entrepreneurship.

EGR Courses. The Keller Center offers courses that have interdisciplinary content integrating engineering, natural sciences, social sciences, and humanities and that are of broad interest to students from across the University. These courses typically have no prerequisites. The following courses are in this category: EGR 102, 103, 105, 106, 109, 116, 199, 200, 201, 208, 218, 222, 228, 250, 251, 260, 262, 263, 277, 324, 328, 350, 351, 386, 391, 437, 448, 450, 451, 488, 491, 492, 494, 495, 497, 498.

Additional EGR courses are those with focused computer science, engineering, or mathematical content. These courses are relevant to students beyond the home department. The following courses are in this category: EGR 126, 191, 192, 194, 245, 305, 307, 309, 431.

All these courses are listed in Course Offerings under engineering and bear the label EGR. For a full list of all EGR courses by category, please check the Keller Center's website.

Courses

EGR 102A Engineering in the Modern World (See CEE 102A)
EGR 102B Engineering in the Modern World (See CEE 102B)
EGR 103 New Eyes for the World: Hands-On Optical Engineering (See ELE 102)
EGR 105 Lab in Conservation of Art (See CEE 105)
EGR 106 The Science and Technology of Decision Making (See ORF 105)
EGR 109 Computers in Our World (See COS 109)
EGR 116 The Computational Universe (See COS 116)
EGR 126 Computer Science: An Interdisciplinary Approach (See COS 126)

EGR 191 An Integrated Introduction to Engineering, Mathematics, Physics (also MAT 191 / PHY 191 ) Fall STL
Taken concurrently with EGR/MAT/PHY 192. An integrated course that covers the material of PHY 103 and MAT 201 with the emphasis on applications to engineering. Physics topics include: mechanics with applications to fluid mechanics, wave phenomena, and thermodynamics. The lab revolves around a single project to build, launch, and analyze the flight dynamics of water-propelled rockets. One lecture, three preceptorials, one three-hour laboratory. D. Marlow

EGR 192 An Integrated Introduction to Engineering, Mathematics, Physics (also MAT 192 / PHY 192 / APC 192 ) Fall QR
Taken concurrently with EGR/MAT/PHY 191. An integrated course that covers the material of PHY 103 and MAT 201 with the emphasis on applications to engineering. Math topics include: vector calculus; partial derivatives and matrices; line integrals; simple differential equations; surface and volume integrals; and Green's, Stokes's, and divergence theorems. One lecture, two preceptorials. C. Taylor
EGR 194 An Introduction to Engineering Spring
This project-based course offers an introduction to the various disciplines of engineering. Current projects include: energy conversion and the environment; robotic remote sensing; and wireless image and video transmission. Projects focus on engineering disciplines and their relationship to the principles of physics and mathematics. Three lectures, one three-hour laboratory. S. Lyon, J. Benziger, M. Littman

EGR 200 Creativity, Innovation, and Design (also ENT 201) Fall/Spring
The class mission is to give students an understanding of the sources and processes associated with creativity, innovation, and design - three interdependent capabilities essential to our own well being, as well as to the well being of society. We will study the internal and external factors that relate to our own ability to create, innovate, and design. We will also understand the factors that impact a group's ability to act creatively, to innovate, and to produce practical and appealing designs. The class will consist of readings and case studies as well as individual and group projects. D. Lidow, S. Pontis

EGR 201 Foundations of Entrepreneurship (also ENT 200) Fall/Spring
The class mission is to give students an understanding of the sources and processes associated with creativity, innovation, and design - three interdependent capabilities essential to our own well being, as well as to the well being of society. We will study the internal and external factors that relate to our own ability to create, innovate, and design. We will also understand the factors that impact a group's ability to act creatively, to innovate, and to produce practical and appealing designs. The class will consist of readings and case studies as well as individual and group projects. R. Kasdin

EGR 208 Designing Sustainable Systems (See ENE 202)

EGR 218 Learning Theory and Epistemology (See PHI 218)

EGR 222A The Computing Age (See ELE 222A)

EGR 222B The Computing Age (See ELE 222B)

EGR 228 Energy Technologies in the 21st Century (See MAE 228)

EGR 244 Introduction to Biomedical Innovation and Global Health (See MAE 244)

EGR 245 Fundamentals of Statistics (See ORF 245)

EGR 250 Engineering Projects in Community Service (EPICS): Non-credit Fall/Spring
In the Engineering Projects in Community Service (EPICS) program, students earn academic credit for their participation in multidisciplinary design teams that solve technology-based problems for local not-for-profit organizations. The teams are: multidisciplinary--drawing students from across engineering and around the university; vertically-integrated--maintaining a mix of freshmen through seniors each semester; and longterm--each student may participate in a project for up to six semesters. The continuity, technical depth, and disciplinary breadth of these teams enable delivery of projects of significant benefit to the community. M. Littman, J. Benziger

EGR 251 Engineering Projects in Community Service (EPICS) Fall/Spring
Same description as EGR 250. Student must complete EGR 250 to enroll into EGR 251 to get a credit and grade (please note that EGR 251 is P/D/F only course). After completing EGR 251 students can continue in EPICS by taking EGR 350 and subsequently EGR 351 to get a credit and grade (it is fully graded course). M. Littman, J. Benziger

EGR 260 Ethics and Technology: Engineering in the Real World (See CBE 260)

EGR 262A Structures and the Urban Environment (See CEE 262A)

EGR 262B Structures and the Urban Environment (See CEE 262B)
EGR 277 Technology and Society (also SOC 277 / HIS 277) Spring SA
Technology and society are unthinkable without each other: each provides the means and framework in which the other develops. To explore this dynamic, this course investigates a wide array of questions on the interaction between technology, society, politics, and economics, emphasizing the themes of innovation and maturation, systems and regulation, risk and failure, and ethics and expertise. Specific topics covered include nuclear power and waste, genetically modified organisms, regulation of the Internet, medical mistakes, intellectual property, the financial crisis of 2008, and the post-fossil-fuels economy. J. Vertesi

EGR 305 Mathematics in Engineering I (See MAE 305)

EGR 307 Optimization (See ORF 307)

EGR 309 Probability and Stochastic Systems (See ORF 309)

EGR 328 Energy for a Greenhouse-Constrained World (See MAE 328)

EGR 350 Engineering Projects in Community Service (EPICS): Non-credit Fall/Spring
Same description as EGR 250. Student must complete EGR 251 to enroll into EGR 350. After completing EGR 350 students need to take EGR 351 to get a credit and grade (it is fully graded course). M. Littman, J. Benziger

EGR 351 Engineering Projects in Community Service (EPICS) Fall/Spring
Same description as EGR 250. Student must complete EGR 350 to enroll into EGR 351 to get a credit and grade (it is fully graded course). After completing EGR 351 students can continue in EPICS by taking EGR 450 and subsequently EGR 451 to get a credit and grade. M. Littman, J. Benziger

EGR 353 Fundamental Principles of Optical and Electronic Devices: How Physics Makes Devices Work (See ELE 353)

EGR 386 Cyber Security (See ELE 386)

EGR 390 Innovation in Practice: Pathways and People (also CEE 390) Spring
Innovation has been defined as "the intersection of invention and insight, leading to the creation of social and economic value." In this course, students build on expert and practitioner experience and insights, as well as readings, to develop an enhanced understanding of innovation and roles in the innovation ecosystem. Companies -- and individuals and social enterprises -- use innovation to establish and drive success. E. Fisher

EGR 391 The Wireless Revolution: Telecommunications for the 21st Century (See ELE 391)

EGR 393 Innovation and the Built and Natural Environment (See CEE 391)

EGR 399 Faster & Higher: The Romance and Reality of Space Flight (See MAE 399)

EGR 431 Solar Energy Conversion (See ENE 431)

EGR 448 Innovating Across Technology, Business, and Marketplaces (See COS 448)

EGR 450 Engineering Projects in Community Service (EPICS): Non-credit Fall/Spring
Same description as EGR 250. Student must complete EGR 351 to enroll into EGR 450. After completing EGR 450 students enroll into EGR 451 to get a credit and grade (it is fully graded course). M. Littman, J. Benziger

EGR 451 Engineering Projects in Community Service (EPICS) Fall/Spring
Same description as EGR 250. Student must complete EGR 450 to enroll into EGR 451 to get a credit and grade (it is fully graded course). M. Littman, J. Benziger
This course will build on the foundational design-thinking curriculum of EGR 392. The goal is to extend students' understanding of creativity and innovation, so as to productively apply it to cross-disciplinary problem solving. The course will emphasize empathic methodologies for breaking down complex organizational challenges and for developing meaningful solutions within experience design, brand strategy, storytelling and communications. *N. Sims*

**EGR 488 Designing Ventures To Change the World**  
**Fall**  
This course offers an interdisciplinary, hands-on, immersive opportunity to design services, technologies, products and ventures addressing the UN's 17 new Sustainable Development Goals (SDGs) through a diverse portfolio of high-impact solo and team-based projects. Our course will weave together three strands of analysis and action: in-classroom exposure to entrepreneurship/social venture development and exploration of selected SDGs, plus a weekly design clinic to give students a chance to develop their own venture and solution ideas. *J. Danner*

**EGR 491 High-Tech Entrepreneurship (also ELE 491)**  
**Fall/Spring**  
This hands-on course introduces students to analysis and actions required to launch and commercialize a tech company, through the use of Harvard Business School cases, visits from entrepreneurs, and two "field assignments". You will learn conceptual frameworks and analytical techniques for evaluating technologies, markets, and commercialization strategies. Additionally, you will learn how to attract and motivate the resources needed to start a company (e.g. people, corporate partners and venture capital), prepare business plans, structure relationships, refine product-market fit, and create and grow enterprise value. *C. Kuenne*

**EGR 492 Radical Innovation in Global Markets**  
**Fall**  
Radical innovation solves big problems and alters the way we live, colliding with government polices as the effects ripple across national frontiers. Where do these innovations come from, how do they work, and what policy problems do they cause? This class examines the impact of technical innovation on a global scale. Students learn how innovations in areas such as satellite imaging, global positioning, internet search engines, and pandemic vaccines have a profound impact on foreign policy. Students learn to think about innovation from the standpoint of business managers, government regulators, social entrepreneurs, in very practical terms. *J. Shinn*

**EGR 494 Leadership Development for Business**  
**Fall/Spring**  
The Leadership Development for Business course deals with the strategic, organizational and leadership challenges that global corporations face. The course provides students with a unique perspective on leadership vision, and how leaders recognize and capitalize on opportunities. We will focus on how leaders achieve results and make things happen working with and through others. This course presents innovative, practical and field tested methods used by successful business leaders to achieve sustained results. Classes will consist of a mix of classroom lecture, case study discussions and guest speakers. *D. Strigl*

**EGR 495 Special Topics in Entrepreneurship**  
**Fall/Spring**  
Covers topical issues highlighting the impact of engineering on society through entrepreneurship. Topics and course format vary from year to year. *Staff*

**EGR 497 Entrepreneurial Leadership**  
**Fall**  
The mission of the class is to enable students to successfully create and lead enterprises by teaching the basic skills required to be a successful entrepreneurial leader. This class compliments EGR 491 "High Tech Entrepreneurship" which focuses on 'giving birth to a company', by focusing instead on enterprise 'early child rearing'. The basic skills taught fall into three major categories: how to create and manage powerful relationships, how to know and manage yourself, in addition to understanding how organizations work as they evolve from the idea stage to become value producing, self-sustaining enterprises. *D. Lidow*
A growing number of entrepreneurs are solving social and environmental challenges by creating private 'nonprofit' organizations and projects. This course will explore the challenges and opportunities they face. While the course will cover the styles and competencies that successful nonprofit managers tend to exhibit, it will explore system-wide changes needed to improve the sector's outcomes, including key ways that funders, government, businesses and the beneficiaries of nonprofits can help. 

M. Johnson
Program in Engineering and Management Systems

Director

Executive Committee
Elad Hazan, Computer Science
Ning Lin, Civil and Environmental Engineering
Alain L. Kornhauser, Operations Research and Financial Engineering

The certificate Program in Engineering and Management Systems (EMS) provides students with tools for the complex decision-making problems that arise in engineering, the sciences, and management. It is aimed at three types of students:

1. Engineering students interested in preparing for careers in management or consulting
2. Students in the liberal arts looking to acquire the analytic tools typically used for careers in corporate or government settings
3. Students in the sciences interested in a stronger exposure to analytic methods and, potentially, careers in management or public policy

The program offers a coherent, integrated set of core courses that are based on analytic methods, with applications in the planning and control of complex systems required by a modern technological society. Emphasis is placed on rigorous modeling and analysis, taking advantage of the vast flow of data and ubiquitous computing power available today.

The EMS certificate program complements the certificate programs in applications of computing, applied and computational mathematics, and finance.

Admission to the Program

The EMS certificate program is open to both B.S.E. and A.B. students. B.S.E. students are required to take math through Math 201 and 202, which will satisfy the math prerequisites of any of the core courses. However, there is flexibility in the choice of core courses, and the math prerequisites depend on the electives that a student chooses. For A.B. students, it is their responsibility to take the necessary prerequisites for their program of study.

To be admitted, interested students should e-mail Professor Warren Powell. The e-mail should state the student's request to participate in the program, and should include the following information: the student's class year, area of concentration, and whether the student has placed out of any course requirements.
Program of Study

The program for each student is worked out by the student and the departmental adviser. In some cases, a course can fulfill both a certificate program requirement, with the exception that ORFE concentrators may not double count the course that integrates optimization and uncertainty. The EMS certificate program does not have a GPA requirement, so courses may be taken pass/fail, limited only by university regulations on pass/fail courses. The program requirements are as follows:

Course requirements. All students must take courses from the following five areas:

1. An introductory statistics course:

   ECO 202 Statistics and Data Analysis for Economics
   ORF 245 Fundamentals of Engineering Statistics
   PHY 301 Thermal Physics and PHY 312 Experimental Physics (both courses must be taken)
   PSY 251 Quantitative Methods
   SOC 301 Sociological Research Methods
   WWS 200 Statistics for Social Sciences
   This requirement may be satisfied with a score of 5 on the AP statistics exam or by taking a higher-level statistics course such as ORF 350 or 405, or ECO 302/312.

2. An introductory optimization course:

   CBE 442 Design, Synthesis, and Optimization of Chemical Processes
   ELE 382 Distributed Algorithms and Optimization Methods for Engineering Applications
   MAE 433 Automatic Control Systems
   ORF 307 Optimization

3. Probability:

   ORF 309 Probability and Stochastic Systems

4. A course integrating optimization and uncertainty:

   COS 402 Artificial Intelligence
   ECO 418 Strategy and Information
   ECO 462 Portfolio Theory and Asset Management
   ECO 465 Options, Futures and financial Derivatives
   MAE 345 Robotics and Intelligent Systems
   ORF 311 Optimization under Uncertainty
Note: ORFE concentrators (beginning with the Class of 2018 and later) may not count the course used in this category as a departmental elective.

5. An integrative course in management, entrepreneurship, or systems:

- CBE 442 Design, Synthesis and Optimization of Chemical Processes
- EGR/ELE 491 High-Tech Entrepreneurship
- EGR 497 Entrepreneurial Leadership
- ORF 411 Operations and Information Engineering

The program is willing to add courses which satisfy the goal of each area. Students wishing to propose a course should send the syllabus to Professor Powell, with an explanation of which area the course satisfies, and why.

Independent Work

A senior thesis or project must be completed and submitted to the program director that demonstrates a command of some portion of the core disciplines of statistics, probability and/or optimization. Students in engineering departments that require a one-semester project can typically use a suitably designed project to satisfy the requirement.

Acceptable theses can be on a wide range of topics, but they must demonstrate a command of the core disciplines of the EMS certificate program, including statistic, probability and/or optimization. The thesis must demonstrate, in appropriate mathematics, the ability to model a problem and perform analysis that leads to some conclusion or scientific result. A thesis with minimal or no mathematical modeling is not acceptable.

Theses that are not allowed include "soft" topics such as the history of the Chinese economy, and hardscience theses (laboratory-based theses) that do not have a significant data-analysis component (for example, collecting observations and taking averages is not sufficient).

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in engineering and management systems upon graduation.

Courses

**ORF 105 The Science and Technology of Decision Making (also EGR 106)** Not offered this year QR
An individual makes decisions every day. In addition, other people are making decisions that have an impact on the individual. In this course we will consider both how these decisions are made and how they should be made. In particular, we will focus on the use of advanced computing and information technology in the decision-making process. Staff

**ORF 245 Fundamentals of Statistics (also EGR 245)** Fall/Spring QR
A first introduction to probability and statistics. This course will provide the foundations of rigorous statistical analysis including estimation, confidence intervals, hypothesis testing and regression and classification. Applicability
and limitations of these methods will be illustrated using a variety of real-world data sets. Prerequisite MAT 201 Equivalent or concurrent. Three lectures, one preceptorial. J. Fan, S.

**Kpotufe**

**ORF 307 Optimization (also EGR 307)**  
Spring

Many real-world problems involve maximizing a linear function subject to linear inequality constraints. Such problems are called Linear Programming (LP) problems. Examples include min-cost network flows, portfolio optimization, options pricing, assignment problems and two-person zero-sum games to name but a few. The theory of linear programming will be developed with a special emphasis on duality theory, which is used to derive algorithms for solving LP problems. These algorithms will be illustrated on real-world examples such as those mentioned. Two 90 minute lectures, one preceptorial. Prerequisite MAT 202. R.

**Vanderbei**

**ORF 309 Probability and Stochastic Systems (also EGR 309 / MAT 380)**  
Fall/Spring

An introduction to probability and its applications. Random variables, expectation, and independence. Poisson processes, Markov chains, Markov processes, and Brownian motion. Stochastic models of queues, communication systems, random signals, and reliability. Prerequisite: MAT 201, 203, 217, or instructor's permission. R. van Handel, M. Shkolnikov

**ORF 311 Optimization Under Uncertainty**  
Spring

A survey of quantitative approaches for making optimal decisions involving uncertainty and complexity including decision trees, Monte Carlo simulation, and stochastic programming. Forecasting and planning systems are integrated with a focus on financial applications. Prerequisites: ORF 307 or MAT 305, and 309. Two 90-minute classes, one preceptorial. J. Mulvey

**ORF 322 Human-Machine Interaction (See PSY 322)**

**ORF 335 Introduction to Financial Mathematics (also ECO 364)**  
Spring QR

This course introduces the basics of quantitative finance, particularly the use of stochastic models to value and hedge risks from options, futures and other derivative securities. The models studied include binomial trees in discrete time, and the Black-Scholes theory is introduced in continuous-time models. Computational methods are introduced in Matlab. The second half of the class looks at modern topics such as credit risk, stochastic volatility, portfolio optimization, as well as lessons from the financial crisis. Prerequisites: ORF 309, ECO 100, and MAT 104. R. Sircar Staff

**ORF 350 Analysis of Big Data**  
Spring QR

This course introduces statistical theory and methods for analyzing Big data, including massive data, high dimensional data, stream data, and network data. Topics include Sufficiency Principle, Divide-and-Conquer Principle, Bonferroni Principle, Parsimonious Principle, and Linear-Complexity Principle. Under a likelihood-based framework, three types of analysis are introduced, including Exploratory Analysis, Predictive Analysis, and Inferential Analysis. Example applications include image clustering and anomaly detection, text mining, computational advertisement, scientific data analysis, and data visualization. H. Liu

**ORF 360 Decision Modeling in Business Analytics**  
Spring

This is an introductory course to decision methods and modeling in business and operations management. The course will emphasize both mathematical decision-making techniques, as well as popular data-based decision models arising from real applications. Upon completion of this course students will have learned analytical tools for modeling and optimizing business decisions. From a practical perspective, this will be a first course that gives an overview of advanced operations research topics including revenue management, supply chain management, network management, and pricing. M. Wang

**ORF 363 Computing and Optimization for the Physical and Social Sciences (also COS 323)**  
Fall QR

An introduction to several fundamental and practically-relevant areas of numerical computing with an emphasis on the role of modern optimization. Topics include computational linear algebra, descent methods, basics of linear and semidefinite programming, optimization for statistical regression and classification, trajectory optimization for dynamical systems, and techniques for dealing with uncertainty and intractability in optimization problems. Extensive hands-on experience with high-level optimization software. Applications drawn from operations research, statistics, finance, economics, control theory, and engineering. A. Ahmadi

**ORF 374 Special Topics in Operations Research and Financial Engineering**  
Not offered this year

A course covering special topics in operations research or financial engineering. Subjects may vary from year to year. J. Mulvey

**ORF 375 Independent Research Project**  
Fall
Independent research or investigation resulting in a substantial formal report in the student's area of interest under the supervision of a faculty member. Open to sophomores and juniors. A. Kornhauser

**ORF 376 Independent Research Project**  
Spring  
Independent research or investigation resulting in a substantial formal report in the student's area of interest under the supervision of a faculty member. Open to sophomores and juniors. A. Kornhauser

**ORF 401 Electronic Commerce**  
Spring  
Electronic commerce, traditionally the buying and selling of goods using electronic technologies, extends to essentially all facets of human interaction when extended to services, particularly information. The course focuses on both the software and the hardware aspects of traditional aspects as well as the broader aspects of the creation, dissemination and human consumption electronic services. Covered will be the physical, financial and social aspects of these technologies. Two 90-minute lectures, one 50-minute preceptorial. A. Kornhauser

**ORF 405 Regression and Applied Time Series**  
Fall  

**ORF 406 Statistical Design of Experiments**  
Not offered this year  
Major methods of statistics as applied to the engineering and physical sciences. The central theme is the construction of empirical models, the design of experiments for elucidating models, and the applications of models for forecasting and decision making under uncertainty. Three lectures. Prerequisite: 245 or equivalent. Staff

**ORF 407 Fundamentals of Queueing Theory**  
Spring QR  
An introduction to the fundamental results of queuing theory. Topics covered include: the classical traffic, offered load, loss, and delay models for communication systems. The theory of Markov chains, Poisson processes, and renewal theory are discussed through concrete examples and motivations. Fundamental queuing results such as the Erlang blocking and delay formulae, Jackson networks, Little's law and Lindley's equation are presented. Applications are drawn from classical problems in voice and data network performance, to modern issues in healthcare operations. Prerequisite: ORF 309 or equivalent. Two 90-minute lectures.

W. Massey

**ORF 409 Introduction to Monte Carlo Simulation**  
Fall  
Introduction to the uses of simulation and computation in the analysis of stochastic models and interpreting real phenomena. Topics include generating discrete and continuous random variables, the statistical analysis of simulated data, variance reduction techniques, statistical validation techniques, stochastic ordering, nonstationary Markov chains, and Markov chain Monte Carlo methods. Applications are drawn from problems in finance, insurance, manufacturing, and communication networks. Students will be encouraged to program in Python. Precept offered to help students with the language. Prerequisite: ORF 309. Two 90-minute lectures.

W. Massey

**ORF 411 Operations and Information Engineering**  
Fall  
The management of complex systems through the control of physical, financial and informational resources. The course focuses on developing mathematical models for resource allocation, with an emphasis on capturing the role of information in decisions. The course seeks to integrate skills in statistics, stochastics and optimization using applications drawn from problems in dynamic resource management which tests modeling skills and teamwork. Prerequisites: ORF 245, ORF 307 and ORF 309, or equivalents. Two 90 minute lectures, preceptorial.

W. Powell

**ORF 417 Dynamic Programming**  
Not offered this year  
An introduction to stochastic dynamic programming and stochastic control. The course deals with discrete and continuous-state dynamic programs, finite and infinite horizons, stationary and nonstationary data. Applications drawn from inventory management, sequential games, stochastic shortest path, dynamic resource allocation problems. Solution algorithms include classical policy and value iteration for smaller problems and stochastic approximation methods for large-scale applications. Prerequisites: 307 and 309.

Staff

**ORF 418 Optimal Learning**  
Spring QR  
Addresses the problem of collecting information used to estimate statistics or fit a model which is then used to make decisions. Of particular interest are sequential problems where decisions adapt to information as it is learned. The course introduces students to a wide range of applications, demonstrates how to express the problem formally, and describes a variety of practical solution strategies. Prerequisite: ORF 245, ORF 309. Two 90-minute lectures, one preceptorial.

W. Powell

**ORF 435 Financial Risk Management**  
Fall
This course covers the basic concepts of modeling, measuring and managing different types of financial risks. Topics include portfolio optimization (mean-variance approach and expected utility), interest rate risk, pricing and hedging in complete and incomplete markets, indifference pricing, risk measures, systemic risk. Prerequisites: ORF 245, ORF 335 or ECO 465 (concurrent enrollment is acceptable) or instructor's permission. Two 90-minute lectures, one preceptorial. J. Mulvey

**ORF 455 Energy and Commodities Markets Fall**
This course is an introduction to commodities markets (energy, metals, agricultural products) and issues related to renewable energy sources such as solar and wind power, and carbon emissions. Energy and other commodities represent an increasingly important asset class, in addition to significantly impacting the economy and policy decisions. Emphasis will be on the application of Financial Mathematics to a variety of different products and markets. Topics include: energy prices (including oil and electricity); cap and trade markets; storable vs non-storable commodities; financialization of commodities markets; applications of game theory. R. Carmona

**ORF 467 Transportation Systems Analysis Fall**
Studied is the transportation sector of the economy from a technology and policy planning perspective. The focus is on the methodologies and analytical tools that underpin policy formulation, capital and operations planning, and real-time operational decision making within the transportation industry. Case studies of innovative concepts such as dynamic "value pricing", real-time fleet management and control, GPS-based route guidance systems, automated transit networks and the emergence of Smart Driving / Autonomous Cars. Two 90-minute lectures, one preceptorial. A. Kornhauser

**ORF 473 Special Topics in Operations Research and Financial Engineering Not offered this year**
A course covering one or more advanced topics in operations research and financial engineering. Subjects may vary from year to year. Staff

**ORF 474 Special Topics in Operations Research and Financial Engineering Not offered this year**
A course covering one or more advanced topics in operations research and financial engineering. Subjects may vary from year to year. Staff

**ORF 478 Senior Thesis Spring**
A formal report on research involving analysis, synthesis, and design, directed toward improved understanding and resolution of a significant problem. The research is conducted under the supervision of a faculty member, and the thesis is defended by the student at a public examination before a faculty committee. The senior thesis is equivalent to a year-long study and is recorded as a double course in the Spring. A. Kornhauser

**ORF 479 Senior Project Spring**
A one-semester project that fulfills the departmental independent work requirement for concentrators. Topics are chosen by students in consultation with members of the faculty. A written report is required at the end of the term. A. Kornhauser
The Program in Engineering Biology is designed for those highly motivated students who are interested in pursuing careers or graduate education in the areas of biotechnology or bioengineering. The interface between engineering science and the life sciences is an area of dramatic growth and intellectual vigor. Innovations and new developments in this area require multidisciplinary approaches and greater exposure to life science and engineering science fundamentals than is available from a single department. For engineering majors, in addition to courses in those subjects fundamental to the student's major, the program encourages the study of cellular and molecular biology, genetics, physiology, biochemistry, and neuroscience. For biological and chemical sciences majors, the program offers study in biotechnology, biomechanics, thermodynamics, control theory, hazardous waste management, electronics, computer graphics, and information theory.

Admission to the Program

Students are formally admitted to the program once they have declared a major. Generally, any student enrolled in the School of Engineering and Applied Science or the Departments of Chemistry, Ecology and Evolutionary Biology, or Molecular Biology is eligible to participate in the program. All other majors are also welcome to apply. A student planning to enroll in the program should submit an application, which is available in A201 EQuad or on the program's website. Freshmen are encouraged to do this as early as possible to begin planning appropriate course sequences.

Program of Study

An engineering biology student will normally satisfy both program and departmental requirements. The program will be developed by the student and his or her departmental adviser in consultation with the special adviser in engineering biology. In some cases courses taken under the program requirements may be applied toward the fulfillment of regular departmental requirements. The program requirements are as follows:

1. Five biology/life science courses selected with the approval of the student's engineering biology adviser. The courses should represent a coherent program in some aspect of biological science. To ensure depth as well as breadth, at least two of the courses should be upper-division courses.

2. Five engineering courses selected with the approval of the student's engineering biology adviser. The courses should represent a coherent program in engineering science, such as biotechnology, waste management,
biomechanical sensor technology, neural networks, or computer graphics, although they need not be in a single
department. At least two of these courses should be at the upper-division level or required courses taken by
departmental majors. Many upper-division engineering courses require calculus and/or differential equations (MAT
104, MAT 202, and MAE 305, or equivalent), and students should allow for these requirements in planning course
selections.

3. Close collaboration with faculty is expected. Students are required to complete, with the grade of B- or better,
at least one semester of independent work in an appropriate area of engineering biology. This independent work is
coordinated with the student's department in order to satisfy departmental requirements for the senior thesis or senior
independent research.

The growth of interdisciplinary research in bioengineering has led to the creation of several courses in the
engineering school that satisfy the biology/life science course requirement, and courses taught in molecular biology
that satisfy the engineering course requirements. Several physiology-oriented courses in the psychology department
satisfy the life science course requirement. Students should consult the program's website for an updated list of
courses that satisfy the program requirements.

Program students are expected to demonstrate strong academic performance. To qualify for the engineering biology
certificate upon graduation, a minimum grade average of B- in the program courses is required. Program courses may
not be taken on a pass/D/fail basis.

Additional information can be obtained at the Program in Engineering Biology website.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in engineering biology upon
graduation.

Courses

**CBE 201 An Introduction to Scientific Computing** Not offered this year QR
An introduction to computer programming emphasizing numerical modeling and problem solving, including
numerical integration, solution of systems of non-linear equations, and composition of high-level macros for
numerical work within spreadsheets. The programming environment is Visual Basic.NET, an object-oriented
programming language that is accessible to beginner programmers and permits the rapid development of applications
with a graphical user interface. Utilizes MATLAB data analysis, visualization, programming, and symbolic
mathematics systems. Two lectures, one preceptorial. Prerequisite: MAT 103.
A. Panagiotopoulos

**CBE 215 Quantitative Principles in Cell and Molecular Biology** (See MOL 215)

**CBE 228 Energy Technologies in the 21st Century** (See MAE 228)

**CBE 245 Introduction to Chemical Engineering Principles** Fall STN
Application of the principles of conservation of mass and energy to the design and analysis of chemical processes.
Elementary treatment of single and multiphase systems. First law of thermodynamics for closed and open systems.
Steady state and transient analysis of reacting and nonreacting systems. Two lectures, one preceptorial. Prerequisite:
CHM 201. L. Loo

**CBE 246 Thermodynamics** Spring STN
Basic concepts governing the equilibrium behavior of macroscopic fluid and solid systems of interest in modern
chemical engineering. Applications of the first law (energy conservation) and second law (temperature, entropy,
reversibility) to open and closed systems. Thermodynamic properties of pure substances and mixtures. Phase equilibrium and introduction to reaction equilibrium. Introduction to the molecular basis of thermodynamics. Applications include thermodynamics of protein stability, the Earth's energy balance, energy conversion schemes, and the binding of ligands to proteins. Prerequisites: CBE 245 and MAT 201. *I. Aksay*

**CBE 250 Separations in Chemical Engineering and Biotechnology**  
Fall STN  
Fundamental thermodynamic principles and transport processes that govern separations in biotechnology and chemical processing. Staged operations, such as distillation and chromatography, are developed based on coupling phase equilibrium with mass balances. Transport processes driven by electric fields, centrifugal fields, or hydrodynamics provide the basis for understanding ultracentrifugation, membrane process, and electrophoresis. Three lectures. Prerequisites: CBE 245 and CBE 246. MAE 305 and CHM 303 may be taken concurrently. *A. Link*

**CBE 260 Ethics and Technology: Engineering in the Real World (also EGR 260)**  
Fall EM  
An examination of engineering as a profession and the professional responsibilities of engineers. The ethics of engineering will be considered through case studies (e.g., automobile safety, pollution control), and the social responsibilities of engineering will be distinguished from those of science and business. Quantitative decision-making concepts, including risk-benefit analysis, are introduced and weighed against ethical considerations to compare technology options. Ethical conflicts between utilitarian theories and duty theories will be debated. Two lectures, one preceptorial, one film class. *J. Benziger*

**CBE 305 Mathematics in Engineering I (See MAE 305)**

**CBE 335 The Energy Water Nexus (also MAE 338 / ENV 335 / ENE 335)**  
Fall  
Students will gain an awareness of challenges to sustainable water and energy and inter-linkages between these. Energy-water design trade-offs will be investigated for various energy and water processing facilities, e.g., electric power or desalination plants. Students will participate in a design and simulation project to analyze water and energy balances for selected processes. Lectures will include review of relevant unit operations, tools/methods for lifecycle environmental and economic analysis, and discussion of contemporary issues where the energy-water nexus plays a critical role. *S. Sundaresan, E. Larson*

**CBE 341 Mass, Momentum, and Energy Transport**  
Fall STN  
Survey of modeling and solution methods for the transport of fluids, heat, and chemical species in response to differences in pressure, temperature, and concentration. Steady state and transient behavior will be examined. Topics include fluid statics; conservation equations for mass, momentum and energy; dimensional analysis; viscous flow at high and low Reynolds number; thermal conduction; convective heat and mass transfer, correlations; diffusion and interphase mass transfer. Working knowledge of calculus, linear algebra and ordinary differential equations is assumed. Prerequisites: CBE 245, CBE 246 & MAE 305. Can take MAE 305 concurrently. *M. Brynildsen*

**CBE 342 Fluid Mechanics**  
Not offered this year  
Elements of fluid mechanics relevant to simple and complex fluids. Topics include macroscopic balances; derivation of differential balance equations and applications to unidirectional flows; treatment of nearly unidirectional flows through the lubrication approximation; introduction to turbulent flow; flow through porous media; capillary flows; dispersed two-phase flows; and hydrodynamic stability. Three lectures. Prerequisite: CBE 341. *S. Sundaresan*

**CBE 346 Chemical Engineering Laboratory**  
Spring STL  
An intensive hands-on practice of engineering. Experimental work in the areas of separations, heat transfer, fluid mechanics, process dynamics and control, materials processing and characterization, chemical reactors. Development of written and oral technical communication skills. One lecture, two three-hour laboratories. Prerequisites: CBE 246 and CBE 341 or equivalents. *B. Koel, R. Prud'homme, J. Benziger*

**CBE 351 Junior Independent Work**  
Fall  
Subjects chosen by the student with the approval of the faculty for independent study. A written report, examination, or other evidence of accomplishment will be required. *A. Link*

**CBE 352 Junior Independent Work**  
Spring  
Subjects chosen by the student with the approval of the faculty for independent study. A written report, examination, or other evidence of accomplishment will be required. *A. Link*

**CBE 415 Polymers (also CHM 415)**  
Fall  
Broad introduction to polymer science and technology, including polymer chemistry (major synthetic routes to polymers), polymer physics (solution and melt behavior, solid-state morphology and properties), and polymer engineering (overview of reaction engineering and melt processing methods). Three lectures. Prerequisites: CHM 301 or 303, which may be taken concurrently, and MAT 304, or permission of the instructor. *R. Register*

**CBE 418 Fundamentals of Biofuels (See ENE 418)**

**CBE 419 Enzymes**  
Spring STN
Enzymes are the engines that fuel life, catalyzing a vast array of different chemical reactions. This course will focus first on enzyme kinetics and the structural biology of enzymes. With these tools we will next move to a series of case studies about different enzymes and enzyme families. *A. Link*

**CBE 421 Catalytic Chemistry (also CHM 421 / ENE 421) Not offered this year**

Concepts of heterogeneous catalysis applied to chemical processes. Major industrial processes based on heterogeneous catalysis, including ammonia synthesis, partial oxidation, petroleum refining, and environmental control. The major classes of heterogeneous catalysts, such as solid acids and transition metals, and the classes of chemical reactions catalyzed by these materials. Processing conditions and reactor design are considered. Fundamentals of surface reactivity will be explored. Two lectures. Prerequisite: CHM 303 organic chemistry. *J. Benziger*

**CBE 422 Molecular Modeling Methods Spring STN**

This course offers an introduction to computational chemistry and molecular simulation methods. Computational chemistry involves using quantum mechanical models to obtain the electronic structure of atoms and molecules. Monte Carlo and Molecular Dynamics methods use input from quantum chemistry and empirical potentials to obtain equilibrium and non-equilibrium properties of fluids and materials. As computer power continues its exponential growth, these methods find increasing applications in engineering, chemistry, physics and biology. *A. Panagiotopoulos*

**CBE 423 Biologically Inspired Materials Not offered this year**

Focuses on the pathways utilized by biological systems to produce hierarchically structured inorganic/organic nanocomposites such as bone, teeth, diatoms, and sea-shells. These structures form through template-assisted self-assembly, in which self-assembled organic materials (proteins, lipids, or both) serve as the structural scaffolding. The outcome is multifunctional composites with self-healing, sensing, and actuating properties. The course will critically evaluate the potential of biologically inspired materials in future applications. Two lectures, one preceptorial. *I. Aksay*

**CBE 425 Polymer Rheology Fall**

A systematic development of the principles and applications of the science of rheology with an emphasis on the development of stress-velocity constitutive equations. Vector and tensor mathematics and Newtonian fluid dynamics are reviewed. Develops the physical and mathematical nature of stress and deformations in materials. Covers the use of theory and application of rheological equations of state. *F. Morrison*

**CBE 432 The Cell as a Chemical Reactor Not offered this year**

Presents a framework for the analysis of cellular responses, such as proliferation, migration, and differentiation. Emphasis on mechanistic models of biotransformation, signal transduction, and cell-cell communication in tissues. Focuses first on unit operations of cell physiology transcription, translation, and signal transduction. Models of these processes will rely on tools of reaction engineering and transport. Process dynamics and control will then be used to analyze the regulatory structure of networks of interacting genes and proteins. One lecture. Prerequisites: MOL 214 and MAE 305 or their equivalents. *S. Shvartsman*

**CBE 433 Introduction to the Mechanics and Dynamics of Soft Living Matter Spring**

This course introduces the concepts of soft condensed matter and their use in understanding the mechanical properties, dynamic behavior, and self-assembly of living biological materials. We will take an engineering approach that emphasizes the application of fundamental physical concepts to a diverse set of problems taken from the literature, including mechanical properties of biopolymers and the cytoskeleton, directed and random molecular motion within cells, aggregation and collective movement of cells, and phase transitions and critical behavior in the self-assembly of lipid membranes and intracellular structures. *C. Brangwynne*

**CBE 434 Biotechnology (See MOL 433)**

**CBE 438 Biomolecular Engineering (also MOL 438) Not offered this year**

This course will focus on the design and engineering of biomacromolecules. After a brief review of protein and nucleic acid chemistry and structure, we will delve into rational, evolutionary, and computational methods for the design of these molecules. Specific topics to be covered include aptamers, protein and RNA-based switches and sensors, unnatural amino acids and nucleotides, enzyme engineering, and the integration of these parts via synthetic biology efforts. Three lectures. *A. Link*

**CBE 439 Quantitative Physiology & Tissue Design Fall**

A treatment of the quantitative tools to understand the human body. Course reviews cell biology and anatomy, then examines cells, tissues, and organs using principles from engineering kinetics and transport processes. Topics include: cell physiology; organ system physiology (including the cardiovascular, renal, and respiratory systems); and pathophysiology. Clinical treatments for human disease will also be analyzed.
C. Nelson

CBE 441 Chemical Reaction Engineering Spring STN
Stoichiometry and mechanisms of chemical reaction rates, both homogeneous and catalytic; adsorption, batch, continuous flow, and staged reactors; coupling between chemical reaction rates and mass, momentum, and energy transport; stability; optimization of reactor design. Application to environmental and industrial problems. Two lectures, one preceptorial. Prerequisites: CBE 246 and CBE 341. J. Avalos

CBE 442 Design, Synthesis, and Optimization of Chemical Processes Fall STL
Introduction to chemical process flow-sheeting; process simulation design, sizing and cost estimation of total processes; process economics; introduction to optimization, linear programming, integer programming, and nonlinear programming; heat integration methods, minimum utility cost, minimum number of units, network optimization. Three lectures, one laboratory. Prerequisites: CBE 341, CBE 346, and CBE 441. Y. Kevrekidis

CBE 443 Separations in Chemical and Biochemical Processes Not offered this year
Separations of importance in biochemical and chemical processes emphasizing physical and chemical mechanisms. Topics include: membrane separations, chromatographic separations, crystallization, centrifugation, filtration, extraction, and adsorption. Three lectures. R. Prud'homme

CBE 445 Process Control Spring
A quantitative study of the principles of process dynamics and control. Dynamic behavior of chemical process elements; analysis and synthesis of linear feedback control systems with special emphasis on frequency response techniques and scalar systems. Two lectures. Prerequisite: MAE 305, which may be taken concurrently. S. Sundaresan

CBE 447 Metabolic Engineering Spring STN
Introduction to engineering metabolism. The objective of this course is to introduce students to current techniques and challenges within the field of metabolic engineering. Specific topics include introduction to metabolism, transcriptional regulation, signal transduction, flux balance analysis, and metabolic flux analysis. Designed for upper division students in engineering, chemistry, and molecular biology. Two lectures. Prerequisites: MOL 214 or MOL 215, or equivalent. M. Brynildsen

CBE 448 Introduction to Nonlinear Dynamics (also MAT 481 ) Not offered this year
An introduction to the phenomenology of nonlinear dynamic behavior with emphasis on models of actual physical, chemical, and biological systems, involving an interdisciplinary approach to ideas from mathematics, computing, and modeling. The common features of the development of chaotic behavior in both mathematical models and experimental studies are stressed, as is the use of interactive graphics to explore and analyze this behavior. Two lectures. Prerequisites: knowledge of linear algebra (MAT 204) and ordinary differential equations (MAE 305). Y. Kevrekidis

CBE 451 Senior Independent Work Fall
A one semester study of an important problem or topic in chemical and biological engineering. Projects may be experimental, computational, or theoretical. Topics selected by the students from suggestions by the faculty. Written report required. A. Link

CBE 452 Senior Independent Work Spring
A one semester study of an important problem or topic in chemical and biological engineering. Projects may be experimental, computational, or theoretical. Topics selected by the students from suggestions by the faculty. Written report required. A. Link

CBE 454 Senior Thesis Spring
A full year study of an important problem or topic in chemical and biological engineering culminating in a senior thesis. Projects may be experimental, computational, or theoretical. Topics selected by the students from suggestions by the faculty. Written thesis, poster presentation, and oral defense required. The senior thesis is recorded as a double course in the spring. Departmental permission required. A. Link

CBE 454R Senior Thesis-Resubmission Spring
An experimental, computational, and theoretical study of an important problem or topic in chemical engineering. Topics selected by the students from suggestions by the faculty. Written thesis and oral defense required. The senior thesis is equivalent to a yearlong study and is recorded as a double course in the spring. J. Benziger
Program in Engineering Physics

Director
Stephen A. Lyon

Antoine Kahn, Electrical Engineering
Stephen A. Lyon, Electrical Engineering
Daniel R. Marlow, Physics

Executive Committee
Edgar Y. Choueiri, Mechanical and Aerospace Engineering
M. Zahid Hasan, Physics

Athanassios Panagiotopoulos, Chemical and Biological Engineering

Interdisciplinary areas in physical sciences in engineering such as energy, environment, materials, microelectronics, astronautics, and photonics promise to become increasingly relevant in the 21st century. The Program in Engineering Physics, which provides students with a fundamental knowledge of physics, together with problem-solving skills and an understanding of engineering, is designed to address the needs of students seeking innovative careers in today's technological age. In addition, it allows students to keep their options open between physical sciences and engineering. Following completion of the engineering physics program, students typically enter careers in engineering, applied science, or applied physics through research, teaching, or entrepreneurial engineering. Past graduates have also pursued other careers as diverse as medicine, business, and law.

The program offers a unique combination of engineering, mathematics, and physics. It is directed toward students who have interest and ability in both engineering and physics. For engineering majors, in addition to courses in those subjects fundamental to the student's field of interest, the program requires courses in quantum mechanics and encourages study of subjects such as electromagnetism, statistical mechanics, thermodynamics, condensed matter physics, mathematical physics, complex analysis, and partial differential equations. For physics majors, the program requires courses in engineering design plus specialization in topics such as solid-state electronics, fluid mechanics, optics/optoelectronics, control theory, computers and computational methods, or a variety of other applied disciplines. Computer science A.B. students are required to meet the technical course requirements needed to satisfy the B.S.E. degree. An engineering physics certificate is awarded upon graduation to students successfully completing the program. Exceptionally outstanding students are awarded the Jeffrey O. Kephart Prize (one per year). The program committee also selects yearly winners of independent work awards, conference travel support, and summer fellowships.

Additional information on the program, faculty, and past and current students can be found on the program's website.

Admission to the Program

Any student who satisfactorily completes the B.S.E. freshman year program or its equivalent is eligible for admission to the program. Engineering students entering the program are strongly encouraged to complete PHY 203, 208 and MAT 201, 202 or their equivalents by the end of the sophomore year.

In applying for admission to the program, a student should indicate interest in a particular area of engineering and should be enrolled as a major in one of the six participating engineering departments or in physics. A student planning to enroll in the program should consult the director of the program, who will assign a special adviser to help plan a curriculum.
Program of Study

An engineering physics major will normally satisfy both program and departmental requirements. The curriculum for each student is worked out by the student and the student's departmental adviser in consultation with the special adviser in engineering physics. In some cases, courses taken under the program requirements may be applied toward the fulfillment of regular departmental requirements. The program requirements are as follows:

1. All students must take two upperclass courses in mathematics (300 and 400 levels).

2. Engineering majors must take a minimum of six advanced courses in physics (which may include the following 200-level courses: PHY 205, 207, 209, and 210), including the quantum mechanics sequence (PHY 208, PHY 305). At least five of the courses must be listed (or cross-listed) in the physics department. In order to accommodate specific student interests, there is particular flexibility with regard to the sixth course, which may be a course with a strong physics content from other departments such as astrophysical sciences or chemistry, but must be approved in advance by the program's committee.

Physics majors enrolled in the program must have five engineering courses, chosen in consultation with their adviser. In order to gain exposure to the design-oriented philosophy of engineering, physics students are required to take at least two of their engineering courses in a coherent area of study so that a clear engineering stem can be identified, and a "core" engineering design course selected from those designated as such by five of the departments in the School of Engineering and Applied Science (CBE 442, CEE 366, CEE 477, COS 217, ELE 302, MAE 321).

3. Close collaboration with faculty is expected. Students are required to complete, with a grade of B- or better, at least one semester of independent work in an appropriate area. Physics students are encouraged to have a professor in engineering serve as a reader on their senior thesis.

4. Program students are expected to demonstrate strong academic performance. To qualify for the engineering physics certificate upon graduation, a minimum grade average of B- in the program courses is required. Courses taken pass/D/fail are permitted, but a pass counts as a C in determining grade average.

Further details can be obtained by contacting the director or visiting the program's website.

Certificate of Proficiency

Students who fulfill the requirements of the program will receive a certificate of proficiency in engineering physics upon graduation.
Department of English

Chair
William A. Gleason

Associate Chair
Jeffrey Dolven (fall)
Diana J. Fuss (spring)

Departmental Representative
Sophie Gee

Director of Graduate Studies
Sarah Rivett

Professor
Eduardo L. Cadava
Anne A. Cheng, also African American Studies
Andrew Cole
Bradin Cormack
Maria A. DiBattista, also Comparative Literature
Jill S. Dolan, also Lewis Center for the Arts, Theater
Jeffrey Dolven
Diana J. Fuss
Simon E. Gikandi
William A Gleason
Claudia L. Johnson
Lee C. Mitchell
Robert Nixon, also Princeton Environmental Institute
Deborah E. Nord
Jeff E. Nunokawa
Esther H. Schor

D. Vance Smith
Nigel Smith
Susan A. Stewart
Clair E. Wills
Susan J. Wolfson

Associate Professor
Zahid R. Chaudhary
Sophie G. Gee
Meredith Anne Martin
Sarah Rivett
Gayle M. Salamon
Tamsen O. Wolff

Assistant Professor
Sarah Chihaya
Joshua I. Kotin
Russell J. Leo
Kinohi Nishikawa, also African American Studies

Lecturer
Sarah M. Anderson
Nijah Cunningham, also Council of the Humanities and African American Studies
Monica Huerta, also Council of the Humanities
Robert N. Sandberg, Lewis Center for the Arts, Theater

Visiting Lecturer
Isobel Armstrong, also Council of the Humanities
Robert Perelman

Associated Faculty
April Alliston, Comparative Literature
Leonard Barkan, Comparative Literature

Information and Departmental Plan of Study
In the Department of English, students read widely across the genres and periods of British, American, and Anglophone literature and explore approaches to literary study with a distinguished, internationally renowned faculty. The department's ranks include historicists and formalists, theorists and poets, and postcolonialists and feminists; the faculty teach not only poetry, prose, and drama, but film, music, art, architecture, and technology. The department is
united by a passion for works of the imagination and for thinking about what they mean and the difference they make in the world.

The department offers courses that cover more than two millennia of literature and culture, in settings ranging from large lectures to small seminars to one-on-one advising. A typical program of study embraces new and experimental writing, important rediscoveries, and the most hallowed texts of the Western literary tradition, the "news that stays news." The department cultivate a common critical vocabulary and joins in debating enduring questions about art, language, and society. The junior year begins with a diverse array of junior seminars, which couple the study of a specific subject with methodological training in critical reading and writing. Juniors and seniors pursue independent work on subjects of their choosing in collaboration with the faculty, and they may elect tracks in British, American, or Anglophone literatures, arts and media, theory and criticism, creative writing, theater and performance studies, or comparative literatures. The department also encourages concentrators who wish to pursue interdisciplinary work through certificate programs.

English concentrators graduate as incisive readers, cogent thinkers, and persuasive writers. They carry with them a lasting ability to take informed pleasure in all forms of literature, in the process of writing, and in the meanings and powers of culture. Graduates go on to become leaders in such fields as education, law, medicine, journalism, business, politics, and the creative arts. Simply put, learning to read closely and write fluently--the twin pillars of the discipline--are among the most valuable skills graduates can bring to the world's work.

Prerequisites

English department prerequisites provide a background in literary history and familiarity with one of the major genres. Concentrators take both ENG 200 (British Literature from the 14th to the 18th Centuries) and one of the 200-level Reading Literature courses: ENG 205 (Poetry), ENG 206 (Fiction), ENG 207 (Drama), or ENG 208 (The Essay) or ENG 209 (Theory).

Program of Study

English concentrators must take a total of 11 courses: two 200-level prerequisites, the Junior Seminar, and eight departmental courses, seven of which must be at the 300 level or above. With the permission of the departmental representative, concentrators may count one cognate course from another department, where that course adds depth or perspective to their studies in English. (Some optional tracks may permit more cognates or specify their nature: see below.)

Distribution Requirements. Departmental distribution requirements ensure historical and generic breadth in each concentrator's program of study. Foundations (two courses in British literature before 1800, only one of which can be Shakespeare, and one course in American literature before 1900) grounds concentrators in the history of English. Modernity (one course in literature after 1800) brings them up to date. Diasporas (one course in Anglophone or U.S. minority literatures) explores the racial, cultural, and geographical diversities that inform literary tradition. Theory and Criticism (one course) provides tools for thinking critically across all these periods, identities, and genres. Each semester, the department offers a wide variety of courses in each area, and a full list is available on the department website. (By arrangement with the departmental representative, some courses may satisfy two requirements simultaneously.)

A few rules regarding departmental courses:
Majors may not pass/D/fail English courses. This includes cross-listed courses, even if English is not the home department.

If you study abroad, you may count two courses per semester abroad toward your departmentals. The exception to this is the Junior Seminar in London: you may count two classes plus the seminar.

Cross-listed courses do not count against the Rule of 12 so long as the home department is not English.

In the Department of English, it is not permissible to drop the lowest-graded departmental course from your average.

Tracks. Optional tracks offer the chance for students with special interests to focus their programs of study within the discipline of English and on questions that lie between disciplines. Concentrators may elect a track at any time: a junior may already know she wants to focus on literary theory; a second-semester senior may realize he has been writing about literature and the arts all along. Some tracks, however, have more requirements than others (arts and media, theater and performance studies, and creative writing in particular), and students are advised to make a start as early as the sophomore year.

Literature, Culture, Language:
Concentrators may focus on a particular national or international body of work: British, American, or Anglophone.

British: Literature and culture of the British Isles. Requirements: four courses in British literature; one junior paper and the senior thesis on a British topic. One cognate course in another department (history, art and archaeology, etc.) on a British topic may be counted.

American: Literature and culture of the territories that became the United States, from native peoples and the first European settlers to the present day. Requirements: four courses in American literature (including at least one of ENG 201, ENG 353, or ENG 366); one junior paper and the senior thesis on an American topic. One cognate course in another department (history, art and archaeology, etc.) on an American topic may be counted. This track is often combined with a certificate in American studies or African American studies.

Anglophone: Literature and culture of English as a global language. Four courses in Anglophone literature; one junior paper and the senior thesis on an Anglophone topic. Up to two cognate courses in another department (history, art and archaeology, etc.) on an Anglophone topic may be counted.

Arts and Media:
Literature in relation to other arts, including architecture, visual art, film, photography, music (classical, popular, or other); and/or in relation to its circumstances of production and transmission, from manuscript to print to radio, television, and the Internet. Requirements: three courses in topics related to the arts and media, including up to two cognates from other departments; one junior paper and the senior thesis on a related topic.

Comparative Literatures:
English in relation to the literature of another language. Requirements: at least three and no more than four 300-level courses in a single foreign language (with no other cognates permitted); one junior paper and the senior thesis on a comparative topic (including translation). With permission of the departmental representative, some foreign language classes may be used to satisfy the departmental distribution requirements.

**Theory and Criticism:**
For students interested in thinking about the underlying principles by which we understand literature. Considers the history and theory of literary interpretation from Plato to the present, including such methods and movements as linguistics, structuralism, feminism, psychoanalysis, Marxism, cultural studies, gender and sexuality studies, race studies, postcolonial studies, and deconstruction. Requirements: three courses in literary or cultural theory and literary criticism, including either ENG 305 or ENG 306; one junior paper and the senior thesis on a topic in theory and criticism, or making imaginative use of critical methodologies.

**Theater and Performance Studies:**
A home for the study of dramatic literature, performance culture, and/or performance studies. Includes traditional theater, live and recorded music, popular culture performances, avant-garde arts, stand-up comedy, street theater, contemporary dance, and slam poetry. Requirements: one introductory class in theater by the end of sophomore year; at least two and not more than three 300- or 400-level courses in theater, counted as departmental courses (no other cognates are allowed); departmental courses must also include one upper-level Shakespeare course, one course in drama and/or performance before 1700, and one course in drama and/or performance after 1700; one junior paper and the senior thesis on a related topic.

**Creative Writing:**
Students elect the creative writing track provisionally; final admission depends on the permission of the Program in Creative Writing to write a creative thesis. The Department of English recommends that students take at least one 200-level creative writing course by the end of sophomore year. Requirements: a minimum of two and a maximum of three courses at the 300 level or above in creative writing counted as departmental courses (no other cognates are allowed); creative thesis. Students not approved to write a creative thesis revert to one of the other tracks. One 300-level creative writing class may be used as a cognate.

**Individual Program of Study:**
By special arrangement with the departmental representative, students may design an interdisciplinary track in an area not covered by the above, counting two cognates taken in other departments toward their eight departmentals.

**Cognates.** Concentrators are ordinarily allowed one cognate course (a course in another department that is counted toward the requirements of the Department of English). Cognates should have a bearing on your studies in English (a history course in a period or place whose literature you have studied, a course in related literature of another language, etc.), and they must be approved by the departmental representative. (You can request approval by email.)

**Independent Work**
Concentrators write two junior papers, the first in conjunction with the fall junior seminar, and the second with a faculty adviser chosen at the end of the fall term. The senior thesis is written with an adviser chosen in the spring of junior year. The Junior Seminar
An introduction to the methods of research and the arts of criticism, taken in the fall of junior year. Concentrators choose one from a menu of five or six seminars when they sign into the department as sophomores. The courses are typical (ranging from Emily Dickinson to "Theater and Sacrifice"), but all of them involve intensive practice in the reading and writing of literary criticism. The fall junior paper is written in conjunction with the seminar, with the seminar instructor as adviser.

During the junior fall, students should plan a program of departmental courses for the next two years. The planned course work for the junior spring and senior year should be discussed with the junior seminar leader, who signs the TiberHub sheet and acts as the junior adviser during the fall term.

Senior Theses. For English concentrators, senior theses are typically 20,000 words (or 80 pages) in length, on a topic chosen in collaboration with the thesis adviser and approved by the committee of departmental studies. One chapter or 20 pages of the thesis is due in December.

Senior Departmental Examination

Comprehensive examinations are set at the end of the senior year, in two four-hour parts on successive days. The first day consists of 15 to 20 passages from the full range of genres, periods, and geographies taught in the department; students write about three. The second day poses questions on period, genre, and theory.

The Rule of 12

A student in the A.B. program is limited to 12 one-term courses (plus independent work) in a given department, plus up to two departmental prerequisites taken during the freshman or sophomore year. Students who exceed the 31-course requirement for graduation may exceed the Rule of 12 by as many courses (e.g., if you take 32 courses total, you can exceed the rule of 12 by one course). For most English concentrators, this means only 12 courses primarily designated as English courses (ENG courses or crosslisted courses where ENG comes first—e.g., ENG 327/GSS 332). Departmental cognates do not count against the Rule of 12.

Study Abroad

The department encourages students to consider studying abroad for a semester or a year. We especially invite students to consider the junior fall term at University College London. There students attend a special Junior Seminar with a visiting Princeton professor and receive direct supervision for the fall junior paper while also attending courses taught through the University of London.

Courses taken abroad may, with approval, receive both departmental and distribution credit (in general, the department can accept two or three courses for each semester abroad). Students considering study abroad should consult the departmental representative at an early stage.

Certificate Programs. The department encourages concentrators to pursue certificates from other programs in conjunction with their studies in English. The creative writing and theater and performance studies tracks are specifically designed to accommodate students seeking the relevant certificates, and most students who specialize in comparative literatures get a certificate in their second language. Concentrators who specialize in American literature, culture, and language will find the program fits well with certificates in American studies or African American studies, but students in almost any track will find that their work in English can be profitably combined
with such certificates as gender and sexuality studies, Judaic studies, Latin American studies, medieval studies, visual arts, environmental studies, or other programs.

Honors in English at graduation are computed according to the following percentages:

- **Departmentals (excluding the Junior Seminar)** 50 percent
- **Thesis** 25 percent
- **Junior Independent Work** 5 percent for each junior paper; 5 percent for Junior Seminar Comprehensives 10 percent

Further Information. For further information, consult the departmental representative and the department's website.

Courses

**ENG 132 Imagining America**  
Not offered this year LA  
An introduction to the cross-cultural study of American literatures, with special attention to the multiple points of connection, conflict, dialogue, and exchange that characterize American writings. Texts may be drawn from a broad range of periods, regions, and cultures. One lecture, two classes.  
**Staff**

**ENG 200 Introduction to English Literature: 14th to 18th Century**  
Spring LA  
An introduction to English literary history. Centered on four great writers--Chaucer, Spenser, Milton, and Pope. Two lectures, one 50-minute preceptorial.  
**S. Gee, D. Smith**

**ENG 205 Reading Literature: Poetry**  
Spring LA  
An introduction to the art of poetry in English from Shakespeare to Mother Goose, from free verse to sestinas, from the beginnings to the 21st century. Discussions will range from the minutiae of how poetry works--rhythm, syntax, trope, image, lineation, sound--to the role of its unique kinds of thinking and feeling in our world. One three-hour seminar.  
**S. Stewart**

**ENG 206 Reading Literature: Fiction**  
Not offered this year LA  
This course is designed to provoke and cultivate an interest both in close reading of particular texts and in the huge range of different forms of fiction. The goal is to enrich our understanding of the real world by knowing more about how the imagination works. Works studied will run from *The Odyssey* to contemporary English and American fiction. Two lectures, one 50-minute preceptorial.  
**S. Chihaya**

**ENG 207 Reading Literature: Drama**  
Spring LA  
This course is designed to teach students how to read plays as literature written for performance. Key assumptions are that every act of reading is an act of interpretation, that a good reader of dramatic literature engages in an activity nearly identical to that of a good director or actor or designer, and that a reader might learn from theater practitioners how to make critical choices based on close reading. Students will get on their feet to explore exactly how a play is what it is. Two lectures, one 50-minute preceptorial.  
**R. Sandberg**

**ENG 208 Reading Literature: The Essay**  
Fall LA  
This course introduces students to the range of the essay form as it has developed from the early modern period to our own. The class will be organized, for the most part, chronologically, beginning with the likes of Bacon and Hobbes, and ending with some contemporary examples of and reflections on the form. It will consider how writers as various as Sidney, Hume, Johnson, Emerson, Woolf, C.L.R. James, and Stephen Jay Gould have defined and revised The Essay. Two lectures, one 50-minute preceptorial.  
**J. Nunokawa**

**ENG 230 Public Speaking**  
Not offered this year LA  
Emphasis upon the preparation and delivery of expository and persuasive speeches before audiences composed of the speaker's fellow students. Consultations with the instructor, readings in textbooks, and written analyses of speeches supplement frequent practice in speaking. One 90-minute lecture, two classes.  
**T. Wolff**

**ENG 231 Topics in African American Studies** (See AAS 230)

**ENG 240 Origins and Nature of English Vocabulary** (See CLA 208)

**ENG 241 Introduction to Language and Linguistics** (See LIN 201)

**ENG 300 Junior Seminar in Critical Writing**  
Fall
Students learn to write clear and persuasive criticism in a workshop setting while becoming familiar with a variety of critical practices and research methods. The course culminates in the writing of a junior paper. Each section will pursue its own topic; students are assigned according to choices made during sophomore sign-ins. Required of all English majors. One three-hour seminar. **Staff**

**ENG 302 Comparative History of Literary Theory (See COM 303)**

**ENG 303 The Gothic Tradition (See COM 372)**

**ENG 305 Contemporary Literary Theory** Not offered this year LA

Fundamental questions about the nature, function, and value of literary theory. A small number of strategically selected theoretical topics, including exemplary literary works as reference points for discussion. Two 90-minute seminars. **A. Cole**

**ENG 306 History of Criticism** Spring LA

A study of particular developments in criticism and theory, from Aristotle to Nietzsche. The course will also consider the relation of contemporary criticism to movements and issues such as deconstruction, feminism, psychoanalysis, and cultural materialism. Two 90-minute seminars. **A. Cole**

**ENG 310 The Old English Period (also MED 310)** Fall LA

An intensive introduction to the English language spoken and written in the British Isles approximately 500 to 1100 C.E., leading to a critical survey of the literature. Attention is paid both to linguistic questions and to the cultural context of such poems as *Beowulf* and the *Dream of the Rood*. Two 90-minute seminars. **S. Anderson**

**ENG 311 The Medieval Period (also MED 309)** Spring LA

A study of the Middle English texts that span the period from the Norman Conquest to the Tudor Renaissance, with attention paid to Middle English as a language. Readings will be chosen from verse romance, drama, political and religious writings, romance and/or lyric. Two lectures, one preceptorial. **D. Smith**

**ENG 312 Chaucer** Fall LA

A study of Chaucer's art with reference to the intellectual, social, and literary conventions of the Middle Ages. The course introduces the student by this means to the characteristically medieval aspects of Chaucer's poetry. Two 90-minute seminars. **A. Cole**

**ENG 314 Criticism Workshop (See THR 326)**

**ENG 317 The Modern European Novel (See COM 306)**

**ENG 320 Shakespeare I** Fall LA

A study of Shakespeare's plays, covering the first half of his career. Emphasis will be on each play as a work of art and on Shakespeare's development as a poet and dramatist. Two lectures, one preceptorial. **J. Dolven**

**ENG 321 Shakespeare II** Spring LA

A study of Shakespeare's plays, covering the second half of his career. Emphasis will be on each play as a work of art and on Shakespeare's development as a poet and dramatist. Two lectures, one preceptorial. **B. Cormack**

**ENG 322 Spenser** Not offered this year LA

A study of the development of the epic romance from Vergil to Spenser through a reading of the *Aeneid* and the three great Renaissance epic romances: Ariosto's *Orlando Furioso*, Tasso's *Gerusalemme Liberata*, and Spenser's *The Faerie Queene*. Two lectures, one preceptorial. **J. Dolven**

**ENG 323 The 16th Century** Not offered this year LA

The study of 16th-century literature, both prose and poetry, in order to define the achievement of the English Renaissance. Literary accomplishments will be placed in the more general context of Elizabethan culture and Renaissance intellectual history. Readings in Wyatt, Surrey, Sidney, Shakespeare, Marlowe, Spenser, Donne. Two 90-minute seminars. **J. Dolven**

**ENG 325 Milton** Spring LA

A study of Milton's poetry and prose, with particular attention to Milton's poetic style and development and his indebtedness to various classical traditions. Emphasis will also be given to Milton as thinker and to the place he holds in 17th-century thought. Two lectures, one preceptorial. **N. Smith**

**ENG 326 The 17th Century** Not offered this year LA

A study of the interaction of literature, culture, and politics during the 17th century. The course will focus on the nature of political work done by literary texts, the representation of changing gender relations, and the evolution of literary forms. Authors include Jonson, Herbert, Donne, Marvell, Hobbes, Milton, Dryden, and the Cavalier Poets. Two 90-minute seminars. **N. Smith**

**ENG 327 The English Drama to 1700** Not offered this year LA
A study of English drama from its medieval origins to Restoration comedy, with special attention to the astonishingly vital commercial theater of the Renaissance. The course will consider the aesthetic and cultural power of dramatic texts and the theater's characteristic production of social anxiety. Two 90-minute seminars. R. Leo III

ENG 328 Topics in the Renaissance Spring LA
An intensive study of various aspects of Renaissance literature. Topics may include sex and gender in the Renaissance, Shakespearean comedies, Elizabethan and Jacobean drama, Renaissance lyric poetry. Two 90-minute seminars. B. Cormack

ENG 329 Topics in the Renaissance Not offered this year LA
An intensive study of various aspects of Renaissance literature. Topics may include sex and gender in the Renaissance, Shakespearean comedies, Elizabethan and Jacobean drama, Renaissance lyric poetry. Two 90-minute seminars. B. Cormack

ENG 330 English Literature of the 18th Century Not offered this year LA
A study of major figures from the Augustan Age through the Age of Johnson: Swift, Pope, Fielding, Boswell, Johnson, Sterne, and Blake. Selections include a wide range of literary types from Gulliver's Travels and Joseph Andrews to Boswell's London Journal and Blake's Marriage of Heaven and Hell. Two lectures, one preceptorial. Staff

ENG 331 English Fiction before 1800 Not offered this year LA
Primarily a course in novels of the 18th century, though early narratives may also be read. Among writers read will be Defoe, Smollett, Richardson, Fielding, Sterne, the Gothic novelists, and Jane Austen. Two lectures, one preceptorial. Staff

ENG 332 American Literature before 1825 Not offered this year LA
An examination of the literature of early America within the context of the intellectual, social, and literary traditions. The course will survey writers from Anne Bradstreet and Edward Taylor to Irving and Cooper, with emphasis on the influence of Puritanism and the Enlightenment. Two lectures, one preceptorial. S. Rivett

ENG 333 Special Topics in Performance Practice (See THR 330)

ENG 334 Topics in 18th-Century Literature Not offered this year LA
This course will at different times deal with particular currents of literature and thought in the 18th century, or with individual authors. Two lectures, one preceptorial. Staff

ENG 335 Topics in 18th-Century Literature Not offered this year LA
This course will at different times deal with particular currents of literature and thought in the 18th century, or with individual authors. Two lectures, one preceptorial. C. Johnson

ENG 336 Romanticism and the Age of Revolution Fall LA
A study of the Romantic movement in an age of revolutions: its literary culture, its variety of genres, its cultural milieu, and the interactions of its writers. Major figures to be studied include Wollstonecraft, Blake, Wordsworth, and Coleridge. Two 90-minute seminars. S. Wolfson

ENG 337 The Later Romantics Spring LA
A study of the young writers who defined English literary culture, especially the Romantic movement, in Regency and late Georgian England. Course material will include poetry, prose, and fiction, with emphasis on close reading as well as cultural contexts. Among the major figures to be studied are the Shelleys, Byron, and Keats. Two 90-minute seminars. S. Wolfson

ENG 338 Experimental Fiction (See COM 325)

ENG 339 Topics in Romance Not offered this year LA
An intensive study of particular aspects of British Romanticism, which may include individual authors, genres, experiments, and legacies. Two 90-minute seminars. E. Schor

ENG 340 19th-Century Fiction Spring LA
Novels of the Romantic and Victorian periods, beginning with Jane Austen, including the Brontës and the major Victorians, and ending with Hardy. Two lectures, one preceptorial. J. Nunokawa

ENG 341 19th-Century Poetry Not offered this year LA
This survey of 19th-century British poetry will explore the ways in which Victorian poetry and poetic form influenced and were influenced by national movements: education, empire, voting reform, gender relations, and the rise of technology. It will consider how the afterlife of 19th-century poetry haunts our interpretation of early 20th-century poetry, and re-historicize Victorian poetics amid the vibrant and complicated tapestry of the 19th century. Students will read poems by Tennyson, D.G. Rossetti, Christina Rossetti, Barrett Browning, Browning, Swinburne, Hardy, Clough, Bridges, and Hopkins. Two 90-minute seminars. M. Martin
ENG 347 Victorian Literature and Society  Not offered this year LA
An examination of the responses of Victorian novelists, poets, social critics, and graphic artists to poverty, industrialization, the "woman question," prostitution, slum life, and other social and political issues of the day. Special emphasis on the development of a language and imagery of social criticism. Two lectures, one preceptorial.

ENG 348 Late Victorian Literature: Decadence and Rebellion  Not offered this year LA
This course studies the literature of the last decades of the Victorian era, often referred to as the fin de siècle (or end of the century). It will focus on literary, cultural, and social developments in the final years of the nineteenth century and first years of the twentieth, among them aestheticism, decadence, literary naturalism, imperialism, socialism, the arts and crafts movement, and the "new woman." Authors to be considered include Wilde, Conrad, Pater, Schreiner, Shaw, Hopkins, Hardy, Bridges, Kipling, Morris, Gissing, and Stevenson. Two ninety-minute lectures, one-hour preceptorial. D. Nord

ENG 350 Literature of the American Renaissance, 1820-1860  Spring LA
A study of the major forms and traditions of American literature during the earlier 19th century, with main emphasis on such writers as Poe, Hawthorne, Melville, Emerson, Thoreau, Dickinson, and Whitman. The artistic achievement of these writers will be studied in relation to developing literary conventions and cultural patterns in pre-Civil War America. Two 90-minute seminars. J. Kotin

ENG 351 American Literature: 1865-1930  Fall LA
A study of the development of American literature within the context of the shifting social, intellectual, and literary conventions of the period. Emphasis will be on the artistic achievement of writers such as James, Howells, Twain, Dreiser, Crane, Adams, Wharton, Cather, Fitzgerald, and Faulkner. Two lectures, one preceptorial. L. Mitchell

ENG 352 African American Literature: Origins to 1910 (See AAS 353)
ENG 356 Topics in American Literature (also JDS 377 / AMS 359)  Not offered this year LA An investigation of issues outside the scope of traditional surveys of American literature. Topics may include: definitions of "America," literature of the South, contemporary poetry, New Historicism, America on film, the Harlem Renaissance, the Vietnam War, the sentimental novel, colonial encounters, literature of the Americas, fictions of empire, Jewish American writers. Two lectures, one preceptorial. E. Schor

ENG 357 Topics in American Literature  Not offered this year LA
An investigation of issues outside the scope of traditional surveys of American literature. Topics may include: definitions of "America," literature of the South, contemporary poetry, New Historicism, America on film, the Harlem Renaissance, the Vietnam War, the sentimental novel, colonial encounters, literature of the Americas, fictions of empire. Two lectures, one preceptorial. Staff

ENG 359 Modern Fiction  Spring LA
The Modern movement in English fiction, from Conrad and Joyce to the present. Two lectures, one preceptorial. M. DiBattista

ENG 360 Modern Poetry  Fall LA
British poetry from the end of the 19th century to the middle of the 20th--from the height of empire to its dissolution. Special attention to the ways in which poets respond to crises historical and personal. Poets considered include Hardy, Yeats, Eliot, Auden, Stevie Smith, and Dylan Thomas, among others. One three-hour seminar. J. Kotin

ENG 362 Modern Drama I (also COM 321)  Not offered this year LA
A study of major plays by Ibsen, Strindberg, Jarry, Chekhov, Pirandello, Brecht, and Beckett. Emphasis will be given to the theatrical revolutions they initiated and to the influence they continue to exert on contemporary drama and theater. Two 90-minute seminars. R. Sandberg

ENG 366 African American Literature: Harlem Renaissance to Present (See AAS 359)
ENG 367 American Women Writers  Not offered this year LA
Nineteenth- and 20th-century literature by American women, with particular emphasis on their historical, cultural, and critical contexts. This course will survey the diversity of writings by American women in relation to questions of canon formation, immigration, race and ethnicity, genre, aesthetics, modernism, and postmodernism. Two lectures, one preceptorial. D. Fuss

ENG 368 American Literature: 1930-Present  Fall LA
A study of modern American writings, from Faulkner to Diaz, that emphasize the interplay between formal experimentation and thematic diversity. Two lectures, one preceptorial. L. Mitchell

ENG 370 Contemporary Fiction  Not offered this year LA
An exploration of the connections and disconnects of our ever-smaller world, viewed through Englishlanguage novels and films of the last 25 years. At stake: translatability of language and ideas, processes of immigration, dynamics of
economic development, history and memory, heroism and maturity, and notions of the future itself, in societies of rapid change. Throughout, the intersections between state policy and individual lives will be considered, such that while the course is premised on grand geopolitical questions, attention will focus on localized examples: specific texts, close reading. Two lectures, one preceptorial.

S. Chihaya

ENG 371 Contemporary Poetry  Not offered this year  LA
With an emphasis on British, Australian, and American poetry from 1945 to the present, this course covers a range of work. It considers such groups as the Beats, the Confessionals, the Surrealists, and the New York School, but attention will mostly be devoted to major works by MacDiarmid, Bishop, Lowell, Auden, Berryman, Brooks, Jarrell, Thomas, Larkin, Levertov, Ammons, Creeley, Duncan, Ginsberg, O'Hara, Ashbery, Merwin, Tomlinson, Walcott, Hill, Plath, Murray, Trantner, Kinsella, and others.

Classwork will be supplemented by attending readings on and off campus. Two lectures, one preceptorial.

S. Stewart

ENG 372 Contemporary Drama  Not offered this year  LA
An examination of some of the best literature written for the stage since the Second World War. Two lectures, one preceptorial.

T. Wolff

ENG 373 Acting, Being, Doing, and Making: Introduction to Performance Studies (See THR 300)

ENG 379 20th Century Master (See AAS 327)

ENG 385 Children's Literature  Not offered this year  LA
A close examination of fairy tales and fantasies written for children but also addressed to adults. Questions to be considered will be literary, cultural, and psychological: the role of fantasy in an age of repression, didacticism versus amorality, male versus female writers, and the conventions of the Victorian fairy tale. Two lectures, one preceptorial.

W. Gleason

ENG 386 Literature and Environment (also ENV 386 )  Spring  LA
Examines how literature defines concepts of "nature" or "environment" from agrarian to postindustrial times. The course will consider rural-urban interaction; forms of pastoral and anti-pastoral; representations of plant or animal life; images of place and region; influence of geography, ecology, and evolutionary biology on modern literary expression. Two 90-minute seminars.

R. Nixon

ENG 388 The Female Literary Tradition (also GSS 399 )  Not offered this year  LA
The development of women's writing from the 18th century to the present with readings in poetry, fiction, and drama. Emphasis on relationships between gender and genre, and on historical, cultural, and theoretical issues raised by a female literary tradition. Two 90-minute seminars.

D. Nord

ENG 389 Women Writers of the African Diaspora (also AAS 389 / GSS 389 )  Not offered this year  LA
A reading of fiction by African, Caribbean, and African American women writers. Diverse strategies for addressing issues of race, gender, and culture in local, global, personal, and political terms are considered. Two lectures, one preceptorial.

D. Brooks

ENG 390 The Bible as Literature (also COM 207 / HUM 207 )  Fall  LA
The Bible will be read closely in its own right and as an enduring resource for literature and commentary. The course will cover its forms and genres, including historical narrative, uncanny tales, prophecy, lyric, lament, commandment, sacred biography, and apocalypse; its pageant of weird and extraordinary characters; and its brooding intertextuality. Students will become familiar with a wide variety of biblical interpretations, from the Rabbis to Augustine, Kafka and Kierkegaard. Cinematic commentary will be included--Bible films, from the campy to the sublime. One 90-minute lecture, one 90-minute preceptorial.

D. Smith

ENG 391 Shades of Passing (See AAS 340)

ENG 392 Topics in African American Literature (See AAS 392)

ENG 393 African American Autobiography (See AAS 325)

ENG 397 New Diasporas (also AAS 397 / COM 339 )  Fall  LA
This course will explore the works of contemporary authors of the African and Caribbean diaspora in Europe and North America in relation to the changing historical and cultural context of migration and globalization. The course will consider how these writers have represented the process of relocation, acculturation, and the transnational moment. What is the role of the imagination in the rethinking of identities lived across boundaries? Why and how do these authors use the term diaspora to describe their experiences? How do the works of a new generation of writers from Africa and the Caribbean transform theories of globalization?

S. Gikandi

ENG 401 Forms of Literature  Not offered this year  LA
Each term course will be offered in special topics of English and American literature. One three-hour seminar. Staff

ENG 402 Forms of Literature  Not offered this year LA
Each term course will be offered in special topics of English and American literature. One three-hour seminar. Staff

ENG 403 Forms of Literature  Not offered this year LA
Each term course will be offered in special topics of English and American literature. One three-hour seminar. Staff

ENG 404 Forms of Literature  Not offered this year LA
Each term course will be offered in special topics of English and American literature. One three-hour seminar. Staff

ENG 405 Topics in Poetry  Not offered this year LA
A focused view of a problem or issue in poetry, changing from year to year. Recent topics have emphasized problems of poetic language, metrics, poetry and social life, poetic influence and canonization, and the relations between poetry and other art forms. Two lectures, one preceptorial. J. Kotin

ENG 409 Topics in Drama (also THR 443 )  Not offered this year LA
A detailed discussion of different bodies of theatrical literature, with emphasis and choice of materials varying from year to year. The focus will be on a group of related plays falling within a specific historical period, the developing work of one playwright, or the relationships among themes, characterization, and structure. Two lectures, one preceptorial. M. Cadden

ENG 411 Major Author(s)  Not offered this year LA
A close study of the works of one or two authors. May include Austen, Dickinson, Wordsworth, George Eliot, Dickens, Melville, Faulkner, James, Stevens, or Woolf, among others. Two 90-minute seminars. Staff

ENG 412 Major Author(s)  Not offered this year LA
A close study of the works of one or two authors. May include Austen, Dickinson, Wordsworth, George Eliot, Dickens, Melville, Faulkner, James, Stevens, or Woolf, among others. One three-hour seminar. Staff

ENG 413 Major Author(s)  Not offered this year LA
A close study of the works of one or two authors. May include Austen, Dickinson, Wordsworth, George Eliot, Dickens, Melville, Faulkner, James, Stevens, or Woolf, among others. One three-hour seminar. Staff

ENG 414 Major Author(s)  Not offered this year LA
A close study of the works of one or two authors. May include Austen, Dickinson, Wordsworth, George Eliot, Dickens, Melville, Faulkner, James, Stevens, or Woolf, among others. One three-hour seminar. Staff

ENG 415 Topics in Literature and Ethics  Not offered this year EM
Courses offered under this rubric will investigate ethical questions in literature. Topics will range from a critical study of the textual forms these questions take to a historical study of an issue traditionally debated by both literature and ethics (responsibility, rhetoric, justice, violence, oppression). Two lectures, one preceptorial. L. Mitchell

ENG 416 Topics in Literature and Ethics  Spring EM
Courses offered under this rubric will investigate ethical questions in literature. Topics will range from a critical study of the textual forms these questions take to a historical study of an issue traditionally debated by both literature and ethics (responsibility, rhetoric, justice, violence, oppression). Two lectures, one preceptorial. S. Gikandi

ENG 417 Topics in Postcolonial Literature (also COM 423 / AFS 416 )  Spring LA
Approaches to the connections between literature and nationality, focusing either on literatures outside the Anglo-American experience or on the theoretical issues involved in articulating nationality through literature. Two 90-minute seminars. S. Gikandi

ENG 418 Topics in Postcolonial Literature  Not offered this year LA
Approaches to the connections between literature and nationality, focusing either on literatures outside the Anglo-American experience or on the theoretical issues involved in articulating nationality through literature. Two lectures, one preceptorial. D. Smith

ENG 419 Seminar. Types of Ideology and Literary Form (See COM 401)

ENG 420 The Lyric (See COM 309)
Program in Entrepreneurship

Director
Mung Chiang

Executive Committee
Markus K. Brunnermeier, Economics
Mung Chiang, Electrical Engineering
Melissa S. Lane, Politics
Kai Li, Computer Science
Lynn Loo, Chemical and Biological Engineering
Meredith A. Martin, English
Robert K. Prud'homme, Chemical and Biological Engineering
Jennifer L. Rexford, Computer Science

Eldar Shafir, Psychology, Woodrow Wilson School
Jacob N. Shapiro, Woodrow Wilson School, Politics
Thomas E. Shenk, Molecular Biology

Sits with Committee
Rakefet S. Kasdin, Electrical Engineering, Keller Center
Derek B. Lidow, Electrical Engineering, Keller Center
Christopher B. Kuenne, Electrical Engineering, Keller Center

Entrepreneurship is driving enormous social and economic changes that are shaping our collective future. The program has three main aims: to create focused pathways through the curriculum that will allow Princeton undergraduates to supplement work in their major departments with a systematic and coherent understanding of, and practice in, entrepreneurship; to leverage, expand, and enhance the University’s offerings across the liberal arts in order to fulfill the previously stated aim; and to promote an interdisciplinary academic community of undergraduate students, faculty members, and others who share an interest and commitment to learning from and contributing to these areas.

Admission to the Program
Student interested in the program will be expected to apply to the program director, normally at the end of the sophomore year and, in general, no later than the fall of the junior year. At the time of application, students must submit a short statement outlining a tentative plan and timeline for completing all of the requirements of the program. The statement will include an account of the two core courses and one breadth course (as explained below) that the student proposes to take, and explain how these courses fit into his or her aspirations for learning and practicing entrepreneurship.

Program of Study
The certificate program exposes students to different ways of understanding, conceptualizing, and for some, building enterprises that create value through positive impact on society, whether through a commercial or social venture. Students will develop necessary skills through a set of practicing courses such as “Entrepreneurial Value Creation,” “Entrepreneurial Leadership” and “Scaling the Enterprise.” But they will do so while developing a contextual understanding of the social forces at work through courses that might include, for example, “History of American Capitalism” or “Psychology of Decision-Making,” and more broadly, by developing an informed understanding of the social and global challenges to which entrepreneurship can seek to contribute.

Program Requirements
There are four sets of requirements:
- Courses (intellectual foundation)
- Workshop (practical skill acquisition)
- Practicum (learning by doing, with a high bar of excellence)
- Colloquium (shared social experience)
Requirement 1: Five Courses

Two common introductory courses: EGR 200/ENT 201 and EGR 201/ENT 200.
Two core courses: must be chosen from a list, which may be updated each year by the Executive Committee
One contextual breadth course: to be chosen from a list of suggestions or be proposed by students to the program director

Introductory Courses (two mandatory courses)
Currently EGR 201/ENT 200, Foundations of Entrepreneurship
Currently EGR 200/ENT 201, Introduction to Creativity, Innovation, and Design Thinking

Two Core Courses (choose two out of nine courses listed)
ANT 300 Ethnography, Evidence and Experience
COS 448 Innovating across Technology, Business, and Markets
EGR 491 Customer Discovery, Commercialization, and Value Propositions
EGR 497 Entrepreneurial Leadership
EGR 488 Designing Ventures to Change the World
EGR 489 Design of the Future
HIS 379 History of American Capitalism
SOC 345 Money, Work, and Social Life

One Breadth Course
Unlike the above list of core courses, the below list of possible breadth courses is illustrative only. Each student may suggest other courses outside of this list, subject to approval by the program director. Students from science or engineering must use a course from the humanities or social science to satisfy the breadth course requirement.

An illustrative list of possible breadth courses:
ANT 301 The Ethnographer’s Craft
ECO 317 Economics of Uncertainty
ECO 385 Ethics & Economics
HIS 481 History of the American Workplace
VIS 214/ARC 214/CWR 214 Graphic Design
VIS 439 Art as Interaction
POL 377 Rise of Asia: Political Economy of Development
POL 349 Political Economics
PSY 311 Rationality and Human Reasoning
PSY 420 The Psychology of Poverty
NEU 425 / PSY 425 Neuroeconomics
SOC 346 Sociology of the Cubicle: Work, Technology, and Organization
WWS 340 / PSY 321 Psychology of Decision Making

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Requirement 2: One Entrepreneurship Workshop

Workshops (without academic course credits) will be offered on practical skills involved in the entrepreneurship process, organized as supplements to credit-bearing courses – including and modeled on e-workshops offered currently at the E-Hub. These are short-term one-off or sessional workshops, normally of 3-12 hours in duration, and students will be required to complete at least one of their choice.

Requirement 3: Practicum

A high level of substantial creative and practical experience in entrepreneurship is required outside of classroom learning. The aim of the practicum is to foster the entrepreneurial mindset in certificate students, in all sorts of settings -- from startups, corporate-to-service organizations and not-for-profits, through “learning by doing.” The suggested model for the practicum encourages students to go through a process of customer research/empathy, hypothesis setting and testing, prototyping and deployment. It is encouraged, but not required, that this process lead to the actual creation of an entrepreneurial enterprise. Expectations of the practicum are as follows:

The student will develop a novel hypothesis in the practicum project, not one that they have already developed in class.
While the project may be supported through existing programs such as the eLab summer accelerator (for at least one summer full-time) and Tiger Challenge (for at least one year), it can happen independently of these.
Throughout the process, students should receive the mentorship of either faculty members or entrepreneurial mentors the University has identified.
The project proposal and the “final product” both would be reviewed by a committee appointed by the program director. Potential end users for this product/service could also be on the committee. The final presentation to the committee would not be a traditional investor pitch, but rather a discussion of how the hypothesis was derived and how the practical testing and prototype development and deployment was carried out. The evaluation of the practicum leads to a pass/fail result and would focus primarily on the process of entrepreneurial endeavor.

Requirement 4: Colloquium

Students are required to present their practicum, or a combination of their academic work and practicum, at least twice before graduation: in an annual program poster session and in one session of a periodic program colloquium. These social events also serve to foster community and conversation among the certificate students. The mentorship of faculty in certain practicing opportunities and of alumni in others will also help to build a greater sense of interaction across the Princetonian community of people with entrepreneurial interests.

Certificate of Proficiency

A student who fulfills the requirements of the program with satisfactory standing receives a certificate of proficiency in entrepreneurship upon graduation.

Courses

ENT 200 Foundations of Entrepreneurship (See EGR 201)
ENT 201 Creativity, Innovation, and Design (See EGR 200)
The Program in Environmental Studies (ENV) offers a vibrant, multidisciplinary forum for engaging the scientific, political, humanistic, and technological dimensions of the greatest environmental challenges facing the world today. Through this certificate program, students majoring in any discipline may pursue either a generalist track in environmental studies, or a specialist track that explores one of the following topic areas: (1) Biodiversity and Conservation, (2) Climate and Energy, (3) Earth Systems, (4) Environmental Policy, and (5) Environment and Water.

Experiential learning is integral to environmental studies at Princeton. Several of the courses offer laboratory and field work components. Additionally, the program offers many opportunities for students to apply for domestic and international internships after their freshman, sophomore, and junior years. Funding is also available for students wishing to conduct field research as a component of their independent work during the junior or senior year. Equally important to the life of the program are the colloquia and other events through which students may present their work and interact with leading scientists and policy makers in the field.

The Program in Environmental Studies is part of the Princeton Environmental Institute (PEI), the interdisciplinary center for environmental research, education, and outreach at Princeton University. PEI is committed to advancing knowledge and developing the next generation of leadership in the environmental field. The institute comprises several major interdisciplinary research centers and educational programs for undergraduate and graduate students.

Admission to the Program

The Program in Environmental Studies is open to all A.B. and B.S.E. students. Students interested in pursuing a certificate are encouraged to register as early as freshman year by completing the ENV Certificate Program Student Profile Form. Students should also meet with the director or the undergraduate administrator as soon as possible to plan a tentative course of study, including requirements for the generalist track or one of the specialist tracks.

Program of Study

Students in this certificate program, whether pursuing the generalist track or a specialist track, must complete five courses, investigate an environmental topic as an element of their departmental thesis, and participate in the senior year colloquium. Students must receive a grade of C or higher (no Pass/D/Fail) in all courses taken in fulfillment of the requirements for the ENV certificate.
Generalist Track

The generalist track is designed for students who wish to study multiple topics in environmental studies from a variety of perspectives (social, political, scientific, etc.).

Students following the generalist track must complete the following:

1. One foundation course: ENV 200, ENV 201A/B or ENV 302. Students enrolled in ENV 200 will select from one of several precept/lab varieties, the choice of which will fulfill differing distribution requirements (STL, QR, LA, EM or SA). ENV 201A/B is recommended for students who do not have a strong quantitative background. ENV 201A is offered without a laboratory, and satisfies the University's (STN) distribution requirement. Students interested in taking a foundation course with a lab should enroll in ENV 201B, as it satisfies the University's distribution requirement for science and technology with a laboratory (STL). Please note the laboratory option is not required for the certificate. ENV 302 involves more complex quantitative analyses and is recommended for students seeking indepth scientific exploration of environmental topics. Students should take their foundation course as early as possible in their academic careers.

2. Four ENV Courses, ENV cross-listed or any elective spanning the academic divisions of natural science, engineering, social science or humanities. Three of these four courses must be from different academic divisions and should be at the 300-level or higher. The fourth course may be from any division.

Students are encouraged to discuss elective choices with the director or undergraduate administrator early in their planning process. Courses that are not designated as ENV electives but have significant environmental content may also be accepted pending approval by the ENV director; this includes courses listed under the specialist tracks.

Academic Divisions

*Humanities electives* include courses with environmental relevance from departments such as Art and Archaeology, English, and Philosophy, as well as the School of Architecture.

*Social science electives* include courses with environmental relevance from departments such as Anthropology, Economics, History, Politics, and the Woodrow Wilson School.

*Natural science electives* include courses with environmental relevance from departments such as Chemistry, Ecology and Evolutionary Biology, Geosciences, Molecular Biology, and Physics.

*Engineering electives* include courses with environmental relevance from departments such as Chemical and Biological Engineering, Civil and Environmental Engineering, and Mechanical and Aerospace Engineering.

Courses from each of the four cognate areas are identified on the program website.

**Courses**

ENV 200: The Environmental Nexus
ENV 201A Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy
ENV 201B Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy
ENV 202A Fundamentals of Environmental Studies: Climate, Air Pollution, Toxics, and Water
ENV 202B Fundamentals of Environmental Studies: Climate, Air Pollution, Toxics, and Water
ENV 302 Advanced Analysis of Environmental Systems
ENV 303 Introduction to Environmental Engineering (See CEE 303)
ENV 304 Disease Ecology, Economics, and Policy
ENV 305 Topics in Environmental Studies
ENV 306 Topics in Environmental Studies
ENV 310 Environmental Law and Moot Court
ENV 312 Marine Biology (see EEB 312)
ENV 316 Climate Science and Communications
ENV 319 Environmental Economics (see WWS 306)
ENV 321 Ethical and Scientific Issues in Environmental Policy (see CHV 321)
ENV 327 Investigating an Ethos of Sustainability at Princeton
ENV 328 Energy for a Greenhouse-Constrained World (see MAE 328)
ENV 331 Environmental Geochemistry: Chemistry of the Natural Systems (see GEO 363)
ENV 333 Oil to Ozone: Chemistry of the Environment (see CHM 333)
ENV 334 Global Environmental Issues (see CEE 334)
ENV 339 Climate Change: Scientific Basis, Policy Implications (see GEO 366)
ENV 357/ENG 398/AMS 457/GSS 357 Empire of the Ark: The Animal Question in Film, Photography and Popular Culture
ENV 361 Physics of the Ocean and Atmosphere (see GEO 361)
ENV 362 Biogeochemistry of the Ocean and Atmosphere (see GEO 362)
ENV 363/ENG 337 Writing the Environment through Creative Nonfiction
ENV 370 Sedimentology (see GEO 370)
ENV 386 Literature and Environment (see ENG 386)
ENV 406 Energy and Form (see ARC 406)
ENV 407: Africans Feeding Africa
ENV 417A Ecosystems and Global Change (see EEB 417A)
ENV 417B Ecosystems and Global Change (see EEB 417B)
ENV 431 Solar Energy Conversion (see ELE 431)
ENV 433 Comparative Environmental History (see HIS 431)
ENV 474 Special Topics in Civil and Environmental Engineering (see CEE 474)
ENV 499 Environmental Change, Poverty, and Conflict (see GEO 499)

**Specialist Tracks**

Students who wish to focus their environmental studies on a particular set of environmental issues and challenges may choose one of five specialist tracks.

Students must complete two foundation courses one on environmental science and one on environmental policy preferably during their sophomore or junior year:

Either: ENV 302: Advanced Analysis of Environmental Systems, or EEB 321: Ecology: Species Interactions, Biodiversity, and Society and:
In addition to the foundational science and policy courses, students in the specialized tracks must take three additional courses at the 300-level or above, chosen from among the courses designated for the particular track they are pursuing. Except with the approval of the director or the undergraduate administrator, at least one of these three elective courses may not count toward the student's departmental concentration or another certificate. In all cases, students are encouraged to meet with the program director or undergraduate administrator in order to choose an appropriate sequence of courses.

**Biodiversity and Conservation track**

The Biodiversity and Conservation track is intended for students interested in conservation and understanding the biological diversity of Earth's natural ecosystems. Through courses in species interactions and biodiversity, ecosystems and climate change, conservation biology, sustainable agriculture and food security, students will investigate factors that contribute to changes in biological diversity over time, and will gain a greater understanding of the planet's ever changing and dynamic natural systems.

**Courses**

AMS 364/ENV 365: Environmental and Social Crisis
CEE 307/EEB 305: Field Ecohydrology
CEE 334/WWS 334/ENV 334: Global Environmental
CEE 391/EGR 393: Innovation and the Built and Natural Environment
EEB 308: Conservation Biology
EEB 312: Marine Biology
EEB 321 Ecology: Species Interactions, Biodiversity, and Society
EEB 322: Advanced Ecology
EEB 323 Integrative Dynamics of Animal Behavior
EEB 324: Theoretical Ecology
EEB 328: Ecology and Epidemiology of Parasites and Infectious Diseases
EEB 332/LAS 350: Pre-Columbian Peoples of Tropical America and Their Environments
EEB 338: Tropical Biology
EEB 346: Biology of Coral Reefs
EEB 341/WWS 490: Water, Savannas and Society
EEB 350: Vertebrate Tropical Biology
EEB 352: Restoration Ecology
EEB 380: Ecology and Conservation on African Landscapes
EEB 382: Tropical Agriculture
EEB 406: Biology of African Animals and Ecosystems
EEB 417/ENV 417: Ecosystems and Climate Change
ENV 302/CEE 302/EEB 302: Advanced Analysis of Environmental Systems
ENV 304/ECO 328/EEB 304/WWS 496: Disease Ecology, Economics, and Policy
ENV 316: Climate Science and Communications
ENV 327: Investigating an Ethos of Sustainability at Princeton
ENV 363/ENG 337: Writing the Environment Through Creative Nonfiction
Climate and Energy track

The Climate and Energy track is designed for students interested in one of today's most complex and urgent challenges: the environmental impact of our global energy system. Students will be exposed to the interdisciplinary dimensions of climate-energy problems and examine the complex links that exist between the growth of global population and affluence, greenhouse gas emissions, ecosystem responses, and policy alternatives. Among the topics to be explored are adaptation, mitigation, and the suffering resulting from global climate change.

Courses
AMS 364/ENV 365: Environmental and Social Crisis
ARC 406/ENV 406: Energy and Form
AST 309/MAE 309/PHY 309/ENE 309: Science and Technology of Nuclear Energy: Fission and Fusion
CBE 335/MAE 338/ENV 335/ENE 335: The Energy Water Nexus
CBE 421/CHM 421/ENE 421: Catalytic Chemistry
CEE 303/ENV 303/URB 303: Introduction to Environmental Engineering
CEE 304/ENE 304/ENV 300: Environmental Implications of Energy Technologies
CEE 305/GEO 375/ENE 305: Environmental Fluid Mechanics
CEE 311/CHM 311/GEO 311/ENE 311: Global Air Pollution
CEE 334/ENV 334/WWS 334: Global Environmental Issues
CEE 477/ENE 477: Engineering Design for Sustainable Development
CHM 333/ENV 333: Oil to Ozone: Chemistry of the Environment
CHM 406: Advanced Physical Chemistry, Chemical Dynamics and Thermodynamics
EEB 417B/ENV 417B: Ecosystems and Global Change
ELE 428/MAE 428/CEE 428: Cleaner Transport Fuels, Combustion Sensing and Emission Control
ELE 431/MAE 431/ENV 431/EGR 431/ENE 431: Solar Energy Conversion
ELE 455/CEE 455/MAE 455/MSE 455: Mid-Infrared Technologies for Health and the Environment
ENV 302/CEE 30/EEB 302: Advanced Analysis of Environmental Systems
ENV 327: Investigating an Ethos of Sustainability at Princeton
ENV 357/ENG398/AMS 457/GSS357: Empire of the Ark: The Animal Question in Film, Photography and Popular Culture
ENV 363/ENG 337: Writing the Environment through Creative Nonfiction
GEO 201/WRI 201/ENV 230: Measuring Climate Change
GEO 366/ENV 339/WWS 451/ENE 366: Climate Change: Scientific Basis, Policy Implications
GEO 430: Climate and the Terrestrial Biosphere
HIS 422/NES 422: Energy and Empire
MAE 228/EGR 228/CBE 228/ENE 228: Energy Solutions for the Next Century
Earth Systems track
The Earth Systems track is designed for students interested in the atmospheric, oceanographic, and environmental aspects of Earth's natural processes and in understanding these dynamics in the context of the global environment. Students will select from among courses that address the geochemical and biological factors that modify the Earth's surface; explore the evolution of Earth as a physical system; and probe the interaction of Earth's oceans and atmosphere with the climate system.

Courses
AMS 364/ENV365: Environmental and Social Crisis
CEE 391/EGR 393: Innovation and the Built and Natural Environment
EEB 417B/ENV 417B: Ecosystems and Global Change
ENV 302/CEE 302/EEB 302: Advanced Analysis of Environmental Systems
ENV 327: Investigating an Ethos of Sustainability at Princeton
ENV 357/ENG 398/AMS 457/GSS 357: Empire of the Ark: The Animal Question in Film, Photography and Popular Culture
ENV 363/ENG 337: Writing the Environment through Creative Nonfiction CHM
333/ENV 333: Oil to Ozone: Chemistry of the Environment
GEO 201/WRI 201/ENV 203: Measuring Climate Change: Methods in Data Analysis and Scientific Writing
GEO 361/ENV 361/CEE 360: Physics of the Ocean and Atmosphere
GEO 363/CHM 331/ENV 331: Environmental Geochemistry: Chemistry of the Natural Systems
GEO 364/ CHM 364: Earth Chemistry: The Major Realms of the Planet
GEO 365: Evolution and Catastrophes
GEO 366/ENV 339/WWS 335: Climate Change: Scientific Basis, Policy Implications
GEO 370/ENV 370/CEE 370: Sedimentology
GEO 372: Earth Materials
GEO 415: Introduction to Atmospheric Sciences
GEO 417/ ENV 363: Environmental Microbiology
GEO 418/ENV 364: Environmental Aqueous Geochemistry
GEO 419/ENV 365: Physics and Chemistry of Earth's Interior
GEO 423/CEE 423: Dynamic Meteorology
GEO 425/ENV 366: Introduction to Physical Oceanography
GEO 427 Fundamentals if the Earth's Climate System
GEO 428: Biological Oceanography
GEO 430: Climate and the Terrestrial Biosphere
GEO 470/CHM 470: Environmental Chemistry of Soils
**Environmental Policy track**

The Environmental Policy track is intended for students who wish to expand their understanding of pressing environmental issues and their policy solutions. Students will address the economic, political, scientific, and social aspects of environmental policy, gaining a diverse set of skills to approach environmental problems that challenge global leaders in the 21st century.

**Courses**

AMS 364/ENV 365: Environmental and Social Crisis
ANT 204/ENV 208: Food and Power
AST 309: Science and Technology of Nuclear Energy: Fission and Fusion
CEE 334/ENV 334/WWS 334: Global Environmental Issues
CHM 333/ENV 333: Oil to Ozone: Chemistry of the Environment
CHV 321/ENV 321/WWS 371: Ethical and Scientific Issues in Environmental Policy
ECO 329/ENV 319: Environmental Economics
EGR 277/SOC 277/HIS 277: Technology and Society
ENV 201A/B: Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy
ENV 202A/B: Fundamentals of Environmental Studies: Climate, Air, Pollution, Toxics, and Water
ENV 302/CEE 302/EGR 302: Advanced Analysis of Environmental Systems
ENV 304/ECO 328/EGR 304/WWS 496: Disease Ecology, Economics, and Policy
ENV 310 Environmental Law and Moot Court
ENV 316: Climate Science and Communications
ENV 327: Investigating an Ethos of Sustainability at Princeton
ENV 357/ENG 398/AMS 457/GSS 357: Empire of the Ark: The Animal Question in Film, Photography and Popular Culture
ENV 363/ENG 337: Writing the Environment through Creative Nonfiction
GEO 366/ENV 339/WWS 335: Climate Change: Scientific Basis, Policy Implications
ENV 407: Africans Feeding Africa
GEO 201/WRI 201/ENV 203: Measuring Climate Change: Methods in Data Analysis and Scientific Writing
GEO 499/ENV 499: Environmental Change, Poverty, and Conflict
HIS 422: History and Empire
HIS 431/ENV 433: Comparative Environmental History
MAE 228/EGR 228/CBE 228/ENE 228: Energy Solutions for the Next Century
MAE 328/EGR 328/ENV 328/ENE 328: Energy for a Greenhouse Constrained World
WWS 406/ECO 429: Issues in Environmental and Natural Resource Economics WWS 350:
The Environment: Science and Policy

**Environment and Water track**

The Environment and Water track is intended for students who wish to delve deeply into the scientific and technical dimensions of domestic and global water resources and management. Students will select from among courses on topics that include eco-hydrology, land surface-atmosphere interactions, the energy-water nexus, climate variability and its impact on the water cycle, as well as the biogeochemistry and remediation of contaminated water.
Courses

AMS 364/ENV 365: Environmental and Social Crisis
CBE 335/MAE 338/ENV 335: The Energy Water Nexus
CEE 304/ENE 304/ENV 300: Environmental Implications of Energy Technologies
CEE 303/ENV 303/URB 303: Introduction to Environmental Engineering
CEE 305/GE 375/ENE 305: Environmental Fluid Mechanics
CEE 306: Hydrology
CEE 307/EEB 305: Field Ecohydrology
CEE 308: Environmental Engineering Laboratory
CEE 471/GE 471/URB 471: Introduction to Water Pollution Technology
CEE 477: Engineering Design for Sustainable Development
CEE 487/ENV 487: Ecohydrology
CHM 406: Advanced Physical Chemistry, Chemical Dynamics and Thermodynamics
EEB 341/ENV 341: Water, Savannas and Society: Resilience and Sustainability in African Dry lands
EEB 417B/ENV 417B: Ecosystems and Global Change
ENV 202A/B: Fundamentals of Environmental Studies: Climate, Air, Pollution, Toxics, and Water
ENV 302/CEE 302/EEB 302: Advanced Analysis of Environmental Systems
ENV 327: Investigating an Ethos of Sustainability at Princeton
ENV 357/ENG 398/AMS457/GSS 357: Empire of the Ark: The Animal Question in Film, Photography and Popular Culture
ENV 363/ENG 337: Writing the Environment through Creative Nonfiction
GEO 201/WRI 201/ENV203: Measuring Climate Change: Methods in Data Analysis and Scientific
GEO 361/ENV 362/CEE 360: Physics of the Ocean and Atmosphere
GEO 363/CHM 331/ENV 331: Environmental Geochemistry: Chemistry of the Natural Systems
GEO 364/CHM 364: Earth Chemistry: The Major Realms of the Planet
GEO 370/ENV 370/CEE 370: Sedimentology
GEO 418/CHM 418: Environmental Aqueous Geochemistry
GEO 427: Fundamentals of the Earth's Climate System

Program Requirements

Senior Thesis. Students in the program are expected to examine an environmental issue as a component of their senior thesis. The topic must be approved by both the director as well as the departmental representative in the student's concentration. The environmental content of the senior thesis will be reviewed as part of the senior thesis colloquium (see below). Students who find it difficult to incorporate an environmental topic into their departmental senior thesis should meet with the director of the ENV program to find a suitable alternative as early as possible in their senior year.

Senior Colloquium. All ENV students pursuing the certificate are required to participate in a faculty-led colloquium during their senior year. The senior colloquium involves a series of gatherings over the course of the academic year that offers students a unique and important forum for discussing outcomes of their independent work and exchanging perspectives on global environmental issues. One of the most important aspects of the senior colloquium is the interdisciplinary dialogue facilitated by the participation of students and faculty members from a wide range of academic departments. The culmination of the senior colloquium in the spring is PEI's Discovery Day, a poster
presentation that allows students to share the final outcomes of their thesis research with fellow students, faculty, and staff.

Certificate of Proficiency

Students who meet the requirements of the program receive a certificate of proficiency in environmental studies upon graduation.

Scholar's Forum. Students in the program will also have the opportunity to participate in a self-governed Scholar's Forum, in which they interact with leading scientists and policy makers who are invited to visit throughout the academic year.

Courses

ENV 102A Climate: Past, Present, and Future (See GEO 102A)
ENV 102B Climate: Past, Present, and Future (See GEO 102B)
ENV 201A Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy (also STC 201A) Not offered this year STN
This course explores how human activities have affected land use, agriculture, fisheries, biodiversity, and the use of energy in the USA and around the world. Students examine the fundamental principles underlying contemporary environmental issues, and use case studies to illustrate the scientific, political, economic, and social dimensions of environmental problems. Two lectures, one preceptorial. K. Caylor, D. Wilcove
ENV 201B Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy (also STC 201B) Not offered this year STL
This course explores how human activities have affected land use, agriculture, fisheries, biodiversity, and the use of energy in the USA and around the world. Students examine the fundamental principles underlying contemporary environmental issues, and use case studies to illustrate the scientific, political, economic, and social dimensions of environmental problems. Two lectures, one preceptorial, one three-hour laboratory. K. Caylor, D. Wilcove, C. Riihimaki
ENV 202A Fundamentals of Environmental Studies: Climate, Air Pollution, Toxics, and Water Not offered this year STN
This course will focus on the environmental consequences of human activities and their interactions with natural systems on global scales, focusing on four main areas of current environmental concern: climate and global change; the atmosphere and air pollution; toxics in the environment; and water resources exploitation and pollution. Underlying principles will be explored for each topic, with examples and case studies used to highlight interconnections between the scientific, technological, political, economic, and social dimensions of environmental issues. Two lectures, one preceptorial. B. Ward
ENV 202B Fundamentals of Environmental Studies: Climate, Air Pollution, Toxics, and Water Not offered this year STL
This course will focus on the environmental consequences of human activities and their interactions with natural systems on global scales, focusing on four main areas of current environmental concern: climate and global change; the atmosphere and air pollution; toxics in the environment; and water resources exploitation and pollution. Underlying principles will be explored for each topic, with examples and case studies used to highlight interconnections between the scientific, technological, political, economic, and social dimensions of environmental issues. Two lectures, one preceptorial, one three-hour laboratory. B. Ward, E. Zerba
ENV 203 Measuring Climate Change: Methods in Data Analysis and Scientific Writing (See GEO 201)
ENV 206 Designing Sustainable Systems (See ENE 202)
ENV 207 Introduction to Environmental Engineering (See CEE 207)
ENV 230 Culture and the Environment in East Asia (See EAS 230)
ENV 250 Architecture, Globalization, and the Environment (See ART 250)
ENV 266 Oil, Energy and The Middle East (See NES 266)
Humans are increasingly affecting environmental systems throughout the world. This course uses quantitative analysis to examine three of today's most pressing issues: energy, water, and food. Each issue is examined from perspectives of natural and engineered ecosystems that depend on complex interactions among physical, chemical, and biological processes. The course is an introduction for students in the natural sciences and engineering pursuing an advanced program in environmental studies. We emphasize quantitative analyses with applications to a wide range of systems, and the design of engineered solutions to major environmental problems. L. Hedin, M. Celia

The dynamics of the emergence and spread of disease arise from a complex interplay among disease ecology, economics, and human behavior. Lectures will provide an introduction to complementarities between economic and epidemiological approaches to understanding the emergence, spread, and control of infectious diseases. The course will cover topics such as drug-resistance in bacterial and parasitic infections, individual incentives to vaccinate, the role of information in the transmission of infectious diseases, and the evolution of social norms in healthcare practices. One three-hour lecture, one preceptorial.

C. Metcalf, B. Grenfell

Examining the relationship between law and environmental policy, this course focuses on cases that have established policy principles. The first half of the seminar will be conducted using the Socratic method. The second half will allow students to reargue either the plaintiff or defendant position in a key case, which will be decided by the classroom jury. One three-hour seminar. G. Hawkins

Climate change has the potential to wreak great havoc over the next century, threatening ecosystems, economies, and human lives. Scientists are putting enormous effort into trying to understand the causes, effects, and possible solutions to the climate-change problem. Yet the public still has only a vague idea of what climate science actually says, and much of that is badly distorted. The course will explore how to communicate to the public about climate change through print, Web, and video, in ways that are at once clear, compelling, and scientifically rigorous. One three-hour seminar. M. Lemonick, H. Cullen

Achieving sustained human and environmental health is a global priority given increasingly disruptive economic, social and environmental conditions. Evidence suggests that humanity is capable of producing sustainable technological and social solutions, but must do so between now and mid-century. This course explores social/ethical dimensions of the sustainability challenge through an evaluation of related ethics and psychology of social norms literature, and includes an exercise in proposing evidence-based solutions toward cultivating an ethos of sustainability on the Princeton campus as a demonstration-scale system. S. Weber
ENV 350 The Environment: Science and Policy (See WWS 350)
ENV 355 Economics of Food and Agriculture (See ECO 355)
ENV 357 Empire of the Ark: The Animal Question in Film, Photography and Popular Culture (also ENG 398 / AMS 457 / GSS 357) Fall
This course explores the current fascination with animals in film, photography and popular culture, engaging central issues in animal and environmental studies. Why has looking become our main way of interacting with animals? How does rethinking animals inspire us to rethink being human? How can we transform our relations with other species and the planet? Course themes include: wilderness, national parks and zoos; the cult of the pet; vampires, werewolves and zombies; animal speech, animal emotions and rights; nature, sexuality and race. Exploring planetary crises such as extinction and climate change, and positive strategies for change. A. McClintock

ENV 361 Earth's Atmosphere (See GEO 361)
ENV 362 Earth's Climate History (See GEO 362)
ENV 363 Writing the Environment through Creative Nonfiction (also ENG 337) Fall LA This workshop will expose participants to some of the most dynamic, adventurous environmental nonfiction writers while also giving students the opportunity to develop their own voices as environmental writers. We'll be looking at the environmental essay, the memoir, opinion writing, and investigative journalism. In the process we'll discuss the imaginative strategies deployed by leading environmental writers and seek to adapt some of those strategies in our own writing. Readings will engage urgent concerns of our time, like climate change, extinction, race, gender and the environment, and relations between humans and other life forms. R. Nixon

ENV 365 Environmental and Social Crisis (See AMS 364)
ENV 370 Sedimentology (See GEO 370)
ENV 372 Topics in Comparative Literature (See COM 370)
ENV 384 Dilemmas of Development in Asia (See EAS 302)
ENV 386 Literature and Environment (See ENG 386)
ENV 401 Environmental Policy Workshop Not offered this year
The workshop will focus on currently unresolved environmental policy questions from the perspective of the scientific evidence available to support alternative interventions and the accompanying social, economic, and political trade-offs and conflicts that require adjudication. Prerequisite: 201 or permission of instructor. B. Singer

ENV 406 Energy and Form (See ARC 406)
ENV 407 Africa's Food and Conservation Challenge (also AFS 407) Fall SA
This course will explore the economic, environmental, and social challenges of meeting growing food needs in sub-Saharan Africa. The region today has the lowest crop yields, the highest percentage of hungry people, and the highest population growth rates, and relies heavily on firewood for energy. The region also has vast areas of environmentally valuable forests and savannas. It has technical opportunities to produce crops better but faces challenges from high rainfall variability and climate change. The course will balance instruction, guest lectures and presentations by student teams, which will also produce a final paper. T. Searchinger

ENV 417A Ecosystems and Global Change (See EEB 417A)
ENV 417B Ecosystems and Global Change (See EEB 417B)
ENV 431 Solar Energy Conversion (See ENE 431)
ENV 433 Comparative Environmental History (See HIS 431)
ENV 474 Special Topics in Civil and Environmental Engineering (See CEE 474)
ENV 487 Ecophyiology (See CEE 487)
ENV 491 History of Ecology and Environmentalism (See HIS 491)
ENV 492 Topics in the Formal Analysis of the Urban Structure (See ARC 492)
ENV 496 Princeton Atelier (See ATL 496)
Program in Ethnographic Studies

Director
Carol J. Greenhouse

Acting Director
Elizabeth A. Davis (fall/spring)

Executive Committee
Mark R. Beissinger, Politics
Amy B. Borovoy, East Asian Studies
Anne C. Case, Woodrow Wilson School, Economics
Miguel A. Centeno, Sociology, Woodrow Wilson School
Elizabeth A. Davis, Anthropology
Mitchell Duneier, Sociology
Carol J. Greenhouse, Anthropology
Judith Hamera, Lewis Center for the Arts, Dance
David Leheny, East Asian Studies
Naomi E. Leonard, Mechanical and Aerospace Engineering
Daniel I. Rubenstein, Ecology and Evolutionary Biology
Martha A. Sandweiss, History
J. Nicole Shelton, Psychology
Jeffrey L. Stout, Religion
Susan L. Sugarman, Psychology
Stacy E. Wolf, Lewis Center for the Arts, Theater
Deborah J. Yashar, Woodrow Wilson School, Politics

The Anthropology Department offers a certificate in ethnographic studies for concentrators in other departments.

What is ethnography? Ethnography is hands-on learning about people in their communities, shaped by the recognition of cultural diversity both at home (wherever that may be) and abroad. Relevant wherever people are relevant, ethnography is a qualitative research method central to knowing the world from the standpoint of its social arrangements. It is also a distinctive method of representing that knowledge effectively in writing. It is as useful for work in the natural sciences and engineering as it is integral to the social sciences and humanities, relating to many forms of academic and personal experience: studying abroad, doing international internships, conducting independent research, or engaging in community service. Students of ethnography learn to recognize, read, and evaluate qualitative evidence; apply their insights to everyday life; and think critically about society across diverse cultural fields at their sites of study, service, and research.

What can I expect to learn? The certificate program in ethnographic studies (ETH) is intended for undergraduate students in all divisions as a supplement or complement to their department concentration or other certificate studies. Students learn how to apply ethnographic methods and ethics as an additional resource during study abroad, internships, and independent research. Field sites may be international or U.S.-based. As students return to campus from the field, the program helps them integrate their experience "away" with their academic work at Princeton. In this way, ethnographic studies may enrich students' experience within their own fields of study, or just deepen their personal appreciation of the human dimensions of globalization and other aspects of the modern world.

What does the certificate program offer? A pair of core courses on key concepts and ethnographic research methods and ethics, elective courses on methods and cultural analysis, and advising support for an ethnographic component in students' independent research in fulfillment of the program's writing requirement — either as part of the senior thesis or as a separate paper.
Admission to the Program

Students may register for the program at any time after their first enrollment at Princeton. There are no prerequisites. Courses taken prior to program registration may be counted. Students curious about the ethnographic studies certificate are encouraged to meet with a program staff member by requesting an appointment using the online enrollment form.

Program Requirements

1. Five courses comprising a core sequence of two ANT courses plus three electives chosen from two lists. Program courses must be completed with a minimum grade of B. Since the certificate is intended to supplement or complement the program of study in the student's department of concentration, no more than one course taken in fulfillment of that concentration may be counted toward the certificate. Likewise, no more than a total of two courses that are counted toward other certificate(s) may be counted toward fulfillment of ETH requirements, no matter how many other certificates the student pursues.

2. Ethnographic research, normally conducted over at least four weeks.

3. A senior thesis that addresses the student's ethnographic research in some explicit way (throughout the thesis or as a discrete chapter, as appropriate), or a separate paper if the student's ethnographic study is unrelated to the thesis topic. Students should plan their writing component carefully in consultation with their major adviser and the certificate adviser.

The ethnographic studies certificate program provides advising on an ongoing basis. This advising is supplemental to, and does not replace, senior thesis advising in the student's department of concentration.

Core courses:

**ANT 300A** "Ethnography, Evidence and Experience": A theory course that explores the relationship between foundational ethnographic concepts and field experience, and between experience and evidence — designed to support students' integration of ethnographic studies into their independent work. (Fall semester course; may be taken anytime up to and including fall of senior year.)

**ANT 301A** "The Ethnographer's Craft": A methods course that introduces students to the practical aspects of ethnographic research, including research ethics — designed to support students' development of a research proposal for ethnographic research to be undertaken during the summer before senior year. (Spring semester course; may be taken anytime but no later than spring of junior year.)

Descriptions of the core courses can be found under the course listings of the Department of Anthropology. In Ethnographic Studies, ANT 301A is designed for second-semester juniors and ANT 300A is designed for first-semester seniors, but either or both courses may be taken earlier, assuming adequate preparation. (See "Study Abroad" section below for more details.)
Elective courses:

In addition to the core courses, certificate students are required to take three additional courses, including at least one course listed under *Ethnographic Methods and Research Ethics* (to help students integrate ethnographic inquiry with research methods that they learn during their broader course of study) and at least one course listed under *Ethnographic and Cultural Contexts* (to give students opportunity to apply cultural analysis in local, regional, or institutional contexts involving diverse subjects, settings, and/or media). The three electives for each student must be chosen from courses offered by at least two different departments.

Elective courses are listed on the ethnographic studies program website. These courses are subject to annual review by the executive committee and may be edited to reflect changes in course offerings.

Ethnographic fieldwork:

Students are required to undertake ethnographic research, drawing on the diverse methods introduced in ANT 301A and the "methods and ethics" electives. Fieldwork should be the student's main activity over the course of at least four weeks (normally continuous), and may be undertaken in conjunction with study abroad, international or community-based internships, or other positions. Prior to beginning their fieldwork, students will demonstrate proficiency in the relevant field or contact language (*see Language Requirements, below*) and acquire Institutional Review Board (IRB) approval for research projects involving human subjects, if applicable.

While the program does not provide funding for research, funding opportunities are available through offerings by departments, centers, other programs, and the Office of the Dean of the College. Advising is available for ethnographic studies certificate students who apply for research funding.

Language Requirements

Language instruction and assessment of proficiency are available through regular Princeton courses. Students whose fieldwork requires a language not taught at Princeton should consult the program.

Independent Work

Certificate students are required to develop a thesis topic or dedicated chapter that addresses their ethnographic research in some explicit way. In circumstances where a departmental thesis is not required, or where dedicated thesis material is not appropriate, a separate paper of approximately 20-30 pages is required.

Study Abroad

Students are encouraged (but not required) to study abroad. Students who anticipate studying abroad for one semester in the spring of their junior year should take ANT 301A early. Otherwise, with the approval of the program, students may substitute an equivalent course taken abroad. Please note that ANT 301A or any equivalent course taken abroad *must* be taken by the end of the junior year. One elective taken abroad, equivalent to Princeton offerings, may also be counted toward the certificate. The final approval of a course taken abroad is contingent upon review of the student's study abroad transcript and grade earned at the relevant institution. Students who study abroad during other semesters, or for a full year, should consult the program well in advance, to coordinate their course schedules.
Certificate of Proficiency

Students who complete the program requirements will be awarded a certificate in ethnographic studies upon graduation.
Program in European Cultural Studies

Director
Brigid Doherty

Executive Committee
David A. Bell, History
Sandra L. Bermann, Comparative Literature
Eduardo L. Cadava, English
Brigid Doherty, German, Art and Archaeology
Rubén Gallo, Spanish and Portuguese
Daniel Garber, Philosophy
Anthony T. Grafton, History
Eric S. Gregory, Religion, ex officio
Wendy Heller, Music

Michael W. Jennings, German
Jan-Werner Müller, Politics
Serguei A. Oushakine, Anthropology, Slavic Languages and Literatures
Spyridon Papapetres, Architecture
Anson G. Rabinbach, History
Eileen A. Reeves, Comparative Literature
Efthymia Rentzou, French and Italian
Thomas A. Trezise, French and Italian

Sits with Committee
Irena G. Gross, Slavic Languages and Literatures

The Program in European Cultural Studies was established in 1975 on the joint initiative of a number of faculty members in History, Comparative Literature, Romance Languages and Literatures, Politics, and Architecture, under the leadership of the eminent cultural historian Carl E. Schorske (1915-2015). Its first certificate class graduated in 1979. Now housed on the second floor of Scheide Caldwell House within the Andlinger Center for the Humanities, ECS enjoys the administrative support of the Council of the Humanities.

Since its inception, the Program in European Cultural Studies has maintained two central aims: to deepen students’ understanding of European civilization, and to strengthen their command of cultural interpretation through interdisciplinary investigation. Committed since its founding to encouraging our students’ engagement at an international level, ECS now also endeavors to situate the study of Europe in broader global contexts. The Program brings together students and faculty from a wide range of departments in a common inquiry. Our focus is, broadly stated, the ways in which European societies, past and present, order reality, make sense of life, and communicate meaning across a range of disciplines and in a wide variety of media. In order to frame these wide-ranging intellectual problems in precise, productive, and engaging ways, ECS offers innovative, interdisciplinary seminars on topics in European history, literature, art, architecture, music, cinema, theater, politics, and philosophy.

Admission to the Program

Students from a wide variety of majors in the humanities, social sciences, natural sciences, and engineering choose to complete a certificate in European Cultural Studies. The Program's courses involve interdisciplinary approaches to the analysis of the products of European culture, from novels, operas, paintings, and photographs, to urban geography and land-use patterns. There are no pre-requisites for admission to the ECS certificate program. However, ECS/EPS 301, ECS/EPS 302, and the HUM 216-219 sequence are each recognized as excellent gateway courses that also count towards fulfillment of the ECS certificate program requirements.

Students normally apply to join the program by the fall of their junior year. Early concentrators, latecomers, and students with further questions about the certificate are urged to contact Brigid Doherty, Director, for additional information.
Program of Study

All students must complete either HUM 216-219 or ECS/EPS 301 or EPS/ECS 302. In addition, they must also take two 300-level ECS seminars, and they are encouraged to enroll in a 400-level ECS seminar. The majority of these seminars are cross-listed with other departments in the Humanities and Social Sciences.

The program has three final requirements. In their junior year, students will take part in a full-day excursion to a cultural event or exhibition in New York, and will also participate in the visit of the program's annual distinguished Faber lecturer. The ECS Junior Excursion is typically scheduled on a weekend and always includes a festive group meal. For the annual ECS Faber Lecture, juniors participate in a mealtime discussion with the speaker on a topic related to the lecture.

In their senior year, ECS students participate in the Senior Thesis Colloquium supervised by the program director. Although ECS certificate students complete their theses under the direction of their home departments, in late winter and early spring of the senior year they join the ECS director to meet one day a week, over a meal, to address common challenges of research, conceptualization, organization, and writing. Each student submits a chapter to the group for discussion during one of the weekly meetings. Though most ECS students address European topics in their theses, this is not a requirement of the program; for the purposes of the workshop, certificate students from the sciences or engineering may substitute a paper written for a 300-level ECS course for circulation and discussion.

Certificate of Proficiency

Students who fulfill all the requirements will receive a certificate upon graduation.

Courses

ECS 302 Landmarks of European Identity (See EPS 302)

ECS 303 Memory, Democracy, and Public Culture: Berlin and Its Pasts (See POL 402)

ECS 306 Descartes, Spinoza, and Leibniz (See PHI 303)

ECS 308 Postcolonial Literature/Postcolonial Criticism (See COM 308)

ECS 310 European Romanticism and War (also GER 335 / COM 313 / ENG 324 ) Fall LA
Counter to received wisdom, it is in the Romantic period, not the 20th century, that war assumes its modern form as "total war." We will examine how literary, philosophical, and artistic Romanticisms grapple with this new phenomenon. Subtopics include: war, media, technology; landscape, spectatorship, and the sublime; cosmpolitanism, nationalism, and the concept of Europe. Readings from Kant, Hegel, Coleridge, Charlotte Smith, Fichte, Clausewitz, Kleist, Stendhal, Austen, de Quincey, and Hazlitt, along with recent scholarship on this topic (Bell, Favret, Mieszkowski), and relevant critical theory (Freud, Butler). D.
Hoffman-Schwartz

ECS 318 Image of the Jew in Russian Visual Culture and Literature (See SLA 318)

ECS 319 The Modern Period (See COM 318)
ECS 320 Cultural Systems  Not offered this year
Symbolic systems and social life in specific historical eras. Topics will vary. Recent courses include, for example, magic, art, and science in Renaissance culture, political discourse and nationalism, culture and inequality, history of technology, and the rhetoric of new media. Staff

ECS 321 Cultural Systems (also SPA 333 / COM 389 )  Spring LA
Symbolic systems and social life in specific historical eras. Topics will vary. Recent courses include, for example, magic, art, and science in Renaissance culture, political discourse and nationalism, culture and inequality, history of technology, and the rhetoric of new media. Staff

ECS 330 Communication and the Arts  Not offered this year LA
The arts and the media in different cultures. Topics will vary, for example, history of the book, art/architecture and society, opera and nationalism, literature and photography, theater and politics. Staff

ECS 331 Communication and the Arts (also HIS 430 / HLS 332 )  Not offered this year LA The arts and the media in different cultures. Topics will vary, for example, history of the book, art/architecture and society, opera and nationalism, literature and photography, theater and politics. Staff

ECS 333 Early Modern Philosophy (See PHI 332)

ECS 338 Early Modern Media (See ART 338)

ECS 340 Literature and Photography (also COM 340 )  Not offered this year LA
A survey of the history of the rapport between literature and photography, looking closely at a number of literary and theoretical texts that differently address questions central to both literature and photography: questions about the nature of representation, reproduction, memory and forgetting, history, images, perception, and knowledge. One three-hour seminar. E. Cadava

ECS 341 What is Vernacular Filmmaking? (See COM 341)

ECS 342 Literature and Photography (also COM 342 / ENG 363 )  Fall LA
Since its advent in the 19th century, photography has been a privileged figure in literature's efforts to reflect upon its own modes of representation. This seminar will trace the history of the rapport between literature and photography by looking closely at a number of literary and theoretical texts that differently address questions central to both literature and photography: questions about the nature of representation, reproduction, memory and forgetting, history, images, perception, and knowledge. E. Cadava

ECS 345 Modernism and Modernity in Literature and the Visual Arts (See GER 374)

ECS 354 East European Literature and Politics (See SLA 345)

ECS 355 Art & Nationalism in Modern Italy (also ART 340 / ARC 355 / HUM 355 )  Fall LA
Following Italian unification Massimo d'Azaglio remarked, "Italy has been made; now it remains to make Italians." This course examines the art and architectural movements of the roughly 100 years between the 1848 uprising and the beginning of the World War II, a critical period for defining Italianità. Topics include the paintings of the Macchiaioli, reactions to the 1848 uprisings and the Italian Independence Wars, the politics of 19th Century architectural restoration in Italy, the re-urbanization of Italy's new capital Rome, Fascist architecture and urbanism, and the architecture of Italy's African colonies. Staff

ECS 358 Surrealism: Sex, Dreams, and Revolution (See FRE 358)

ECS 362 Stolen Years: Youth under the Nazis in World War II (See COM 362)

ECS 364 France and its Empire, 1500-1815 (See HIS 364)
ECS 369 Beyond Crisis: Contemporary Greece in Context (See COM 369)

ECS 370 Weimar Germany: Painting, Photography, Film (See GER 370)

ECS 372 Writing About Art (Rilke, Freud, Benjamin) (See GER 372)

ECS 374 Afterlives of the Iliad (See COM 374)

ECS 376 The Body in Space: Art, Architecture, and Performance (also ARC 376 / ART 386) Spring LA
An interdisciplinary investigation of the status of the human body in the modern reinvention of space within the overlapping frames of art, architecture, and the performing arts, from the fin-de-siècle to the present. Works by artists, architects, theater designers, and film makers who address the human figure in space will be supplemented by readings on architectural theory, intellectual and cultural history, psychoanalysis, anthropology, and aesthetics. Course will address issues of bodily empathy, the relation between bodily perception and space, as well as the animation and mechanization of bodies and things inside modern enclosures. S. Papapetros

ECS 378 A Different Kind of Cinema: Can Contemporary Film Makers Resist Hollywood? (See COM 387)

ECS 391 Holocaust Testimony (also COM 391 / JDS 391) Spring LA
This course focuses on major issues raised by but also extending beyond Holocaust survivor testimony, including the communication of trauma, genres of witnessing, the ethical implications of artistic representation, conflicts between history and memory, the fate of individuality in collective upheaval, the condition of survival itself, and the crucial role played by reception in enabling and transmitting survivors' speech. Staff

ECS 397 Polish Literature on Screen (See SLA 396)

ECS 414 "What is Enlightenment"? Social and Political Theory in the Age that Defined "the Human" (See COM 414)

ECS 419 Conceptions of the Sensory (See COM 419)

ECS 429 History of European Fascism (See HIS 429)

ECS 449 The French Enlightenment (See HIS 449)

ECS 451 Artist as Idea: Leonardo to Warhol (See ART 451)

ECS 458 Seminar. Modern Architecture (See ART 458)

ECS 486 Order and Chaos in Eighteenth-Century European Art (See ART 486)
Program in Finance

Director
Markus K. Brunnermeier

Executive Committee
Dilip J. Abreu, Economics
Mark A. Aguiar, Economics
Yacine Aït-Sahalia, Economics
Alan S. Blinder, Economics, Woodrow Wilson School
Markus K. Brunnermeier, Economics
René A. Carmona, Operations Research and Financial Engineering
Jianqing Fan, Operations Research and Financial Engineering
Maryam Farboodi, Economics
Mikhail Golosov, Economics
Harold James, History, Woodrow Wilson School
Jakub Kastl, Economics
Nobuhiro Kiyotaki, Economics
Alan B. Krueger, Woodrow Wilson School, Economics
Atif R. Mian, Woodrow Wilson School, Economics
Stephen E. Morris, Economics
Ulrich K. Mueller, Economics
John M. Mulvey, Operations Research and Financial Engineering
Christopher A. Sims, Economics
K. Ronnie Sircar, Operations Research and Financial Engineering
Robert J. Vanderbei, Operations Research and Financial Engineering
Mark W. Watson, Woodrow Wilson School, Economics
Wei Xiong, Economics

Under the auspices of the Bendheim Center for Finance, Princeton undergraduates concentrating in any department may earn a certificate that attests to their proficiency in the discipline of finance. The rapidly developing field of finance focuses on the pricing of financial assets, including equities, bonds, currencies, and derivative securities; portfolio management and the evaluation of financial risks; banking and financial intermediation; the financing of corporations; corporate governance; financial-market and banking regulation; and many other topics. In addition to the obvious practical relevance of finance, the field contains both challenging intellectual problems and a distinctive formal framework within which those problems can be addressed. Knowledge of modern finance is also essential to the proper understanding of many other topics in economics and public policy, including the determination of exchange rates and international capital flows, the making of monetary and fiscal policy, the role of financial reform in developing and transition economies, the regulation and taxation of financial markets and financial instruments, and antitrust policy. Finally, modern finance is remarkably eclectic, drawing from many disciplines besides economics, including mathematics, operations research, engineering, computer science, psychology, politics, and history.

Admission to the Program

Students normally enter the certificate program at the beginning of their junior year. Interested students must submit a completed application form by May 31 of their sophomore year to the program representative. The application should include a brief description of the student's plan to fulfill the independent work requirement (see below) and a short essay explaining the student's interest in the finance certificate. Criteria for admission include the overall academic record of the student in the freshman and sophomore years, the plan to complete the independent work, and an essay. See the Program in Finance website for more details.
As economic theory, mathematics, and probability and statistics are pervasive in modern financial analysis, completion of the certificate in finance requires mathematical ability and preparation. The following foundation courses, or their equivalent, are required for admission into the program and (except as noted) must be completed by the end of the sophomore year. ECO and ORF majors require a higher level of proficiency in the prerequisite courses to ensure that the independent work is sufficiently quantitative. Consequently, ECO and ORF majors must have a minimum average grade of B- calculated across all prerequisites. All courses require a letter grade (pass/fail not allowed).

1. **Mathematics:** MAT 175 (Mathematics for Economics/Life Sciences), or MAT 201 (Multivariable Calculus) and MAT 202 (Linear Algebra with Applications), MAT 203 (Advanced Vector Calculus), and MAT 204 (Advanced Linear Algebra with Applications)

2. **Economics:** ECO 310 (Microeconomic Theory: A Mathematical Approach)

3. **Probability and Statistics:** ORF 245 (Fundamentals of Engineering Statistics), or ECO 202 (Statistics and Data Analysis for Economics), or PSY 251 (Quantitative Methods), or SOC 301 (Sociological Research Methods), or POL 345 (Quantitative Analysis and Politics), WWS 200 (Statistics for Social Science) or WWS 332 (Quantitative Analysis for Public Policy), or PHY 301 (Thermal Physics) and PHY 312 (Experimental Physics), or a score of 5 in AP Statistics.

**Program of Study**

1. A total of five courses, at level 300 or higher. All students must have a minimum grade of C+ averaged over the core courses, the elective courses, and the independent work.

   a) The two core courses, ECO 362 (Financial Investments) and ECO 363 (Corporate Finance and Financial Institutions), typically completed during the junior year.

   b) Three electives chosen from the two lists of elective courses found on the program's website. List 1: Financial Applications, and List 2: General Methodology for Finance. ECO and ORF majors must take at least two of their three elective courses from List 1. All other concentrators must take at least one of their three elective courses from List 1. The program representative can approve a coherent plan of study that involves elective courses outside the preapproved lists.

2. A senior thesis in the major department (or other form of independent work required by their concentration) with significant finance content (subject to approval of the program representative). "Significant finance content" means that a substantial component of the thesis will involve issues or methods drawn from finance. Faculty affiliated with the Bendheim Center can provide secondary thesis advising as the need arises. If there is no possibility of finance content in the senior thesis, a separate, shorter piece of independent work is required; please consult with the program representative.

**Certificate of Proficiency**

Students who fulfill all the requirements will receive a certificate upon graduation.
Sample Elective Selection. Elective courses may be selected either according to individual needs and preferences, or to conform to one of five suggested tracks, listed below. These tracks are intended to be illustrative of coherent courses of study that students might choose. It is not necessary for a student to designate or complete a particular track to satisfy the certificate requirements.

1. Mathematical Finance Track. Students in this track study the mathematics of financial price theory, including stochastic calculus and its applications to arbitrage and equilibrium in dynamic economies. Relevant courses include ECO 317, 414, 465, 466; MAT 305, 391, 392; ORF 309, 311, 515.

2. Corporate Finance Track. Students in this track study issues such as the choice and financing of investment projects, firms' determination of dividend policy, optimal capital structure, financial reorganization, mergers and acquisitions, and the management and regulation of banks and other financial institutions. Relevant courses include ECO 317, 322, 342, 361, 490, 464; ELE 491.

3. Derivatives Pricing and Risk Management Track. Students in this track focus on the determination of the prices of options, futures, and other derivative securities, and on the management of their risks. Relevant courses include APC 350; CEE 460; COS 323; ECO 302, 312, 463, 465, 466, 491; MAT 304, 331; ORF 309, 335, 374, 405, 435, 474, 515.

4. Investment Management Track. Students in this track study the design and functioning of asset markets around the world, the theory of optimal portfolios, the behavior and determinants of asset returns, and techniques of portfolio management. Relevant courses include COS 323; ECO 311, 342, 353, 462, 463, 464, 465, 466, 492, 493; HIS 364; ORF 307, 311, 405, 435; WWS 340.

5. Information Technologies for Finance Track. Students in this track study the computer-based technologies that are becoming increasingly important in finance, such as the design of efficient trading systems, algorithms, interfaces and large databases, and the security of computer networks. Relevant courses include COS 318, 323, 333, 423, 425, 432, 436, 461, 496; ECO 461; MAT 305.

6. Behavioral Finance Track. Students in this track study how human psychology, including many documented behavioral biases, influence financial decision-making and ultimately asset prices. Relevant courses include ECO 462, 467, 468; WWS 340/PSY 321; NEU/PSY 425.

7. Finance and Public Policy Track. Students in this track study the interaction between finance and policy, including public finance, response to financial crisis, central banking, and securities law. Relevant courses include ECO 361, 491, 492, 493; WWS 340/PSY 321, WWS 466, 594N, 582F.
The Department of French and Italian offers a liberal arts major designed to give students a thorough grounding in the language, literature, and culture of one or more of the subjects it teaches, seen as independent disciplines or in
combination with other languages and cognate subjects. Its courses provide practical instruction in the French and Italian languages; the literatures and cultures of France and Italy in all periods, from medieval to contemporary; and literature in French written in other parts of Europe, Asia, Africa, and the Americas.

Students are encouraged to complement their courses in French and/or Italian with related and varied courses in other literatures, art history, history, political science, sociology, comparative literature, or other humanities subjects.

In addition to serving as the focus for an education in liberal arts, the French and Italian concentrations can be the basis for graduate or professional study. In mostly small classes and seminars, allowing extensive student/teacher interaction, students become equipped to take up careers in many walks of life, including journalism, business, law, government service, and international affairs. For non-majors, the department offers a rich set of language courses, from introductory to very advanced. It also offers a popular certificate program, allowing the study of French and Italian to be combined with concentration in history, architecture, English, politics, or any other subject available at Princeton.

Information and Departmental Plan of Study

The French Language Program. An Advanced Placement score of 5 or an SAT Subject Test score of at least 760 is required to satisfy the A.B. foreign language requirement at entrance, or for admission to a 200-level course.

Students who wish to continue a language begun in secondary school must have their proficiency measured either by a College Board score or by a placement test administered prior to course registration. Placement will depend on previous training and proficiency.

The normal program for beginners seeking a basic mastery of French is the sequence 101, 102, 107, which satisfies the University's language requirement. Normally students electing a beginner's course in any language will receive credit only if two terms are completed.

Students showing particular gifts in 101 may be admitted to the accelerated, double-credit spring course, 102-7, which also satisfies the University's language requirement.

Students with advanced placement in French will be placed in either 103 or 105 and will proceed to either 107 or 108 to satisfy the University language requirement. They also may be placed directly into 108. Students who have successfully completed 107 cannot take 108.

Course credit in 107 or 108 is also available through approved summer courses abroad (see Study and Work Abroad below). Funding may be available for selected and committed students. Students must pass a placement test upon their return to satisfy the language requirement.

The Italian Language Program. An Advanced Placement score of 5 or an SAT Subject Test score of at least 760 is required to satisfy the A.B. foreign language requirement at entrance, or for admission to a 200-level course.

Students who wish to continue a language begun in secondary school must have their proficiency measured either by a College Board score or by a placement test administered prior to course registration. Placement will depend on previous training and proficiency.
The normal program for beginners seeking a basic mastery of Italian is the sequence 101, 102, 107, which satisfies the University's language requirement. Normally students electing a beginner's course in any language will receive credit only if two terms are completed.

Students showing particular gifts in 101 may be admitted to the accelerated, double-credit spring course, 102-7, which also satisfies the University's language requirement.

Students with advanced placement in Italian will be placed in 107 to fulfill the University language requirement.

Course credit in 107 is also available through approved summer courses abroad (see Study and Work Abroad below). Funding may be available for selected and committed students. Students must pass a placement test upon their return to satisfy the language requirement.

All questions concerning placement and summer study are dealt with by the language coordinator in the relevant program.

**Advanced Placement**

For information about advanced placement, see the French and Italian language programs described above.

**Prerequisites**

The normal requirement for admission to the department is successful completion of at least one, preferably two, 200-level courses, including one of the following: FRE 211, 215, 221, 222, 224, or 225; ITA 208, 209, or 220. Students who have not satisfied this prerequisite by the end of sophomore year should consult with the departmental representative. Concentrators who plan to participate in one of the certificate programs, such as African studies, African American studies, European cultural studies, Latin American studies, or the study of women and gender, must also satisfy the prerequisites of that program.

**Early Concentration**

Qualified students are encouraged to begin departmental concentration in the sophomore year. This has the advantage of a longer period for independent work and preparation of the senior thesis; it also makes a semester or junior year abroad more feasible.

**Program of Study**

All students are expected to include one advanced language course (FRE 207, 307, 407; ITA 207, 307) in their subject(s) of concentration. Any two of the following courses can count as one course credit for departmental requirement: FRE 211, 215, 221, 222, 224, 225; ITA 208, 209, 221, 222.

Courses taught in the department place varying emphases on language, literary history and interpretation, aesthetics and literary theory, and cultural and intellectual history. Students are therefore able to pursue courses of study that are consistent with their own interests. To complement this individualized approach to students' plans of study, the department offers four distinct tracks within the concentration in French and/or Italian:
1. Concentration in One language, literature, and culture. Students concentrate in French or Italian. Eight upper-division courses are counted toward concentration. At least five of these must be in the language and subject of concentration. Up to three of the eight may be cognate courses approved by the departmental representative and drawn from other sections of the department or from other humanities and social science subjects.

2. Concentration in Two languages, literatures, and cultures. Students intending to combine work in two languages, civilizations, and cultures normally take a minimum of eight upper-division courses: five in one of the languages (one of which may be a cognate), and three in the other relevant language. The first language of concentration must be either French or Italian.

3. Concentration in Literature and Any other related field approved by the departmental representative. Students intending to combine work in French or Italian and another related field normally take a minimum of eight upper-division courses: five in the relevant language and literature (one of which may be a cognate), and three in the other field. For example, students specializing in French or Italian and History, Politics, or Art and Archaeology, might take appropriate courses in those departments, such as HIS 345, 350, 351, or 365; POL 371, 372, 381, or 391; or ART 319, 320, or 333.

4. Concentration in Literature and the Creative Arts. This track is designed for students wishing to combine work in French or Italian and a creative art, such as theater, music, dance, painting, film, and creative writing. Upon approval by the departmental representative, the student normally would take a minimum of eight upper-division courses: five in the relevant language and literature and three in the field related to the art of interest. In some cases, an original work of creation (e.g., paintings, prose, or poetry), or of performance (e.g., theater), may substitute for the senior thesis. In these cases, students will be required also to submit a substantial critical work of at least 6,000 but no more than 10,000 words (25-35 pages), in which they will position and discuss their creative work in relation to the historical and cultural context of the language in question.

Important Note: Any upper-level French or Italian course taught in English will require all written work to be completed in French or Italian in order to count toward the concentration.

**Independent Work**

Junior Papers. At the time of entering the department, and in all cases no later than spring of the sophomore year, students should discuss their likely area of interest with the departmental representative in order to make the attribution of junior advisers as appropriate as possible. The adviser will be assigned at the beginning of junior year. Students should get in touch with their Junior Adviser and plan regular meetings. In consultation with their adviser, students will also choose the language in which they will draft their paper. Responsibility for making and keeping these arrangements falls on the student.

The first junior paper, written in the fall semester, should be about 4,000 words. The second junior paper, written in the spring semester, should be between 5,000 and 8,000 words. Both junior papers may be written in English, in which case a three-page summary in the relevant language must be provided. If the paper is written in the relevant language, a three-page summary in English is required.

Students following tracks 2 or 4 may write one junior paper in one of their two subjects of concentration, and one in the other.
In preparing their papers students should conform to the principles specified in the University's instructions for the writing of essays. Presentation should follow either the Modern Language Association Handbook or The Chicago Manual of Style, with consistency.

Senior Thesis. As the culmination of their independent work, senior students write a thesis on an approved topic. Late in their junior year, students will discuss possible areas of interest with the departmental representative. Topics chosen in the past have ranged across the field of French and Italian studies, from linguistic problems and literary techniques to close textual analysis to thematic and ideological study. Students primarily interested in culture and civilization have written on art, on political and economic issues, on education, and on a variety of social questions. For students following tracks 2, 3, and 4, joint supervision may be arranged. The senior thesis is a major commitment of a student's time and energy, and the most important yardstick for choosing a topic is willingness to spend many hours immersed in that particular set of texts or problems.

To help the students plan and clarify their topics and to respond to specific questions they may have when they enter the writing phase, the department holds a Senior Thesis Writers Group workshop once a month, starting in October, and continuing through the Spring semester. This opportunity to exchange ideas in an informal way has proved to be intellectually stimulating and productive of real progress towards completion of the writing process.

Concentrators in French and/or Italian who are also earning certificates should consult with their advisers about selecting a suitable thesis topic. The senior thesis may be written in English, in which case a three-page summary in the relevant language must be provided. If the thesis is written in the relevant language, a three-page summary in English is required.

Senior theses should not be more than 20,000 words, nor should they fall below 15,000 words.

**Senior Departmental Examination**

The examination, taken in May of the senior year, is designed to test aspects of the student's entire program of study in the department. A list of required and recommended readings is provided for each of the languages and literatures taught in the department, and guides students in preparing for the written examination. The format of the examination is as follows:

1. **Written Component (three hours) in class, including:** (a) A sight translation. This exercise will consist of the translation of a short prose text (500 words or less) from French or Italian into English. The resulting translation should reflect the linguistic command and stylistic sophistication expected from a reasonably proficient speaker of French or Italian. For concentrators following Track 2, and combining French and Italian, the original text will be given in the dominant language. (b) An essay written in the language of specialization. Students will choose one topic out of three culture/literature questions. Topics will be based on the reading lists and course offerings.

2. **Oral Presentation (30 minutes).** A brief (10-15 minutes) oral presentation, in the language of concentration (French or Italian), followed by a discussion. The content of the presentation will be determined and prepared by the student in concert with his/her adviser, and may reflect any aspect of the student's own general intellectual and academic experience in the department. It may therefore stem from the senior thesis, but also largely refer to the overall course of study achieved in the subject of concentration. The examining committee will be constituted by at least two permanent faculty of each section.
Note: In order to better prepare for the comprehensive examination, students are strongly encouraged to include either FRE 307 or ITA 307 in their departmental course work.

**Study and Work Abroad**

The department strongly encourages its concentrators and certificate students to spend as much time as they can in any country, including those in Africa, where the language(s) they study is (are) widely spoken. There are several ways of doing this within the four-year undergraduate degree: by study abroad for one or two semesters; by summer study abroad; or by obtaining summer work or an internship abroad.

Junior Semester/Junior Year Abroad. Students planning to spend semester or their whole junior year abroad should seek advice from the departmental representative and from relevant faculty in choosing a suitable program of study. Further assistance is available from the Office of International Programs. Departmental and University approval is required.

Grades awarded by foreign institutions for courses that are recognized in lieu of Princeton courses are not included in the computation of departmental honors.

Students studying abroad for one or two semesters are not exempted from independent work requirements. The responsibility for consulting with advisers, as well as for meeting all normal deadlines, lies with the student.

An approved one-semester course of study abroad normally counts for two departmental course credits. Students must complete the program abroad to the standard required by the foreign institution.

Summer Language Study. The department has a special relationship with the Institut International de Langue IS Aix-en-Provence, which offers intensive four-week language courses in French at various levels. The department has established a similar relationship with the University of Macerata, offering intensive language courses in Italian. The department is able to provide financial support to a small number of students in each of these courses each year.

It also maintains ties with the Bryn Mawr College summer programs held in Avignon, in French language, literature, art, and civilization (including social, political, and economic institutions). See the departmental representative if you are interested in one of these programs.

Summer Work Abroad. Princeton-in-France is a long-established summer work program that selects students who qualify linguistically to take on the responsibilities of a paying summer job or internship in France. Travel grants and salary supplements are available to students who receive financial aid. Announcements will be made early in the fall concerning a November information meeting about the program. The application deadline is early December.

Information about other placements and internships abroad may also be obtained from the director of international internships in the Office of International Programs.
Certificate in Language and Culture

Admission. The program is open to undergraduates in all departments. Students should consult the departmental representative by the beginning of the junior year. Ordinarily, students concentrating in language and literature departments, including comparative literature, will be eligible for the certificate in language and culture provided that: (a) the linguistic base for the language and culture certificate is different from the linguistic base of the concentration; and (b) the work required for the language and culture certificate does not duplicate the requirements of the major. Students pursuing area studies certificates may earn the certificate in language and culture provided that: (a) the courses they elect to satisfy the requirements of the area studies program are different from those they elect to satisfy the requirements of the language and culture certificate program; and (b) they submit a piece of independent work in addition to the independent work that satisfies the requirements of the area studies program.

Application forms are available from the departmental office located in 303 East Pyne and on the FIT website. A separate application must be completed for each language in which a certificate will be pursued.

Plan of Study. The Certificate in Language and Culture is available in French and Italian and involves satisfactory completion of the following course requirements:

1. Four departmental courses in the relevant language, linguistics, literature, or culture, excluding courses that do not have a language prerequisite. At least three of these courses must be at the 300 level (or higher). At the 200 level, the course must be higher than FRE 207 and ITA 207. Courses below these levels are not eligible. At the discretion of the departmental representative, a student may substitute one pre-approved course per semester abroad, or one pre-approved course taken in the summer. A 200-level course is a prerequisite for taking 300-level courses in French or Italian. Courses must be taken for a letter grade, no Pass/D/Fail or Audit.

Please note: Any upper-level French or Italian course taught in English will require all written work to be completed in French or Italian in order to count toward the concentration.

2. Independent Work. This requirement can be satisfied in one of several ways: (a) by a substantial paper on a topic agreed upon with the student's appointed adviser; (b) by a substantial paper growing out of one of the courses taken to fulfill the certificate requirement (this paper is in addition to the work required in the course; the subject and scope of this paper will be agreed upon with the student's appointed adviser); or (c) with the agreement of the student's home department, a student may submit a junior paper or a senior thesis that satisfies the requirements of both the home department and the Department of French and Italian. A junior paper or senior thesis of this sort must be based in substantial part on foreign language sources and display effective competence in utilizing the relevant language as an indispensable research tool.

Papers of types (a) and (b) are approximately 4,000 to 5,000 words in length. Students are urged to write them in the appropriate foreign language. Alternatively, they may submit the independent work in English together with a 700- to 1,000-word summary in the foreign language. Students submitting a junior paper or a senior thesis in lieu of independent work [in line with option (c) above] must also submit the summary in the foreign language.
Courses

FRE 101 Beginner's French I Fall
An audio-visual approach is used to develop the skills of listening, speaking, reading, and writing French in a cultural context. The main emphasis is on acquiring competence through aural/oral practice. Classroom activities include videos, comprehension and grammar exercises, conversation, and skits. Five classes; laboratory required. No credit is given for 101 unless followed by 102. Staff

FRE 102 Beginner's French II Spring
A continuation of 101. The audio-visual approach promotes proficiency through listening and speaking French. Growing emphasis on reading and writing. Classroom activities include videos, discussions, small group work, and comprehension and grammar exercises. A midterm interview with instructor, and a final oral presentation. Five classes; laboratory required. Prerequisite: 101. Students who complete 102 normally place into 107. Staff

FRE 1027 Intensive Intermediate and Advanced French Spring
An intensive double-credit course designed to help students develop an active command of the language. Focus will be on reading and listening comprehension, oral proficiency, grammatical accuracy, and the development of reading and writing skills. A solid grammatical basis and awareness of the idiomatic usage of the language will be emphasized. Students will be introduced to various Francophone cultures through readings, videos, and films. Prerequisite: 101 and permission of instructor. Five 90-minute classes. Staff

FRE 103 Intensive Beginner's and Intermediate French Fall/Spring
An intensive course that covers 101 and 102 in one semester. Designed for students who have previously studied French but whose preparation is either too remote or insufficient for direct placement in intermediate French. An audio-visual approach is used to develop concurrently the skills of listening, speaking, reading, and writing French in a cultural context. Classroom activities include videos, discussions, small group work, comprehension and grammar exercises, and conversation. Five classes; laboratory required. Normally followed by 107. Staff

FRE 105 Intermediate French Fall
Designed for students who have a satisfactory foundation in French but are not yet qualified for 108. Grammar review, composition, reading of standard French texts, and practice in listening and speaking. Three classes, laboratory as deemed necessary. Prerequisites: two to five years of secondary school French and a satisfactory score on the placement test. Normally followed by 108. C. Sagnier

FRE 107 Intermediate/Advanced French Fall/Spring
A continuation of 102. Develops an active command of spoken and written French through class discussion and compositions. Continued presentation and review of grammar. Acquisition of reading skills through short readings. Five classes. Normally open only to students who have successfully completed 102 or 103. Staff

FRE 108 Advanced French Fall/Spring
An intensive course aimed at developing an active command of the language. Syllabus includes the reading of literary texts, and class exercises emphasize comprehension and oral proficiency. Three classes. Prerequisite: 105 or satisfactory score on placement test. Staff

FRE 207 Studies in French Language and Style Fall/Spring
Intensive practical training in oral and written French through a study of French culture and society. Strong emphasis on discussion. Film series. Recommended as preparation for advanced courses in French literature and civilization. Three classes. Prerequisite: 107 or 108. Staff

FRE 211 French Theater Workshop (also THR 211 ) Fall/Spring LA
An intensive practical training in French through an introduction to acting techniques and an exploration of the French dramatic canon. Emphasis is placed on improving students' oral skills through pronunciation and diction exercises and the performance of scenes from French playwrights. Course culminates in the performance of students' work. Prerequisite: FRE 107, 108, or the equivalent. FRE 207 recommended as a co-requisite. Two 90-minute classes. F. Masse

FRE 215 France Today: Culture, Politics, and Society Fall
Intensive language practice and readings from French textbooks for students of economics and politics, focusing on the concepts and vocabulary of the modern international economy. Prerequisite: a 200-level course in French, or instructor's permission. Two 90-minute classes. C. Sagnier

FRE 221 The Rise of France: French Literature, Culture, and Society from the Beginnings to 1789 Fall LA
A study of the evolution of French literature, culture, and society from the beginnings to the Revolution: the Middle Ages, the Renaissance, Neo-Classicism, and the Enlightenment. The distinguishing cultural and social ideas of these four periods will be defined and analyzed, and representative cultural productions (the cathedrals, the
châteaux of the Loire, Versailles, etc.) will be discussed in context. A few major literary texts will constitute primary readings. Prerequisites: 107, 108, or equivalent. 207 recommended as a corequisite. Two 90-minute classes. Staff

FRE 222 The Making of Modern France: French Literature, Culture, and Society from 1789 to the Present

Spring LA
A historical survey of the main features of French society, literature, and culture from the period of the French Revolution (1789-99) to the present. Weekly lectures cover political, intellectual, and cultural history, while precepts and readings focus on representative literary texts (drama, lyric poetry, and fiction) as well as examples of French art and film. Prerequisites: 107, 108, or equivalent. 207 recommended as a corequisite. Two 90-minute classes. Staff

FRE 224 French Literature: Approaches to the Language of Literary Texts

Fall/Spring LA
The application of various critical methods to the interpretation of texts (short fiction, drama, and poetry) from all periods. Topics will include themes, narrative and rhetorical strategies, authorial voice, implicit reader, and genre theory. Two 90-minute classes. Prerequisite: 107, 108 or equivalent. 207 recommended as a corequisite. A. Benhaïm

FRE 307 Advanced French Language and Style

Fall/Spring
Intensive practice of written and spoken French through close analysis of grammatical and syntactic structures, literary translation, and the stylistic study of representative literary works from the Middle Ages to the present. Prerequisite: a 200-level French course or instructor's permission. Two 90-minute classes.

FRE 313 Contemporary French Civilization

Fall SA
The evolution of 20th-century French institutions and their relationship to intellectual and social movements since World War I. New directions taken by French thought will be stressed through the study of individuals, selected from representative fields, whose influence led to the restructuring of contemporary French civilization. Two 90-minute classes. Prerequisite: a 200-level course in French or instructor's permission. Staff

FRE 321 The Invention of Literature and Culture in France (also GSS 330)

Fall/Spring LA
The birth of literature in the Middle Ages in France is accompanied by remarkable inventiveness. From the glamour of troubadour love songs to the somber passion of heroic poetry, from the refinements of chivalric romance to the bawdy of (fabliaux), from intricate lyric forms to complex prose romances, medieval writers not only practiced but constantly re-created the emergent concept of "literature," elaborating, as they did so, such legendary tales as those of Roland, Tristan, Lancelot, and the grail. Prerequisite: a 200-level course in French or instructor's permission. One 90-minute lecture, one 90-minute preceptorial. A. Benhaïm

FRE 327 Tales of Hospitality: France, North Africa, and the Mediterranean (also COM 357)

Fall EM
An exploration of the concept of hospitality, individual and collective, in French, Mediterranean, and Maghrebi (i.e., North African: Arab, Berber, and Jewish) cultures. Draws on materials from literature and the arts, politics and law, philosophy and religion. Issues studied include immigration, citizenship, alienation, and, more generally, the meaning of welcoming a stranger. Prerequisite: a 200-level course in French or instructor's permission. One 90-minute lecture, one 90-minute preceptorial. Staff

FRE 330 Landmarks of French Culture (also AFS 330)

Spring LA
An interdisciplinary study of places, periods, persons, or questions that helped define French cultural identity, from its origins to the present. Areas of study could include courtly love; gothic art; the Encyclopedia; the Belle Époque; the Figure of the Intellectual from Zola to Simone de Beauvoir; the sociocultural revolution of May 1968; colonization, its discontents, and its aftermaths; France in the age of globalization; Franco-American relations; etc. Prerequisite: a 200-level course in French or instructor's permission. Two 90-minute classes. Staff

FRE 331 French Renaissance Literature and Culture

Fall LA
Readings from the works of Rabelais, the Pléiade poets, Marguerite de Navarre, Montaigne, and d'Aubigné in the light of contemporary artistic, political, and cultural preoccupations. Themes will include the rhetoric of love, education, humanism, recurrent mythologies, and utopias. Two 90-minute classes. Prerequisite: a 200-level course in French or instructor's permission. K. Chenoweth
FRE 332 Topics in the French Middle Ages and Renaissance Spring LA
The continuities of French culture and its preeminence over much of Europe from its 11th-century beginnings through the 16th century. Emphasis on medieval and Renaissance literary works (in modernized versions) in their relationship to topics such as "love" (fin'amor), saintliness, national identity, humanism, and so on. Prerequisite: a 200-level course in French or instructor's permission. One 90-minute lecture, one 90-minute preceptorial. K. Chenoweth

FRE 341 The Classical Age Fall LA
An introduction to the literature and culture of the 17th century, known in France as le grand siècle. Readings range from the dramatic masterpieces of Corneille, Molière, and Racine to La Fontaine's Fables and Perrault's Contes, to be studied in relationship to their historical context. Formal and thematic analysis with an emphasis on moral, social, and political tensions and conflicts. Two 90-minute classes. Prerequisite: a 200-level French course or instructor's permission. V. Schröder

FRE 351 The Age of Enlightenment LA
Examines the challenge to the political and cultural authority of the ancien régime from new ideas, values, and rhetorics. The emphasis may fall on the work of an individual writer or group of writers, a genre or subgenre (the epistolary novel, the popular scientific essay), or the role of literary institutions (journalism, salons, censorship). Two 90-minute classes. Prerequisite: a 200-level French course or instructor's permission. Staff

FRE 352 Topics in 17th- and 18th-Century French Literature (also GSS 352) Spring LA
Topics will range from single authors and major texts (for example, the Encyclopedie) to literary genres and questions of culture (preciosite, comedy and/or tragedy, historiography, epistolary writing, etc.). Prerequisite: a 200-level course in French or instructor's permission. Two 90-minute classes. V. Schröder

FRE 353 The Old Regime: Society and Culture in France, 1624-1789 Fall/Spring LA
The age of French political and cultural hegemony is characterized by the construction of the modern state, the imposition of strict social discipline, and the rationalization of large areas of human behavior. These processes will be studied in political and philosophical writings, plays, novels, poems, and memoirs. Prerequisite: a 200-level course in French or instructor's permission. Two 90-minute classes. V. Schröder

FRE 357 Literature, Culture, and Politics (also TRA 357) Fall/Spring LA
Literary texts represent and often question relations of power and cultural norms, but as a form of knowledge, literature is itself implicated in power relations. Topics range from the work of a writer or group of writers who composed both fiction and political theory or commentary to the function of censorship and of literary trials. Prerequisite: a 200-level course in French or instructor's permission. One 90-minute lecture, one 90-minute preceptorial. G. Blix

FRE 362 The 19th-Century French Novel Spring LA
Major literary and cultural themes in the tradition of the French novel. Special attention to fictional techniques and innovations in the works of Stendhal, Balzac, Flaubert, and Zola. Emphasis on literary form in relation to intellectual, artistic, and historical background. One 90-minute lecture, one 90-minute preceptorial. Prerequisite: a 200-level French course or instructor's permission. Alternates with 363. G. Blix

FRE 363 The 20th-Century French Novel Fall LA
A study of major themes, forms, and techniques in modern fiction. Close analysis of works by Proust, Gide, Céline, Sartre, Camus, Sarrute, Duras, Robbe-Grillet, and Condé. The nouveau roman and experiments in contemporary fiction will be examined as well as the cultural, moral, and political problems of our times. One 90-minute lecture, one 90-minute preceptorial. Prerequisite: a 200-level French course or instructor D. Bellos, T. Trezise

FRE 364 Modern French Poetry Fall/Spring LA
Postromantic poetry, including works by Baudelaire, the symbolists (Verlaine, Rimbaud, Mallarmé), such modernists as Valéry, Apollinaire, and the surrealists. Special emphasis is placed on close textual analysis, as well as on symbolist, surrealist, and contemporary poetics. Two 90-minute seminars. Prerequisite: a 200-level French course or instructor E. Rentzou

FRE 365 French Theater Fall LA
Plays by Molière, Corneille, Racine, Beaumarchais, Marivaux, Hugo, Feydeau, Jarry, Claudel, Giraudoux, Anouilh, Sartre, Genet, Ionesco, and Beckett, along with consideration of mise en scène, techniques of acting, theories of Artaud, and evolution of such traditions as théâtre de moeurs, boulevard comedy, and theater of the absurd. Two 90-minute classes. Prerequisite: a 200-level French course or instructor's permission. V. Schröder

FRE 366 French Fiction in Translation Spring LA
Innovations in the theory and practice of French narrative from the 1850s to the present, considered in cultural, historical, and intellectual context. Works by Flaubert, Proust, Gide, Céline, Camus, Sarraute, Yourcenar, and others will be read in English translation. Prerequisite: a 200-level literature course or instructor's permission. Two 90-minute classes. T. Trezise

FRE 367 Topics in 19th- and 20th-Century French Literature and Culture Spring LA
Topics will range from the oeuvre and context of a single author (for example, Balzac, Baudelaire, or Beckett) to specific cultural and literary problems (modernism and the avant-garde, history as literature, women's writing). Prerequisite: a 200-level French course or instructor's permission. C. Wampole

FRE 371 World Literatures in French Fall/Spring LA
An introduction to francophone societies and cultures in Europe, Africa, Asia, and America. Each year special attention will be paid to one of these (for example, the Caribbean, the Maghreb). Readings will include both literary works and works of historical and social analysis. Prerequisite: a 200-level course in French or instructor's permission.

FRE 391 Topics in French Cinema (also VIS 347) Spring LA
Major movements and directors in French and French-language cinema. Topics may include: early history of the cinematographe; the Golden Age of French film; Renoir, Bresson, Tati; the "New-Wave"; French women directors of the 1980s; adaptation of literary works. T. Trezise

FRE 401 Topics in French Literature and Culture Fall/Spring LA
Issues pertaining to French literature and/or culture that transcend chronological boundaries. The specific content of the course will change each time it is offered. Possible topics include: French Autobiographical Writings, The Idea of Nationhood in France, The French Intellectual, Satire and Humor in France. Prerequisite: a 200-level course in French or instructor's permission. One three-hour seminar. Staff

FRE 407 Prose Translation (also TRA 407) Fall/Spring LA
History, theory, and practice of literary translation. One three-hour seminar. Prerequisite: a 200-level course in French or instructor's permission. D. Bellos

ITA 101 Beginner's Italian I Fall
An oral-aural method is used to develop concurrently the skills of speaking, understanding, reading, and writing Italian. The main emphasis is on basic grammatical principles and vocabulary. A substantial portion of the basic grammar is covered. Five classes, laboratory. No credit is given for ITA 101 unless followed by ITA 102. Staff

ITA 102 Beginner's Italian II Spring
A continuation of 101. The remainder of the basic grammar is covered. A number of texts from a reader will be studied. Growing emphasis on reading and writing, but much attention will continue to be given to oral Italian. Five classes, laboratory. Prepares for 107. Staff

ITA 107 Advanced Italian Fall
Further development of general proficiency and extensive reading of standard texts. Five classes. Prerequisite: 102 or instructor's permission. Staff

ITA 207 Studies in Italian Language and Style Fall
Intensive practice in spoken and written Italian with emphasis on vocabulary acquisition and advanced syntactical structures. Close readings and translations of contemporary Italian prose. Discussions are based on newspaper and magazine articles, television, and films. Emphasis on an audio-video approach to Italian language and culture. Prerequisite: 107 or instructor's permission. Three classes. G. Marrone-Puglia

ITA 208 Introduction to Italy Today Spring
Designed to develop students' ability to communicate effectively in present-day Italy. Exploration of key moments in contemporary Italy, focusing on concepts and the vocabulary of modern politics and the economy. Emphasizes Italian social, political, and economic institutions, through the analysis of cultural and social differences between Italians and Americans in such everyday concerns as money, work, and leisure. Two 90-minute classes. Prerequisite: 107 or instructor's permission. Staff

ITA 220 Italian Civilization Through the Centuries Fall LA
This course is designed to give an overview of pivotal moments in Italian culture, such as the relationship between Church and Empire in the Middle Ages, Machiavelli's political theory during the Renaissance, and the rise and fall of Fascism in the 20th century. Through the examination of the most relevant intellectual, historic and artistic movements and their main geographical venues, students will be able to acquire a comprehensive understanding of the development of Italian history and civilization. **Staff**

**ITA 302 Topics in Medieval Italian Literature and Culture**
Spring LA
Topics will range from the work of a single author (such as Boccaccio) and certain major texts to specific cultural, literary, and poetic problems (such as the medieval *comune*). Major figures include Giacomo da Lentini, Guido Guinizelli, Guido Cavalcanti, Petrarch, and Boccaccio. Two 90-minute seminars. Alternates with 306. Prerequisite: a 200-level Italian course or instructor's permission. **S. Marchesi**

**ITA 303 Dante's "Inferno" (also MED 303)**
Fall/Spring LA
Intensive study of the *Inferno*, with major attention paid to poetic elements such as structure, allegory, narrative technique, and relation to earlier literature, principally the Latin classics. Two 90-minute classes, one preceptorial. **S. Marchesi**

**ITA 306 The Italian Renaissance: Literature and Society**
Spring LA
Readings from the works of Ariosto, Machiavelli, Guicciardini, Tasso, Della Casa, Michelangelo, and Bembo, interpreted in light of artistic and cultural preoccupations of the time. Topics include: Tasso and the Counter-Reformation sensibility, the Renaissance epic, history and the writing of history. One three-hour seminar. Alternates with 302. Prerequisite: a 200-level Italian course or instructor's permission. **P. Frassica**

**ITA 307 Advanced Language and Style**
Fall LA
Intensive practice of written and spoken Italian through close analysis of grammatical and syntactic structures, literary translation, and the stylistic study of representative literary works from the Middle Ages to the present. Focus on rhetorical structures and on Italian linguistic change. Prerequisite: a 200-level course in Italian or instructor's permission. Two 90-minute classes. **Staff**

**ITA 308 Topics in 20th-Century Italian Literature**
Fall LA
Topics will range from the study of a single author (such as Pirandello, Montale, Pavese, D'Annunzio) to the investigation of specific literary and poetic problems. One three-hour seminar. Prerequisite: a 200-level Italian course or instructor's permission. **P. Frassica**

**ITA 309 Topics in Contemporary Italian Civilization**
Fall LA
The evolution of Italian contemporary civilization through the study of historical, sociopolitical, and cultural topics. The approach will be interdisciplinary; each year a different topic will be selected and studied as portrayed in representative samples of slides, films, and pertinent reading material. One threehour seminar. Prerequisite: a 200-level Italian course or instructor's permission. Offered in alternate years. **P. Frassica**

**ITA 310 Topics in Modern Italian Cinema (also VIS 443)**
Spring LA
An introduction to Italian cinema from 1945 to the present. Through an interdisciplinary approach, the course will focus on sociopolitical and cultural issues as well as on basic concepts of film style and technique. Specific topics will change from year to year, and prerequisites will vary. One three-hour seminar, one film showing. **G. Marrone-Puglia**

**ITA 311 Topics in 19th-Century Italian Literature**
Fall LA
Topics will range from the study of a single author (such as Leopardi, Manzoni, Verga) to the thematic, artistic, and cultural analysis of either a genre or a literary movement (such as Romanticism, *Verismo*). One three-hour seminar. Prerequisite: a 200-level Italian course or instructor's permission. **G. Marrone-Puglia**

**ITA 312 Fascism in Italian Cinema (also VIS 445)**
Spring LA
A study of fascist ideology through selected films from World War II to the present. Topics include: the concept of fascist normality; racial laws; the role of women; and the Resistance and the intellectual left. Films include: Bertolucci's *The Conformist*, Fellini's *Amarcord*, Rossellini's *Open City*, and Benigni's *Life is Beautiful*. The approach is interdisciplinary and combines the analysis of sociohistorical themes with a cinematic reading of the films. One lecture, one two-hour preceptorial, one film screening. **G. Marrone-Puglia**

**ITA 313 Marxism in Italian Cinema (also VIS 446)**
Spring LA
A study of the influence of Marxist ideology on major Italian directors from the Cold War to the present. Representative films include: Bertolucci's *The Last Emperor*, Visconti's *The Leopard*, Pasolini's *Teorema*, Wertmuller's *Seven Beauties*, Pontecorvo's *The Battle of Algiers*. The approach will be interdisciplinary and will
combine the analysis of historical and political themes with a cinematic reading of the films. One lecture, one two-hour preceptorial, one film screening. G. Marrone-Puglia

**ITA 401 Seminar in Italian Literature and Culture**  
**Fall LA**

Investigation of a major theme or author, with special attention to formal structures and intellectual context. Topics may range from the medieval chivalric tradition in such Renaissance masterpieces as Ariosto's *Orlando Furioso* to a reading of the writings of Primo Levi as these examine the issue of the annihilation of the personality. Prerequisite: a 300-level course in Italian or instructor's permission. One three-hour seminar. *Staff*
Program in Gender and Sexuality Studies

Director
Regina Kunzel, History, Gender and Sexuality Studies

Executive Committee
Elizabeth M. Armstrong, Woodrow Wilson School, Sociology
Wallace D. Best, Religion, African American Studies
Margot Canaday, History
Hendrik A. Hartog, History
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Jill S. Dolan, English, Lewis Center for the Arts, Theater
Patricia Fernandez-Kelly, Sociology
Su Friedrich, Lewis Center for the Arts, Visual Arts
Margaret Frye, Sociology
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Rubén Gallo, Spanish and Portuguese Languages and Cultures
Jenny E. Greene, Astrophysical Sciences
Judith Hamera, Lewis Center for the Arts, Program in Dance
Elizabeth Harman, Philosophy, University Center for Human Values
Wendy Heller, Music
Brooke A. Holmes, Classics
Alison Isenberg, History
Amaney A. Jamal, Politics
Melissa S. Lane, Politics
Satyel Larson, Near Eastern Studies
Russell J. Leo III, English
Sarah-Jane Leslie, Philosophy
Beth Lew-Williams, History
AnneMarie Luijendijk, Religion
Stephen J. Macedo, Politics, University Center for Human Values
Gaetana Marrone-Puglia, French and Italian
Tali Mendelberg, Politics
Deborah E. Nord, English
Jeff E. Nunokawa, English
Elizabeth L. Paluck, Psychology, Woodrow Wilson School
Sarah S. Poor, German
Deborah A. Prentice, Psychology, Woodrow Wilson School
Jennifer L. Rexford, Computer Science
Rebecca A. Rix, History
Carolyn M. Rouse, Anthropology
Daniel I. Rubenstein, Ecology and Evolutionary Biology
Esther H. Schor, English
The Program in Gender and Sexuality Studies is an interdisciplinary forum for the study of gender and sexuality, as well as their intersections with race, class, and ethnicity, across cultures and global geographies both past and present. The program's courses, which are open to all students, and examine gender and sexuality from a variety of disciplinary and interdisciplinary perspectives. The program offers core courses, seminars, and cross-listed courses. A current list of course offerings is available on the program website. The program also encourages summer internships in relevant community-based programs, nonprofits, and nongovernmental organizations with which the program's theoretical and historical inquiries can be applied in a practical setting.

**Admission to the Program**

Admission to the program is by application, available via program website, and/or consultation with the program director.

**Program of Study**

Students who wish to complete the requirements for the undergraduate certificate in gender and sexuality studies must take five courses: the introductory course, GSS 201, at least one course from at least three of five thematic clusters (Transnational/Global Perspectives; Gender, Race, and Ethnicity; Bodies, Sexualities; Culture and Representation; Politics and Social Change; Historical Perspectives), and one additional 300 or 400-level GSS course. Students may take gender- or sexuality-related courses in their major departments for certificate credit. In addition, certificate students are required to incorporate issues related to feminism, women, gender, and/or sexuality into one junior paper and their senior thesis.

**Certificate of Proficiency**

Certificates of proficiency in the study of gender and sexuality are issued upon graduation to students who have completed the program and have met the requirements of their departments.

A list of gender- and sexuality-related courses across the University may be found on the program website. With the director's approval, these courses may be used to satisfy the program's requirements.

**Courses**

**GSS 201 Introduction to Gender and Sexuality Studies**  **Fall SA**  
What does it mean to be a woman or a man? Or neither? How do gender and sexuality, those seemingly most personal and private of attributes, emerge from networks of power and social relations? This course introduces major concepts in the interdisciplinary field of gender and sexuality studies. We will analyze the ways in which gender, as an object of study and as a lived experience, intersects with class, race, and ability, and will examine the relation between gender, sexuality and power in literary, philosophical, political and medical discourses. *G. Salamon*

**GSS 212 Classical Mythology (See CLA 212)**

**GSS 221 Inequality: Class, Race, and Gender (See SOC 221)**
GSS 225 Sex, Sexuality, and Gender (See SOC 225)
GSS 227 Approaches and Paradigms: Study of Women, Gender & Sexuality in the Middle East and North Africa (See NES 227)
GSS 242 Other Futures: An Introduction to Modern Caribbean Literature (See AAS 242)
GSS 245 Sex and Salvation in Early Christian Literature (See CLA 245)
GSS 253 Early Christian Women: From Mary Magdalene to Martyred Mothers (See REL 253)
GSS 276 Saints and Sinners: Women and the Church in Colonial Spanish America (See REL 276)
GSS 300 Gender, Sexuality, and Modernity in the Middle East (See NES 312)
GSS 301 Evolution and the Behavior of the Sexes (See EEB 301)
GSS 302 Topics in the Study of Gender (also LAS 314 / REL 300 ) Spring SA
Advanced seminar; focus changes from year to year. In general the seminar uses contemporary and classic works of feminist theory to examine ideas about gender that have shaped modern culture. Topics have included feminism and liberalism, literature and ideology, and psychoanalysis and feminism. J. Delgado
GSS 306 Women and Film (also VIS 341 ) Not offered this year LA
An exploration of the relationships between the idea of "woman" and the art of film. Issues addressed will include the role of woman as performer and director, questions of film genre, the identification of the female image as constitutive of the cinematic image, the historical and social dimensions of the female image projected in films of different times and different cultures. Film screenings, one three-hour seminar.
G. Marrone-Puglia
GSS 308 A Gendered History of the Avant-Garde: Bodies, Objects, Emotions, Ideas (See ITA 305)
GSS 309 Topics in Judaic Studies (See JDS 301)
GSS 310 The Family in Jewish Tradition (See JDS 315)
GSS 312 Gender and Development in the Americas (See SOC 310)
GSS 314 Dangerous Bodies: Cross-Dressing, Asia, Transgression (See EAS 314)
GSS 315 Sex on Stage (also THR 374 ) Spring LA
This course examines theatrical performance as a mode of theorizing about gender, sex, sexuality and embodiment. Through lecture, discussion and performance workshops, this course draws upon contemporary U.S. dramatic literature as it undertakes a multinational, historical survey of theories of performance. The course considers such topics as gender as performance, cross-gender performance, performances of sexual identity, and the explicit body in performance. B. Herrera
GSS 316 Queer Boyhoods (also AMS 366 / THR 358 ) LA
This course examines enactments of youthful masculinity in U.S. popular performance with a particular eye toward accounts of variant or queer boyhoods. As we scrutinize the regimentation and valorization of specific boyish behaviors, we will explore the cultural impact of non-normative youthful masculinities (ie. sissies, tomboys, bois, punks, transgys, etcetera) as we also assess the place of queer boyhoods in American life. Course readings will be historical, literary and theoretical, with play scripts, films, memoirs and literature for young readers functioning as primary objects for the course's analytic project. B. Herrera
GSS 317 Sexuality, Public Culture and Medicine in East Asia (See EAS 306)
GSS 319 U.S. Women Writers (also AMS 320 ) Fall LA
An exploration of the literary works of women writers in the United States with an emphasis on the role gender has played and continues to play in the development of literary movements and genres. Our examination of both canonical and non-canonical writings will focus on the formation of feminist literary conventions in the 19th century and their transformations in the 20th and 21st centuries. Our reading will include romantic tales, ghost stories, realistic stories, novels of immigration, thrillers, works for children, autobiographical mythmaking, poetry, and graphic novels. A. Bendixen
GSS 320 Topics in Medieval Greek Literature (See CLA 320)
GSS 321 Topics in German Medieval Literature (See GER 321)
GSS 328 Women and Gender in Islamic Societies (See REL 328)
GSS 329 Psychology of Gender (See PSY 329)
GSS 330 The Invention of Literature and Culture in France (See FRE 321)
GSS 331 Sex and Gender in the Ancient World (See CLA 329)
GSS 332 Queer Sexualities: Biopsychosocial and LGBT Perspectives Spring SA
Queer Sexualities is an interdisciplinary course, which intertwines the study of human sexuality from scientific and public health perspectives with queer academic writing about sexual orientation and gender. Through the lenses of human sexuality theory, social science and medical perspectives, biological and sexual functioning, and LGBT
history and subcultures, this course will explore the many ways in which queer sexualities, identities, and relationships are constructed, expressed, and regulated. D. Bazarsky

GSS 336 Crime, Gender, and American Culture (also AMS 436 / ENG 334) Fall LA
An exploration of the ways in which gender and crime are intertwined in some of the most significant and popular works of American fiction. Our analysis of the aesthetic, cultural, and psychological dimensions of narratives based on crime and detection will focus on texts by both women and men with an emphasis on the capacity of gender studies to illuminate American crime fiction's recurring concern with questions of race and class, justice and power, violence and victimhood. A. Bendixen

GSS 337 Reproductive Politics in the United States and Abroad since 1945 Fall SA
Questions of who should have access to abortion, adoption and birth control and who should be allowed to procreate and parent have underpinned major social struggles in the United States and abroad. How the state, medical experts, religious authorities, activists and everyday people have answered these questions has changed substantively over time and differed across and within cultures. This course takes an expansive view of the histories of reproductive politics in order to locate these debates within United States while situating the United States within a broader global conversation over reproductive access and justice. G. Frank

GSS 338 The Buddhist Individual (See REL 308)

GSS 341 Women, Music, and the Stage (See MUS 341)

GSS 343 Special Topics in Creative Writing (See CWR 345)

GSS 344 Sex in Ancient Judaism and Christianity (See REL 344)

GSS 345 Pleasure, Power and Profit: Race and Sexualities in a Global Era (also AAS 355 / ENG 399 / AMS 373) Fall EM
Pleasure Power and Profit explores the intimate ways that sexualities and race are entwined in contemporary culture, historically, and in our own lives. Why are questions about sexuality and race some of the most controversial, compelling, yet often taboo issues of our time? Exploring films, popular culture, novels, social media, and theory, we engage themes like: race, gender and empire; fetishism, Barbie, vampires and zombies; sex work and pornography; marriage and monogamy; queer sexualities; and strategies for social empowerment such as: Black Lives Matter, the new campus feminism, and global movements against sexual and gender violence. A. McClintock

GSS 346 FAT: The F-Word and the Public Body (See DAN 312)

GSS 349 Race and Living Laboratories (See AMS 379)

GSS 350 Topics in 19th-Century Art (See ART 343)

GSS 351 Law, Social Policy, and African American Women (See AAS 351)

GSS 352 Topics in 17th- and 18th-Century French Literature (See FRE 352)

GSS 357 Empire of the Ark: The Animal Question in Film, Photography and Popular Culture (See ENV 357)

GSS 360 Women and American Religion (See REL 360)

GSS 361 Culture, Power, and Inequality (See SOC 361)

GSS 363 Gender, Sexuality, and Contemporary U.S. Theatre and Performance (also THR 373 / AMS 363) Fall/Spring LA
Addresses contributions by women, LGBT people, feminists, and people of color to contemporary U.S. theatre and performance. Analyzes performance forms, contents, intents, contexts, and reception to ponder how people who straddle identity vectors influence American culture and help imagine our changing nation. Surveys significant U.S. human rights movements and the performance forms through which many were vitalized. Considers how some minority groups became central to theatre culture by the 21st century and whether or not forums like Broadway dilute the radical politics in which these struggles began. J. Dolan

GSS 365 Isn't It Romantic? The Broadway Musical from Rodgers and Hammerstein to Sondheim (also ENG 365 / AMS 365 / MTD 365) Spring LA
Song. Dance. Man. Woman. These are the basic components of the Broadway musical theatre. How have musical theatre artists, composers, lyricists, librettists, directors, choreographers, and designers worked with these building blocks to create this quintessentially American form of art and entertainment? This course will explore conventional and resistant performances of gender and sexuality in the Broadway musical since the 1940s. Why are musicals structured by love and romance? S. Wolf

GSS 366 Bioethics, Sex and Society in Muslim Communities (See NES 361)

GSS 368 20th Century Master (See AAS 327)

GSS 370 Topics in Comparative Literature (See COM 370)

GSS 371 Gender and the Social History of the Pre-modern Middle East (See NES 371)
GSS 374 Culture and International Order (See ANT 375)
GSS 376 Gender, Bodies, and Sacraments: Penitence and Eucharist in Catholic Europe and the Americas (See REL 375)
GSS 378 Religion, Gender, and Sexuality in Early Latin America (See REL 378)
GSS 380 Script, Screen, and Sexuality in East Asia (See COM 379)
GSS 384 Gender and Sexuality in Modern America (See HIS 384)
GSS 387 Special Topics in Dance History, Criticism, and Aesthetics (See DAN 321)
GSS 388 Women, Religion, and Human Rights (See REL 389)
GSS 389 Women Writers of the African Diaspora (See ENG 389)
GSS 390 African American Women's History (See HIS 390)
GSS 392 Sex and Ethics (See PHI 392)
GSS 393 Gender and Science Fall SA
An exploration of two aspects of the gender and science literature: the historical participation of women (and men) in scientific work and the feminist critique of scientific knowledge. The seminar will explore ways in which women have been systematically excluded from science and assess the problems with that thesis. One three-hour seminar. A. Creager
GSS 394 History and the Body (also HIS 312) Fall/Spring HA
This course introduces students to new scholarship on the history of the body and the shifting political and cultural contests over understandings of the "natural" or "normal" body. Through primary and secondary sources, we will explore changes in the ways in which human bodies have been conceived and represented, and will consider the work of historians and cultural theorists who move further to historicize the lived experience of the human body. R. Kunzel
GSS 396 Queer Theory (See ENG 396)
GSS 397 Feminist Media Studies /Media Representations of Feminism Spring SA
Feminist media studies are a rich field of inquiry, while feminism is a recurring object of media fascination. Media stories of feminism circulate as authoritative. Feminist arguments often become public spectacles where the media leers at and dismisses feminist speech. These spectacularly public representations reduce the multiplicity of feminist positions and voices. M. Deem
GSS 398 Queer Citizenship: Merging Theory and Activism Spring SA
Is there a particularly "queer" way to be a world citizen? Does a queer perspective mitigate for certain forms of social, interpersonal or political action? Is a university education necessary, or even useful, for these endeavors? Does academic queer theory have any relevance to "real-world" LGBTQ activism? In this course, students will examine the connections and disconnects between academic work in gender and sexuality studies and the ways feminist and LGBTQ politics are imagined and lived within contemporary activist communities. Staff
GSS 399 The Female Literary Tradition (See ENG 388)
GSS 400 Contemporary Theories of Gender and Sexuality Spring SA
We will take as our primary text the new translation of Simone deBeauvoir"s landmark volume The Second Sex, one of the most significant origin points of current understandings of gender. In our sustained consideration of The Second Sex, we will explore Beauvoir's ideas about the influence of sex and gender on childhood, the family, sexuality, relationships, aging, work, the social order, and the philosophical imaginary. We will also consider contemporary writing alongside that text, taking Beauvoir as our tour guide as we encounter and interpret contemporary representations of gender. G. Salamon
GSS 401 Seminar. Types of Ideology and Literary Form (See COM 401)
GSS 408 Women in American Theater: Doing Gender, Race, Sexuality Onstage and Off (See ENG 408)
GSS 420 Born in the U.S.A.: Culture and Reproduction in Modern America (also SOC 420) Spring SA
Reproduction is a basic biological process, as well as a fundamental one for all societies. While the biology of human reproduction is universal across time and place, cultural norms and social institutions powerfully inflect and shape the experience of pregnancy and childbirth in every society. This course investigates the history and sociology of reproduction, focusing on the contemporary United States, but with an eye toward other societies for comparison. How, why, and for whom does birth matter? How do reproductive practices reflect gender, race, and class? The course examines the culture, politics, and economics of reproduction. E. Armstrong
GSS 421 Seminar in American Politics (See POL 420)
GSS 422 Seminar in American Politics (See POL 422)
GSS 444 Gender and U.S. Citizenship (See HIS 444)
GSS 454 Women and Gender in Early Modern England (See HIS 454)
GSS 459 The History of Incarceration in the U.S. (See HIS 459)
GSS 460 Gendered Identities in Contemporary Korea (See EAS 460)
GSS 487 Women in American Higher Education (See HIS 487)
GSS 488 Intimacy Beyond Borders: Transnational Histories of Sexuality (See HIS 488)
Program in Geological Engineering

Director
Catherine A. Peters

Executive Committee
Ian C. Bourg, Civil and Environmental Engineering
Princeton Environmental Institute
Michael A. Celia, Civil and Environmental Engineering

John A. Higgins, Geosciences
Ning Lin, Civil and Environmental Engineering
Adam C. Maloof, Geosciences
Satish C. B. Myneni, Geosciences
Catherine A. Peters, Civil and Environmental Engineering
James A. Smith, Civil and Environmental Engineering

Geological engineering is the application of science to problems involving the Earth, its physical environment, earth materials, and natural resources. Geological engineering problems are increasingly important to humankind, and the well-trained Earth scientist-engineer will be uniquely positioned to solve these problems and find the best ways to use the earth's resources while protecting the environment. For example, the geological engineer is involved with exploration and use of Earth's water, energy, and mineral resources, as well as in the acquisition and utilization of the data necessary to shape environmental policy and practice. Princeton's Program in Geological Engineering combines studies in engineering and earth sciences, with focus on applications of geology, geochemistry, and geophysics.

Depending upon the selection of electives, the program prepares students for graduate study or practice in geology, geochemistry, geophysics, oceanography, water resources, engineering and environmental geology, and civil and environmental engineering. The program is a cooperative effort of the Department of Civil and Environmental Engineering and the Department of Geosciences, and the program committee is drawn from those departments. The student may be a candidate for either the B.S.E. or the A.B. degree.

Students with interests in this interdepartmental approach are encouraged to consult the program director. Further information may be found under the listings of the two departments.

Program of Study

Participants in the program will satisfy the degree requirements for their department as well as the course and independent work requirements for the program. A coherent course of study will be developed in conjunction with the program adviser and the departmental representative and will include geosciences and engineering courses outside the student's department. Specific program requirements are listed below.

Program Requirements

All program students must take:

1. B.S.E. mathematics, physics, and chemistry requirements.

2. Four program-approved courses at or above the 300 level that constitute a coherent sequence (for additional details, see the geosciences and civil and environmental engineering department descriptions). At least two of these courses must be from a department different from that in which the student is concentrating.
3. A two-semester senior thesis on a geological engineering topic approved by the program committee.

To remain a member of the program in good standing, students must maintain at least a B- average in their technical subjects. To be awarded the program certificate upon graduation, students must achieve a minimum grade average of B- in program courses. Program courses may not be taken on a pass/D/fail basis. **Certificate of Proficiency**

Students who have met the program requirements will receive a certificate of proficiency upon graduation.

**Select GEO courses**

GEO 203 Fundamentals of Solid Earth Science  
GEO 300 Summer Course in Geologic Field Methods  
GEO 361 Physics of Earth, the Habitable Planet  
GEO 363 Environmental Geochemistry: Chemistry of the Natural Systems  
GEO 366 Climate Change: Scientific Basis, Policy Implications  
GEO 370 Sedimentology  
GEO 417 Environmental Microbiology  
GEO 418 Environmental Aqueous Geochemistry  
GEO 424 Introductory Seismology  
GEO 441 Computational Geophysics  
GEO 470 Environmental Chemistry of Soils

**Courses**

**CEE 102A Engineering in the Modern World (also EGR 102A / MAE 102A )** Fall HA  
Lectures and readings focus on bridges, railroads, power plants, steamboats, telegraph, highways, automobiles, aircraft, computers, and the microchip. Historical analysis provides a basis for studying societal impact by focusing on scientific, political, ethical, and aesthetic aspects in the evolution of engineering over the past two and a half centuries. The precepts and the papers will focus historically on engineering ideas including the social and political issues raised by these innovations and how they were shaped by society as well as how they helped shape culture. Two lectures, one preceptorial. *M. Littman*

**CEE 102B Engineering in the Modern World (also EGR 102B / MAE 102B )** Fall STL  
Lectures and readings focus on bridges, railroads, power plants, steamboats, telegraph, highways, automobiles, aircraft, computers, and the microchip. We study some of the most important engineering innovations since the industrial revolution. The laboratory centers on technical analysis that is the foundation for design of these major innovations. The experiments are modeled after those carried out by the innovators themselves, whose ideas are explored in the light of the social environment within which they worked. Two lectures, one three-hour laboratory. *M. Littman*

**CEE 105 Lab in Conservation of Art (also ART 105 / EGR 105 )** Not offered this year STL  
This course examines how environmental factors (acid, rain, ice, salts, biota) damage sculpture and monuments made of stone and masonry, paintings on wood, and sculptures in bronze. It examines campus buildings that illustrate each type of damage and uses a visit to the Cloisters Museum to learn how those medieval buildings are protected. Lectures on structure and properties of materials and mechanisms of attack. Labs include quantifying water movement through stone, damage from freezing and salts, strength of mortars, protective effects of sealants and consolidants, effect of moisture on wood. Two lectures and one three-hour laboratory. *G. Scherer*

**CEE 205 Mechanics of Solids** Fall STN  
This course teaches fundamental principles of solid mechanics. Equilibrium equations, reactions, internal forces, stress, strain, Mohr's circle, and Hooke's law. Analysis of the stress and deformation in simple structural members
for safe and stable engineering design. Axial force in bars, torsion in shafts, bending and shearing in beams, stability of elastic columns, strain transformation, stress transformation, circle of Mohr, combined loadings, design project. Two lectures, one class. Prerequisites: MAT 104, PHY 103. S.

Adriaenssens

CEE 207 Introduction to Environmental Engineering (also ENV 207) STN
The course introduces the students to the basic chemical and physical processes of relevance in environmental engineering. Mass and energy balance and transport concepts are introduced and the chemical principles governing reaction kinetics and phase partitioning are presented. We then turn our focus to the application of these principles in environmental engineering problems related to water and air pollution. Two 80-minute lectures. Prerequisite: CHM 201 or MAT 104 or instructor's permission. I. Bourg

CEE 208 Mechanics of Fluids (See MAE 222)

CEE 242 The Experience of Modernity: A Survey of Modern Architecture in the West (See ART 242)

CEE 262A Structures and the Urban Environment (also ARC 262A / EGR 262A / URB 262A / ART 262) Spring LA
This course focuses on structural engineering as a new art form begun during the Industrial Revolution and flourishing today in long-span bridges, thin shell concrete vaults, and tall buildings. Through laboratory experiments students study the scientific basis for structural performance and thereby connect external forms to the internal forces in the major works of structural engineers. Students examine contemporary exemplars that are essential to the understanding of 21st century structuring of cities with illustrations taken from various cities in the U.S. and abroad. Two lectures, one preceptorial. M. Garlock

CEE 262B Structures and the Urban Environment (also ARC 262B / EGR 262B / URB 262B) Spring STL
This course focuses on structural engineering as a new art form begun during the Industrial Revolution and flourishing today in long-span bridges, thin shell concrete vaults, and tall buildings. Through laboratory experiments students study the scientific basis for structural performance and thereby connect external forms to the internal forces in the major works of structural engineers. Students examine contemporary exemplars that are essential to the understanding of 21st century structuring of cities with illustrations taken from various cities in the U.S. and abroad. Two lectures, one three-hour laboratory. M. Garlock

CEE 263 Rivers and the Regional Environment Not offered this year QR
River basins are the fundamental frameworks for examining the natural environment and its interaction with the works of society. These works, exemplified by major dams, are the basis for the agricultural and industrial development of a modern society. The course will explore the history, science, and engineering of water resource development and the design of large-scale structures related to that development. Two lectures, one preceptorial. J. Smith

CEE 267 Materials for Energy Technologies and Efficiency (See ENE 267)
CEE 302 Practical Models for Environmental Systems (See ENV 302)

CEE 304 Environmental Engineering and Energy (also ENE 304 / ENV 300) Fall/Spring The course uses materials balance, energy balance, and life cycle assessment tools to examine the environmental impacts of energy technologies. Environmental implications include those associated with water quality, air quality, land use, and climate change. Builds the tools for investigating energy technologies and then examines technologies including conventional fossil fuel combustion, advanced fossil energy systems, solar, wind, geothermal, hydroelectric, and nuclear energy. Focused primarily on scientific and technological principles, but socioeconomic aspects are also addressed. Prerequisites: CHM 201 and MAT 104, or permission of the instructor. Staff

CEE 305 Environmental Fluid Mechanics (also GEO 375 / ENE 305) Not offered this year STN
The course starts by introducing the conservation principles and related concepts used to describe fluids and their behavior. Mass conservation is addressed first, with a focus on its application to pollutant transport problems in environmental media. Momentum conservation, including the effects of buoyancy and earth's rotation, is then presented. Fundamentals of heat transfer are then combined with the first law of thermodynamics to understand the coupling between heat and momentum transport. We then proceed to apply these laws to study air and water flows in various environmental systems, with a focus on the atmospheric boundary layer. E. Bou-Zeid

CEE 306 Hydrology Spring STN
Analysis of fundamental processes affecting the dynamics of the hydrologic cycle. These include precipitation, evaporation, infiltration, runoff, and groundwater flow. Governing equations will be developed and applications will be considered for a range of hydrologic systems. Concepts and techniques for design of water projects will
also be covered. Students will be encouraged to solve problems in Matlab. Prior experience with Matlab is not required. Three lectures. Prerequisite: MAT 201, may be taken concurrently. J. Smith

CEE 307 Water, Energy, and Ecosystems (also EEB 305) Spring STL
This three-week course, offered as part of a four-course study abroad semester, takes place at Princeton University's Mpala Research Centre in central Kenya. The course will provide an introduction to the principles of hydrological sciences via the development and application of instrumentation for characterizing surface/subsurface hydrological dynamics in field settings. Lectures and field activities will address the theory of operation, design, and implementation of methods used to quantify hydrological patterns and processes. Prerequisite: MAT 201. K. Caylor

CEE 308 Environmental Engineering Laboratory Spring STL
Designed to teach experimental measurement techniques in environmental engineering and their interpretations. Analytical techniques to assess biodegradation of wastes, lake eutrophication, non-point source pollution, and transport of contaminants in surface and groundwater, as well as hydrologic measurements to determine river and groundwater discharges, and soil-moisture dynamics in response to precipitation events will be conducted. One three-hour laboratory plus one lecture per week. Prerequisites: CEE 303 and CEE 306 or Permission of Instructor. CEE 306 may be taken concurrently. P. Jaffé

CEE 311 Global Air Pollution (also CHM 311 / GEO 311 / ENE 311) Fall
The chemical and physical processes involved in the transformation, transport, sources, and sinks of air pollutants on local to global scales. Topics include photochemical smog, particulate matter, greenhouse gases, and stratospheric ozone depletion. Students will have the unique opportunity to analyze chemical and physical data acquired in real-time from the NSF Gulfstream-V research aircraft as it probes the atmosphere from the Earth's surface to the lower stratosphere over a latitudinal range from the Arctic to the Antarctic. A wide range of environments will be studied, from very clean, remote portions of the globe to urban megacities. M. Zondlo

CEE 312 Statics of Structures Spring STN
Presents the fundamental principles of structural analysis, determination of internal forces, and deflections under the static load conditions, and introduces the bending theory of plane beams and the basic energy theorems. The theory of the first order will be developed for continuous girders, frames, arches, suspension bridges, and trusses, including both statically determinate and indeterminate structures. Basic principles for construction of influence lines and determination of extreme influences will be presented. Two lectures, one preceptorial. Prerequisite: CEE 205. B. Glisic

CEE 323 Modern Solid Mechanics (See MAE 223)

CEE 334 Global Environmental Issues (also WWS 452 / ENV 334 / ENE 334) Spring STN This course examines a set of global environmental issues including population growth, ozone layer depletion, climate change, air pollution, the environmental consequences of energy supply and demand decisions and sustainable development. It provides an overview of the scientific basis for these problems and examines past, present and possible future policy responses. Individual projects, presentations, and problem sets are included. Prerequisites: AP Chemistry, CHM 201, or permission of instructor. D. Mauzerall

CEE 360 Earth's Atmosphere (See GEO 361)


CEE 362 Structural Dynamics and Earthquake Engineering Not offered this year STN Analysis of forces and deformations in structures under dynamic loads. Idealization as discrete parameter systems. Single and multiple degrees of freedom. Response analysis under free vibration, harmonic, impulsive and random dynamic loads. Time and frequency domains. Earthquake phenomena from the engineering point of view. Seismic waves and power spectra. Measurement of strong ground motion. The concepts of response spectra, structural response to earthquakes, design criteria, and seismic safety. Prerequisite: 361 or instructor Staff

CEE 364 Materials in Civil Engineering (also ARC 364) Spring STL
Lectures on structure and properties of building materials including concrete (conventional and low CO2), steel, asphalt and wood; fracture mechanics; strength testing; mechanisms of deterioration (corrosion; freeze-thaw cycles, pollution). Labs on brittle fracture, heat treatment of steel, strength of concrete, mechanical properties of wood. Prerequisites: CEE 205 C. White, G. Scherer

CEE 365 Soil Mechanics Not offered this year
General introduction to physical and engineering properties of soils. Soil classification and identification methods. Soil exploration, sampling, and in situ testing techniques. Permeability, seepage, and consolidation phenomena. Bearing capacity, equations, stress distributions and settlements. Slope stability and lateral pressures. Prerequisite: CEE 205 or permission of instructor. J. Prévost

CEE 366 Design of Reinforced Concrete Structures Fall STN

CEE 370 Sedimentology (See GEO 370)
CEE 375 Independent Study Fall
Independent Study in the student's area of interest. The work must be conducted under the supervision of a faculty member and must result in a final paper. Permission of advisor and instructor are required. Open to sophomores and juniors. Must fill out Independent Study form. C. Peters

CEE 376 Independent Study Spring
Independent research in the student's area of interest. The work must be conducted under the supervision of a faculty member, and must result in a final paper. Students must obtain prior approval of a faculty member to serve as research advisor, and Hand in to E-211 E-Quad the Independent Research Proposal Project form signed by your advisor & the dept rep. Open to sophomores and juniors. C. Peters

CEE 390 Innovation in Practice: Pathways and People (See EGR 390)
CEE 391 Innovation and the Built and Natural Environment (also EGR 393 ) Fall
How does innovation apply to issues of broad scale and scope affecting long term harmony between the built and natural environment? These significant topics have big impacts: from ongoing access to safe drinking water, to creating where we live and work, to climate concerns. Because of their nature and stakeholders, these issues pose special challenges and policy considerations. Class will explore: What distinguishes innovation for the built and natural environment? What roles do civil and environmental engineers play? Other disciplines? What frameworks and tools are useful? How do human, organizational and institutional factors matter? E. Fisher

CEE 417 Environmental Microbiology (See GEO 417)
CEE 418 Extraordinary Processes (See VIS 418)
CEE 423 Dynamic Meteorology (See GEO 423)
CEE 424 Introductory Seismology (See GEO 424)
CEE 428 Cleaner Transport Fuels, Combustion Sensing and Emission Control (See ELE 428)
CEE 439 Structural Health Monitoring Fall
This course introduces the topics with basic definitions of measurement and monitoring, monitoring activities and entities, and with various available and emerging monitoring technologies. The fundamental criteria for applications on concrete, steel and composite materials are elaborated, and basics on data interpretation and analysis for both static and dynamic monitoring are presented. Finally, methods applicable to large spectrum of civil structures, such as bridges, buildings, geo-structures, and large structures are developed. Prerequisites: CEE 205 or CEE 312 or CEE 361, or permission from the lecturer B. Glisic

CEE 455 Mid-Infrared Technologies for Health and the Environment (See ELE 455)
CEE 460 Risk Analysis Spring QR

CEE 461 Design of Large-Scale Structures: Buildings Spring STN
This course will focus on the structural design of buildings and is open to students of engineering and of architecture who meet the prerequisites. The course will culminate in a major building design project incorporating knowledge and skills acquired in earlier course work. Structural design is considered from concept development to
the completion of detailed design while incorporating appropriate engineering standards and multiple realistic constraints. Not Open to Freshmen. Prerequisites: both CEE 312 and CEE 366, or permission from the instructor.

CEE 462 Design of Large-Scale Structures: Bridges
The design of bridges is considered from the conceptual phase up to the final design phase. The following issues are addressed in this course: types of bridges, design codes, computer modeling of bridges, seismic analysis and design, seismic retrofit design, inspection, maintenance and rehabilitation of bridges, movable bridges, bridge aerodynamics, organization of a typical engineering firm, marketing for engineering work. Several computer codes are used in this course. Prerequisite: CEE 366 or CEE 361, or instructor's permission. Staff

CEE 463 A Social and Multi-Dimensional Exploration of Structures (also LAS 463)
The class has pedagogical objectives related to the spatial relations of dimensions and time (sustainability and society). It develops the students' skills in drawing, model making, writing, oral communication, and advanced engineering analysis. The course is focused on a study of one theme that changes every year. Two three-hour studios per week with lectures included. Prerequisites: both CEE 205 and CEE 312. M. Garlock, I. Payá-Zaforteza

CEE 465 Resilience Engineering
Most critical infrastructures have rigid operating parameters and tend to be vulnerable to small, unforeseen natural and man-made disasters. The need to maintain efficient functioning of the system and to explore the system at some "equilibrium" state is of utmost importance to planners, designers and engineers. This course will discuss the characteristics of resilient systems and ways to measure and monitor the resilience of critical infrastructures, including organizational resilience. The course will also introduce the concept of sustainability and will attempt to connect sustainability and resilience in a unified framework. N. AttohOkine

CEE 466 Wind Engineering
Introduction of wind effects on the built environment. The nature of wind storms, tropical cyclones and climate change, prediction of design wind speeds and structural safety, strong wind characteristics and turbulence, basic bluff-body aerodynamics, resonant dynamic response and effective static load distributions, wind tunnel experiments, tall buildings, low-rise buildings, windborne debris, wind loading codes and standards, wind-induced storm surge, wind and surge damage. Prerequisites: undergraduate level basic courses in Probability and Statistics and in Differential Equations. N. Lin

CEE 467 Design and Behavior of Steel Structures
Topics in the design and analysis of steel structures are covered such as geometric properties and stresses of built-up shapes, columns (including plate buckling), beams, tension members, beam-columns. M. Garlock

CEE 471 Introduction to Water Pollution Technology (also GEO 471 / URB 471)
An introduction to the science and engineering of water quality management and pollution control in natural systems; fundamentals of biological and chemical transformations in natural waters; identification of sources of pollution; water and wastewater treatment methods; fundamentals of water quality modeling. Two 90-minute lectures and field trips. Open to Juniors and Seniors Only. Prerequisites: Student should have some background in chemistry and an interest in water pollution problems. P. Jaffé

CEE 472 Hydrometeorology and Remote Sensing
The structure and evolution of precipitation systems are examined, including the dynamical and microphysical processes that control the spatial and temporal distribution of precipitation. The fundamentals of remote sensing of aerosols, clouds and precipitation are introduced. Related topics in hydrology and hydraulics are covered. Three lectures. Prerequisite: instructor's permission. J. Smith

CEE 474 Special Topics in Civil and Environmental Engineering
This class is an introduction to physical computing using the Arduino platform, with the goal of developing environmental sensors that talk to the internet over cellular networks. You will learn to develop computer code and wire electronics, as well as learn the nuts and bolts of the internet, including linux utilities, mysql, python, and sms. Not Open to Freshmen. K. Caylor

CEE 477 Engineering Design for Sustainable Development
Students will design several features of a LEED-certified building project. Features that will be considered include ground source heat pumps; ventilation; photovoltaics (PV); insulation; glazing; green materials; and storm water management systems, including a green roof, porous parking lots, and the gray water usage. Ventilation will be designed considering the potential for vapor emissions from building materials. Energy software will be used to
determine the carbon footprint of alternative designs. Two 90-minute lectures. Prerequisite: CEE 303 or equivalent with instructor's permission. Open to Seniors and Graduate students only. *R. Harris*

**CEE 478 Senior Thesis**  
Fall/Spring  
A formal report on research involving analysis, synthesis, and design, directed toward improved understanding and resolution of a significant problem in civil and environmental engineering. The research is conducted under the supervision of a faculty member, and the thesis is defended by the student at a public examination before a faculty committee. The senior thesis is equivalent to a year-long study and is recorded as a double course in the spring. *C. Peters*

**CEE 487 Ecohydrology (also ENV 487)**  
Spring  
The course is focused at the undergraduate level towards the understanding of the systems that control the circulation of water between atmosphere, soil, and plants. The course will address the dynamics of soil moisture and its relationship with the ecosystem structure. It will also study the impact of environmental conditions on natural ecosystems, plant strategies in water use, and hydrologic controls on nutrient cycles. Prerequisites: A first course in Probability and Statistics at the undergraduate level and an elementary course in Differential Equations at the undergraduate level. *I. Rodriguez-Iturbe*

**CEE 490 Mathematical Modeling of Energy and Environmental Systems (also ENE 490)**  
Fall  
Department of Geosciences

Chair
Bess B. Ward

Associate Chair
Thomas S. Duffy

Departmental Representative
Satish C. B. Myneni

Director of Graduate Studies
Jeroen Trom

Professor
Thomas S. Duffy
Gerta Keller
François Morel, also Princeton Environmental Institute
Satish C. B. Myneni
Tullis C. Onstott
Michael Oppenheimer, also Woodrow Wilson School, Princeton Environmental Institute
S. George H. Philander
Allan M. Rubin
Jorge L. Sarmiento
Daniel M. Sigman

Jeroen Tromp, also Applied and Computational Mathematics
Bess B. Ward, also Princeton Environmental Institute

Associate Professor
Stephan A. Fueglistaler
Adam C. Maloof
Blair Schoene
Frederik J. Simons

Assistant Professor
John A. Higgins
Jessica C. E. Irving

Associated Faculty
Michael A. Celia, Civil and Environmental Engineering
Peter R. Jaffé, Civil and Environmental Engineering
Denise L. Mauzerall, Woodrow Wilson School, Civil and Environmental Engineering
Catherine A. Peters, Civil and Environmental Engineering
James A. Smith, Civil and Environmental Engineering
Eric F. Wood, Civil and Environmental Engineering
Information and Departmental Plan of Study

Program in Atmospheric and Oceanic Sciences

Director
Stephan A. Fueglistaler

Executive Committee
Thomas L. Delworth, Geosciences,
Atmospheric and Oceanic Sciences
Leo J. Donner, Geosciences, Atmospheric and
Oceanic Sciences
Stephan A. Fueglistaler, Geosciences
Stephen T. Garner, Geosciences, Atmospheric and Oceanic Sciences
Stephen Griffies, Geosciences, Atmospheric and Oceanic Sciences
Robert W. Hallberg, Geosciences, Atmospheric and Oceanic Sciences
Isaac M. Held, Geosciences, Atmospheric and Oceanic Sciences
Larry W. Horowitz, Geosciences, Atmospheric and Oceanic Sciences
Sonya A. Legg, Atmospheric and Oceanic Sciences, Geosciences
Yi Ming, Geosciences, Atmospheric and Oceanic Sciences
Rong Zhang, Geosciences, Atmospheric and Oceanic Sciences

Associated Faculty
Denise L. Mauzerall, Woodrow Wilson School, Civil and Environmental Engineering
Michael Oppenheimer, Woodrow Wilson School, Geosciences
Stephen W. Pacala, Ecology and Evolutionary Biology
James A. Smith, Civil and Environmental Engineering
Mark Zondlo, Civil and Environmental Engineering

The intellectual excitement of modern geosciences is fueled by our exploration of the dynamic forces and delicate balances that mold our planet and have rendered it conducive to life for much of its history. Our landscape is continually reshaped by the movement of cold continents atop the hot, viscous mantle, and our lives are altered by the earthquakes and volcanic eruptions that attend their collision. Rocks that cover the Earth's surface sink to great depths and transform under enormous temperatures and pressures, perhaps to be uplifted as mountains and exposed to future generations by the forces of erosion. The ocean and atmosphere engage in a continuous and complex dialogue that controls the Earth's climate. Chemical reactions operating within microorganisms and on a variety of mineral and other natural surfaces are integrated into large geochemical fluxes, which distribute the resources needed for life, and life in turn alters these fluxes. This process operates within the framework of biological
evolution, in which diverse organisms appear, evolve, and vanish, sometimes leaving a transfigured world in their wake. All of these processes influence our daily lives in profound and surprising ways.

Many of the great challenges to humanity, today and in the future, involve processes that are studied by Earth scientists, leading to a rapidly increasing role for the field in issues of environmental regulation and public policy. A background in the Earth sciences is an essential component of contemporary education. Practicing geoscientists study nature both in the field and in the lab. To an ever-increasing degree, they must quantify observations with the aim of not only describing the past but also predicting the future of our planet, often with the aid of rigorous laboratory and field experiments, and intensive computation and modeling. The diversity of processes that characterize the Earth as a whole requires geosciences to be an extraordinarily interdisciplinary field with direct connections to mathematics, physics, chemistry, biology, and computer science. As a result of these connections, the geosciences department frequently draws students from many backgrounds. Many of our most successful graduates begin their undergraduate careers in subjects ranging from physics to English. The Department of Geosciences welcomes this intellectual variety, and our undergraduate program allows flexibility while stressing the importance of a sound understanding of the basic sciences.

Prerequisites

All concentrators are required to take either GEO 202 or GEO 203 (no exceptions).

Students must take an additional introductory course selected from GEO 201, GEO 202, GEO 203, GEO 255 or a Geosciences Freshman Seminar prior to graduation (but not necessarily before declaring the concentration). Students with adequate preparation may substitute a GEO 300-level course for this second introductory class. Other introductory geosciences courses, such as GEO 102 and 103 are intended primarily for non-science concentrators and do not count toward a concentration in the geosciences.

General Requirements

The following courses are required for graduation (with at most one pass/D/fail). AP credit may be used to place into a more advanced math or science course, but it does not provide credit toward the geosciences concentration.

Mathematics: Mathematics Prerequisite: MAT 104 or MAT 175 or one more advanced course in math. AP credit does not fulfill this requirement.

Geosciences Core Science Requirements: There are three ways to satisfy this requirement

(1) Recommended for students without AP credit: Students must complete two core science requirements at Princeton. Five acceptable course combinations to fulfill a core science requirement are: (a) PHY 103104, (b) MAT 201-202, (c) CHM 201-207, (d) COS 126, 226, (e) COS 126 + ORF 309, (f) EEB 211, MOL 215. AP credits do not fulfill this requirement.

(2) Recommended for students with or without AP credit: ISC 231-234

(3) Recommended for students with AP credit: In lieu of the intro sequences, students with AP credit may choose to substitute a more advanced course to satisfy a core science requirement. For example, CHM 215, CHM 303 or
CHM 305 could substitute for CHM 202. Permission from the UWC is required if you would like to pursue this option.

Students interested in graduate school are encouraged to take more than these minimum basic science requirements.

**Departmental Requirements**

Concentrators are required to take seven upper-level geosciences courses (300 level or higher) not including GEO 503.

Upper Level Science Courses: Up to two of the following courses may be substituted for GEO 300-level or above courses if they were not also used to satisfy the Geosciences Core Science Requirement. Students may substitute other advanced science courses not listed below with permission of the Undergraduate Work Committee (UWC): APC 350, AST 204, AST 301, CHM 303, CHM 304, CHM 305, CHM 306, CEE 205, CEE 303, CEE 305, CEE 306, CEE 365, COS 323, COS 333, EEB 324, EEB 355, ENV 302, MAE 221, MAE 222, MAE 223, MAE 305, MAE 306, MAT 323, MAT 325, MOL 342, MOL 345, ORF 405, PHY 207, PHY 208, PHY 301, PHY 304 and PHY 305.

Students are urged to consult with the departmental representative or their junior or senior advisor before choosing departmental courses outside geosciences. In general, the department is flexible about course selections and requirements; however, we must ensure a degree of coherency in each student's course of study.

Junior Colloquium. Is a weekly luncheon meeting, convened during the fall term, to acquaint juniors with research and career opportunities. This one-hour colloquium is mandatory for all geosciences concentrators (including those in the geological engineering program).

**Program of Study**

A set of informal programs (tracks) of study is designed to help students interested in different areas of geosciences, and to provide basic course plans that allow students to develop a strong foundation in those areas. These areas of focus include:

Geology and Geophysics (GPG). This track focuses on the structure and evolution of the Earth as a physical system, by theory, experiment, field work, and numerical simulation. The emphasis is on geological processes of global relevance, the history of the Earth, and life in the rock record. The quantitative concepts and techniques covered in class are also relevant to applied sciences and industry.

Ocean, Atmosphere, and Climate (OAC). This track specializes in the study of the coupled ocean and atmosphere system as it interacts with life to set the physical and chemical conditions of the Earth's surface. Students with backgrounds in subjects as diverse as chemistry, biology, physics, public policy, and economics who have an interest in climate and global environmental conditions will find this track a challenging and relevant addition to their coursework.

Environmental Biogeochemistry (EBG). This track focuses on the understanding of chemical and biological processes modifying the Earth's surface (atmosphere, soils, sediments, oceans), and how their interactions alter the behavior of elements or molecules responsible for different environmental processes, such as climate change, and the transport and bioaccumulation of anthropogenic contaminants.
Certificate Programs. The department offers a certificate program in geological engineering in collaboration with the Department of Civil and Environmental Engineering, which is described in the entry for the Program in Geological Engineering. The department also cooperates in the certificate programs in environmental studies, materials science and engineering, planets and life, and teacher preparation. Several geosciences courses fulfill the requirements of these certificate programs.

All students considering a concentration in the department should see the departmental representative. They are encouraged to consult as soon as possible, even as first-year students, to aid in the design of a course of study. The department offers an open house in both the fall and spring terms to introduce prospective students to departmental courses, faculty, students, and research interests.

For full details, see the department's website.

Geoscience Advisers

Each geosciences junior and senior is assigned an adviser, who is a faculty member and part of the Undergraduate Work Committee. Students are expected to regularly meet with their advisers for discussions on curriculum, course selection, choice of junior and senior research paper topics, study abroad plans, and the like. Once the courses have been selected in consultation with the adviser, students turn in their signed fall and spring course worksheet to the undergraduate coordinator. Any course changes should also be discussed and approved by the adviser or the undergraduate chair. At the beginning of each academic year, students will be informed who their geosciences advisers are.

Independent Work

*Please begin by examining the Geosciences Junior Paper and Senior Thesis Guide.*

Junior Independent Work. All juniors are required to conduct independent research in both the fall and spring terms. Each term, this work includes a written progress report, final written report, and a poster presentation of your final JP work. Faculty members will evaluate student poster presentations and submit feedback and grades. Although geoengineers are not required to conduct JP research, some geoengineers have conducted independent research in geosciences or engineering for course credit.

Different research topics are available in any given year and some ideas are listed in the Shopping Guide, which students obtain from the undergraduate coordinator. Students are encouraged to consult with their faculty advisers for suggestions regarding selection of the JP project. If students have other exciting ideas for possible JP projects, they are encouraged to consult their faculty advisers to discuss the feasibility of these projects.

The fall JP consists of a research proposal. The proposal includes a statement of the hypothesis you are proposing to test, a literature review that motivates your work, and preliminary data collection (i.e., field work, laboratory analysis, and/or data mining) and analysis that convinces the reader you will be able to test your central hypothesis. The fall JP is presented as a poster presentation to the Geosciences Department prior to submitting a final written report.
The spring JP project is a full scientific research paper. A student may choose to work on the same topic they proposed in the fall, or on a completely new topic with a new adviser. All spring JP work must include original data analysis; a literature review by itself does not qualify as a JP project. Many opportunities for collecting data are available, either through the student's own efforts (including field work, experiments conducted in any of the several laboratories in the department, and computer simulations) or by accessing databases made available by and for the scientific community at large. The spring JP is presented as a poster to the Geosciences Department prior to submitting a final written report.

Proposals for funding to support independent work are due in late September/early October for the fall JP, and mid-February for the spring JP (but please see the ST/JP Guide for details each year as the due dates are subject to change). Part of the JP grade is awarded based on two reports submitted at two different milestones during the semester. The final grade for both fall and spring independent research is decided based on the quality of the research and the written and oral work of the student.

Senior Independent Work. The senior research thesis project involves a much more in-depth study in the chosen topic and is a full-year effort. Students should budget their time accordingly. Each geosciences senior will choose an appropriate faculty member as senior thesis adviser in consultation with the departmental adviser and the faculty members that support the student's interests. The student is expected to conduct research in the adviser's laboratory and work closely with the adviser and/or graduate students/postdoctoral fellows.

The department publishes a Shopping Guide, which lists some research topics that the geosciences faculty members currently are pursuing. The Shopping Guide is a good starting point to identify a list of topics and research advisers from which students can select a topic and adviser for their senior independent research in consultation with the departmental adviser and faculty members. Students interested in pursuing a topic that is not part of the Shopping Guide are encouraged to approach their departmental advisor to discuss the feasibility of conducting the research either under the supervision of a faculty member in the department or in another department in the University.

Many students select their projects early, in consultation with the faculty adviser, and begin the research during the summer preceding the senior year. The department and the faculty adviser usually provide the necessary funds to conduct the independent research.

The department requires that a student submit a thesis proposal (due in late September or early October) and several interim research progress reports, including the fall semester progress report, a rough draft of the thesis for feedback, and the final thesis. The goal of the interim reports is to facilitate timely adviser-student feedback, help minimize the unavoidable thesis rush at the end of the year, and ensure that the final product of the thesis is of the highest quality. In addition to writing their theses, all students give oral presentations to the faculty and students of the geosciences department. The grade for the thesis is based on the quality of the research, the written report, and the oral presentation.

**Senior Departmental Examination**

The comprehensive examination in the department consists of an oral examination based on the senior thesis and related topics.

Grading and Honors
Senior Thesis: You will be graded on (1) your thesis research plus written report and (2) oral presentation plus answers to questions.

Thesis Grade:

(i) Research: Quality, originality, and commitment to doing the best possible lab-, field-, or model-based research. Ability to interpret results. Grade determined by adviser.

(ii) Written thesis: Quality and clarity of writing, proper organization and citations, illustration of results, interpretation, and discussion. Grade determined by adviser and second reader.

(iii) Oral presentation: Based on quality and clarity of presentation in lecture and illustrations as well as facility in answering questions pertaining to research results. Grade determined by the entire faculty.

The final thesis grade will be set only after a meeting of the faculty to discuss and rank all theses. In general, an A on a senior thesis means that the work and write-up submitted have sufficient merit to be published in a peer-reviewed journal. The final thesis grade is reported to the registrar and appears on the student's transcript.

Academic Honors:

The department awards academic honors (Honors, High Honors, Highest Honors) based on a combination of factors, including the overall grade point average (GPA), departmental GPA, junior research papers, and senior thesis. If the student has taken more than the required courses, then the courses with the highest grades that satisfy the concentration and breadth requirements are used in the calculation. For the senior thesis and junior research papers, the assigned grades will be used. In addition to grades, dedication to research, academic participation, and the overall impressions made by the student on the faculty are taken into consideration in the honors calculation. To ensure that the quality of honors remains consistent from year to year, the faculty compares student achievements with those from previous years.

Preparation for Graduate Study

Specialization in any one of the Earth sciences today requires graduate study. Students interested in pursuing graduate studies in any of the tracks are encouraged to take advanced chemistry, physics, mathematics, and biology courses. More specific information on graduate education can be obtained from the departmental representative or other faculty members.

Field Programs. Since experience in field geology is an important aspect of professional training, students are encouraged to take a course in field methods in geology and oceanography.

Geological Field Camp. After their freshman, sophomore or junior year, many of our students enroll in a Geosciences summer field camp (students should consult their faculty adviser in the November before they plan to attend summer field camp). Other students choose to work with a faculty member or a graduate student in the field,
and may conduct independent research for junior or senior independent research as part of this opportunity. Geosciences facilitates student enrollment in these field opportunities by providing financial aid.

Experience at Sea. Students interested in ocean studies can participate in ongoing studies at sea or at the Bermuda Biological Station. The department tries to make available opportunities to interested undergraduates, particularly to those electing the OAC and EBG tracks, to participate in an oceanographic cruise at some time during their undergraduate years.

Information on other opportunities for field experience is made available annually. The student should consult the departmental representative if interested in participating in field programs.

Financial Assistance. Grants for field work in geology are available through the Tony Conway '36 Memorial Scholarship Fund. Grants for field and museum studies and research in natural history during the summer are available to students of high scholastic standing from the John Boyd '43 Memorial Fund and the Glenn L. Jepsen '27 Fund. Grants are available from the Erling Dorf '33 Fund for field work and the field course. The Howard T. Vaum Jr. '78 Fund supports studies in geological engineering in a field study program. Grants for environmental studies are available from the Princeton Environmental Institute. Students wishing assistance from any of these funds should present a proposal (two pages of research description) by February 15 to the departmental representative. Funds are available from time to time for qualified undergraduates to serve as research assistants to faculty members during the regular academic session as well as during the summer months.

In some instances summer employment for qualified students can be arranged with governmental, commercial, or academic field parties.

Courses

GEO 102A Climate: Past, Present, and Future (also ENV 102A ) Fall STN
An introduction to the processes and conditions that control Earth's climate; an overview of past climate evolution from the time of Earth's origin to the period of human history; and an investigation of ongoing climate changes and those predicted for the future, including the capacity of human activities to alter climate and the impacts of climate change on environment and society. Intended primarily for students not concentrating in science or engineering. Three lectures. D. Sigman

GEO 102B Climate: Past, Present, and Future (also ENV 102B ) Fall STL
An introduction to the processes and conditions that control Earth's climate; an overview of past climate evolution from the time of Earth's origin to the period of human history; and an investigation of ongoing climate changes and those predicted for the future, including the capacity of human activities to alter climate and the impacts of climate change on environment and society. Intended primarily for students not concentrating in science or engineering. Three lectures, one three-hour laboratory. D. Sigman

GEO 103 Natural Disasters Spring STL
An introduction to natural (and some society-induced) hazards and the importance of public understanding of the issues related to them. Emphasis is on the geological processes that underlie the hazards, with some discussion of relevant policy issues. Principal topics: Earthquakes, volcanoes, landslides, tsunami, hurricanes, floods, meteorite
impacts, global warming. Intended primarily for non-science majors. Three lectures, one three-hour laboratory. A. Rubin

GEO 202 Ocean, Atmosphere, and Climate Spring STL
An introduction to the ocean, atmosphere, and climate from the perspective of oceanography. Covers coastal processes including waves, beaches, tides, and ecosystems; open ocean processes including atmospheric circulation and its impact on the surface ocean, the wind-driven circulation, and surface ocean ecosystems; and the abyssal ocean including circulation, the cycling of chemicals, and ocean sediments and what they tell us about the climate history of the Earth. The final part of the course will cover humans and the Earth system, including a discussion of ocean resources and climate change. Two lectures, one three-hour laboratory. J. Sarmiento

GEO 203 Fundamentals of Solid Earth Science (also ENE 203 ) Fall QR
A quantitative introduction to Solid Earth system science, focusing on the underlying physical and chemical processes and their geological and geophysical expression. Through the course we investigate the Earth starting from its basic constituents and continue through its accretion, differentiation and evolution and discuss how these processes create and sustain habitable conditions on Earth's surface. Topics include nucleosynthesis, planetary thermodynamics, plate tectonics, seismology, geomagnetism, petrology, sedimentology and the global carbon cycle. Two field trips included. J. Irving

GEO 207 A Guided Tour of the Solar System (also AST 207 ) Not offered this year QR
Examines the major bodies of our solar system, emphasizing their surface features, internal structures, and atmospheres. Topics include the origin of the solar system, habitability of planets, and the role of impacts in planetary evolution. Terrestrial and giant planets will be studied as well as satellites, comets, and asteroids. Recent discoveries from planetary missions are emphasized. This course is aimed primarily at non-science majors. Three lectures, this course is normally taught in the fall. T. Duffy

GEO 255A Life in the Universe (also AST 255A / EEB 255A / CHM 255A ) Fall STN
Introduces students to Astrobiology, a new field where scientists trained in biology, chemistry, astrophysics and geosciences combine their skills to unravel life's origins and to search for extraterrestrial life. Topics include: the astrophysical prerequisites for life, the RNA world, the evolution of metabolism and photosynthesis, microbes in extreme environments, and the search for life within our solar system and in nearby solar systems. Two 90 minute lectures. Track A will be required to take a mid-term exam during Fall break. Prerequisite: one geoscience, chemistry, biology or astronomy class or instructors' permission.
T. Onstott, C. Chyba, A. Link

GEO 255B Life in the Universe (also AST 255B / EEB 255B / CHM 255B ) Not offered this year STL
Introduces students to Astrobiology, a new field where scientists trained in biology, chemistry, astrophysics and geosciences combine their skills to unravel life's origins and to search for extraterrestrial life. Topics include: the astrophysical prerequisites for life, the RNA world, the evolution of metabolism and photosynthesis, microbes in extreme environments, and the search for life within our solar system and in nearby solar systems. Two 90 minute lectures and field training in Yellowstone National Park over Fall break is required. Prerequisite: one geoscience, chemistry, biology or astronomy class or instructors' permission. T. Onstott, C. Chyba, A. Link

GEO 300 Summer Course in Geologic Field Methods Spring STL
Introduction to modern geologic field methods, with local and regional problems studied from a residential base camp. One option is the five week University of Houston-Yellowstone Bighorn Research Association (YBRA) course based in Red Lodge, Montana, run by the University of Houston. Alternatively, students may attend field courses offered by other institutions after obtaining approval from the Undergraduate Work Committee of the Department of Geosciences. Financial aid is available through the Geosciences Department. A. Maloof, L. Goodell

GEO 311 Global Air Pollution (See CEE 311)

GEO 333 Oil to Ozone: Chemistry of the Environment (See CHM 333)

GEO 361 Earth's Atmosphere (also ENV 361 / CEE 360 ) Fall STN
This class discusses fundamental aspects of Earth's climate with a focus on the fundamental atmospheric processes that render Earth "habitable," and how they may respond to the forcing originating from natural (such as volcanoes) and anthropogenic (such as emission of carbon dioxide and ozone-depleting gases) processes. S. Fueglistaler

GEO 362 Earth's Climate History (also ENV 362 ) Spring STN
The chemical cycles of ocean and atmosphere and their interaction with Earth's biota. Topics include: the origin of the ocean's salt; the major and biologically active gases in the atmosphere and ocean; nutrients and ocean fertility; the global carbon cycle; the reactive chemistry of the atmosphere. Prerequisites: CHM 201/202 or higher; GEO 202 and/or GEO 361; or permission of the instructor. Three lectures. M. Bender

GEO 363 Environmental Geochemistry: Chemistry of the Natural Systems (also CHM 331 / ENV 331 ) Fall STN
Covers topics including origin of elements; formation of the Earth; evolution of the atmosphere and oceans; atomic theory and chemical bonding; crystal chemistry and ionic substitution in crystals; reaction equilibria and kinetics in aqueous and biological systems; chemistry of high-temperature melts and crystallization process; and chemistry of the atmosphere, soil, marine, and riverine environments. The biogeochemistry of contaminants and their influence on the environment will also be discussed. Two 90minute lectures. Prerequisite: one term of college chemistry or instructor's permission. S. Myneni

GEO 364 Earth Chemistry: The Major Realms of the Planet (also CHM 364 ) Not offered this year STN
The chemical composition of the major realms of the planet: core, mantle, continents, ocean, atmosphere, and biosphere. Topics include the synthesis of the chemical elements in stars, the origin of the solar system and Earth, and the chemical differentiation of Earth's core, mantle, crust, ocean, atmosphere, and biosphere. Also explores the global cycles of carbon, nitrogen, and other biologically important elements, their interactions with the geosphere, and their evolution through time. Prerequisites: CHM 201, or equivalent; MAT 103, or equivalent. Three lectures. D. Sigman

GEO 365 Evolution and Catastrophes Fall STN
This course introduces students to the evolution of life and mass extinctions based on a broad survey of major events in Earth history as revealed by the fossil record. Concepts and techniques of paleontology are applied to all aspects, including colonization of the oceans, invasion of land, mass extinctions and evolutionary radiations. The roles of major catastrophes in the history of life are evaluated, including meteorite impacts, volcanism, climate change, and oceanic anoxia. One three-hour lecture. Prerequisite:
One 200 level or higher GEO course. G. Keller
GEO 366 Climate Change: Impacts, Adaptation, Policy (also ENV 339 / WWS 451 / ENE 366) Not offered this year STN
An exploration of the potential consequences of human-induced climate change and their implications for policy responses, focusing on risks to people, societies, and ecosystems. As one example: we examine the risk to coastal cities from sea level rise, and measures being planned and implemented to enable adaptation. In addition, we explore local, national, and international policy initiatives to reduce greenhouse-gas emissions. The course assumes students have a basic background in the causes of human-induced climate change and the physical science of the climate system. Two 90-minute lectures, one preceptorial. M. Oppenheimer

GEO 370 Sedimentology (also ENV 370 / CEE 370) Not offered this year STL
A treatment of the physical and chemical processes that shape Earth's surface, such as solar radiation, i.e., deformation of the solid Earth, and the flow of water (vapor, liquid, and solid) under the influence of gravity. In particular, the generation, transport, and preservation of sediment in response to these processes are studied in order to better read stories of Earth history in the geologic record and to better understand processes involved in modern and ancient environmental change. Prerequisites: MAT 104, PHY 103, CHM 201, or equivalents. Two lectures, two laboratories. A. Maloof

GEO 371 Global Geophysics (also PHY 371) Spring STN
An introduction to the fundamental principles of global geophysics. Taught in four parts, the material builds up to form a final coherent picture of (how we know) the structure and evolution of the solid Earth: gravity, magnetism, seismology, and geodynamics. The emphasis is on physical principles including the mathematical derivation and solution of the governing equations. Prerequisites: MAT 201 or 203, PHY 103/104 or PHY 105/106, or permission of the instructor. Two 90-minute lectures. F. Simons

GEO 372 Rocks Spring STL
This course serves as an introduction to the processes that govern the distribution of different rocks and minerals in the Earth. Students learn to make observations from the microscopic to continental scale and relate these to theoretical and empirical thermodynamics. The goal is to understand the chemical, structural, and thermal influences on rock and mineral formation and how this in turn influences the plate tectonic evolution of our planet. This course has two lectures, one lab and a required Spring Break fieldtrip. Prerequisite: One introductory GEO course and GEO 378. B. Schoene

GEO 373 Structural Geology Fall STL
The nature and origin of the deformed rocks composing the crust of Earth considered at scales ranging from atomic to continental. Tectonics and regional geology of North America. Two lectures, one lab and a required Fall Break fieldtrip. B. Schoene

GEO 374 Planetary Systems: Their Diversity and Evolution (also AST 374) Spring STN
Examines the diversity of recently discovered planetary systems in terms of fundamental physical and chemical processes and what this diversity implies about the origin and evolution of our own planetary system. Topics include: the formation and dynamics of planets and satellites, planetary migration, the evolution of planetary interiors, surfaces and atmospheres, the occurrence of water and organics, and the habitability of planets and planetary systems. Recent discoveries from planetary missions and extrasolar planet observations are emphasized. Prerequisites: GEO 207, 255, or instructor's permission. Two 90-minute lectures. T. Onstott

GEO 375 Environmental Fluid Mechanics (See CEE 305)
GEO 417 Environmental Microbiology (also CEE 417 / EEB 419)  
Spring

The study of microbial biogeochemistry and microbial ecology. Beginning with the physical/chemical characteristics and constraints of microbial metabolism, we will investigate the role of bacteria in elemental cycles, in soil, sediment, and marine and freshwater communities, in bioremediation and chemical transformations. Prerequisites: One 300-level course in chemistry or biology, or instructor's permission. Two 90-minute classes, this course is normally offered in the Spring. B. Ward

GEO 418 Environmental Aqueous Geochemistry (also CHM 418)  
Fall

Application of quantitative chemical principles to the study of natural waters. Includes equilibrium computations, weathering and diagenetic processes, precipitation of chemical sediments, and pollution of natural waters. Two lectures. Prerequisite: one year of college chemistry. Previous or concurrent enrollment in CHM 306 recommended. F. Morel

GEO 419 Physics and Chemistry of Earth's Interior (also PHY 419)  
Spring

The Earth is a physical system whose past and present state can be studied within the framework of physics and chemistry. Topics include current concepts of geophysics and the physics and chemistry of Earth materials; origin and evolution of the Earth; and nature of dynamic processes in its interior. One emphasis is to relate geologic processes on a macroscopic scale to the fundamental materials properties of minerals and rocks. Three lectures. Prerequisites: one year of college-level chemistry or physics (preferably both) and calculus. Offered alternately with 424. T. Duffy

GEO 420 Topics in Earth Science

These courses cover one or more advanced topics in modern Earth science. They are offered only when there is an opportunity to present material not included in the established curriculum; the subjects vary from year to year. Three classes or a three-hour seminar. Staff

GEO 422 Data, Models, and Uncertainty in the Natural Sciences  
Fall QR

This course is for students who want to turn observations into models and subsequently evaluate their uniqueness and uncertainty. Three main topics are elementary statistics (inference), heuristic time series (Fourier) analysis, and model parameter estimation via matrix inverse methods. Prerequisites: MAT 201 and 202. Theory lectures and classroom Matlab instruction in alternating weeks. Two 90-minute lectures/classes. F. Simons

GEO 423 Dynamic Meteorology (also CEE 423)  
Not offered this year

This course provides the rigorous introduction to the moving atmosphere needed to understand Earth's weather and climate. The fundamental forces of the atmosphere (pressure gradient, gravity, and Coriolis) and conservation laws (mass, momentum, energy) will be developed. Approximations relevant to Earth's large-scale circulation and regional-scale extreme events will be discussed. Important consequences of atmospheric turbulence will also be covered. Throughout, connections between dynamical equations and atmospheric observations will be strongly emphasized. Staff

GEO 424 Introductory Seismology (also CEE 424 / ENE 425)  
Spring STN

Fundamentals of seismology and seismic wave propagation. Introduction to acoustic and elastic wave propagation concepts, observational methods, and inferences that can be drawn from seismic data about the deep planetary structure of the Earth, as well as about the occurrence of oil and gas deposits in the crust. Prerequisites: PHY 104 and MAE 305 (can be taken concurrently), or permission of the instructor.
Two 90-minute classes. *J. Tromp*

**GEO 425 Introduction to Ocean Physics for Climate (also MAE 425)**  
Fall  
The study of the oceans as a major influence on the atmosphere and the world environment. Ocean circulation and the oceans' properties. The Coriolis-dominated equations of motion, the thermocline, wind-driven and thermohaline-driven circulation, and oceanic tracers. Three lectures. Prerequisite: MAT 201, MAT 202 or equivalent. *G. Vecchi*

**GEO 428 Biological Oceanography**  
Spring  
Fundamentals of biological oceanography, with an emphasis on the ecosystem level. The course will examine organisms in the context of their chemical and physical environment; properties of seawater and atmosphere that affect life in the ocean; primary production and marine food webs; and global cycles of carbon and other elements. Students will read the current and classic literature of oceanography. Prerequisites: college-level chemistry, biology, and physics. Two 90-minute classes. *B. Ward*

**GEO 440 Advanced Mineralogy (also MSE 440)**  
Not offered this year  
An advanced survey of the structure and crystal chemistry of major rock-forming minerals. Topics include: crystallography, physical properties of minerals, mineral thermodynamics, lattice dynamics, phase transformations, defects, and kinetics. Prerequisites: GEO 372 or MSE 301, or instructor's permission. Two 90-minute lectures. *T. Duffy*

**GEO 441 Computational Geophysics (also APC 441)**  
Spring  
An introduction to weak numerical methods used in computational geophysics. Finite- and spectralelements, representation of fields, quadrature, assembly, local versus global meshes, domain decomposition, time marching and stability, parallel implementation and message-passing, and loadbalancing. Parameter estimation and "imaging" using data assimilation techniques and related "adjoint" methods. Labs provide experience in meshing complicated surfaces and volumes as well as solving partial differential equations relevant to geophysics. Prerequisites: MAT 201; partial differential equations and basic programming skills. Two 90-minute lectures. *J. Tromp*

**GEO 442 Geodynamics (also PHY 442)**  
Fall  
An advanced introduction to setting up and solving boundary value problems relevant to the solid Earth sciences. Topics include heat flow, fluid flow, elasticity and plate flexure, and rock rheology, with applications to mantle convection, magma transport, lithospheric deformation, structural geology, and fault mechanics. Prerequisites: MAT 201 or 202. Two 90-minute lectures. *A. Rubin*

**GEO 464 Radiogenic Isotopes**  
Spring  
Theory and methodology of radiogenic isotope geochemistry with a focus on geochronology as applied to topics in the geosciences, including the formation and differentiation of the Earth and solar system, thermal and temporal evolution of orogenic belts, and the rates and timing of important geochemical, biotic, and climatic events in earth history. Two 90-minute lectures. *B. Schoene*

**GEO 470 Environmental Chemistry of Soils (also CHM 470)**  
Spring  
Focuses on the inorganic and organic constituents of aqueous, solid, and gaseous phases of soils, and fundamental chemical principles and processes governing the reactions between different constituents. The role of soil chemical processes in the major and trace element cycles, and the biogeochemical transformation of different soil contaminants will be discussed in the later parts of the course.
Prerequisites: GEO363/CHM331/ENV331, or any other basic chemistry course. Two 90-minute lectures.

S. Myneni

GEO 471 Introduction to Water Pollution Technology (See CEE 471)
Information and Departmental Plan of Study  Advanced Placement

A student with a minimum SAT Subject Test score in German of 760 or an Advanced Placement Examination score of 5 will be considered to have satisfied the A.B. foreign language requirement and be eligible for placement in 200- or 300-level courses, as well as participation in the Summer Work Program and the Berlin Consortium. Students with some knowledge of German but without SAT Subject or AP test scores must have their proficiency measured by the online placement test administered by the Registrar. Sophomores and upper-class students may take the test as well, but must do so according to the test's availability during Orientation as indicated by the Registrar.

Prerequisites

The requirement for admission to the German department is a satisfactory working knowledge of German demonstrated by the completion of 107, an SAT Subject Test score of 760, or a 5 on the Advanced Placement test.

Early Concentration

Qualified students may begin departmental work in the sophomore year under the following plan:

1. Recommended introductory courses: 207, 208, 209, 210, or 211;

2. Independent work beginning in the second sophomore term;

3. Meetings with the departmental representative for individual discussion of the student's independent work.
This plan permits students to devote themselves to their major interest before their junior year. They can advance when ready and as swiftly as possible. An early start gives students a wider choice of courses and seminars in their senior year and enables them to start work on the senior thesis before their final year at Princeton.

**Program of Study**

The department offers six areas of concentration:

1. **German Literature.** This program focuses on the major periods and forms of German literature with emphasis on literary and historical analysis. Students will satisfy the general University requirement of eight departmental courses by taking a minimum of five courses in the department (at least three of which should be 300-level courses) and a maximum of three cognate courses in related humanities departments and other disciplines such as philosophy and religion.

2. **German Philosophy and Intellectual History.** This program concentrates on philosophy, political and cultural theory, particular intellectual movements, and epochs in German-speaking contexts. Students in this track are required to take a minimum of five courses in the German department (at least three of which should be 300-level courses) and a maximum of three relevant cognate courses in history, European cultural studies, or philosophy.

3. **Media and Aesthetics.** This program is designed for students who wish to focus on art, film, music, sound technology, and/or media theory broadly conceived. Students take a minimum of five courses in the German department (at least three of which should be 300-level courses), and a maximum of three relevant cognate courses in art and archaeology, music, philosophy, European cultural studies, and the Program in Visual Arts.

4. **Germanic Linguistics.** This program concentrates on the history and structure of the German language. Majors who select this program are required to take the following courses: LIN 213 Introduction to Language and Linguistics or a comparable course in linguistics, GER 505 History of the German Language, and either GER 506 Second Language Acquisition and Pedagogy or GER 316, with the same title. In addition, such students will take at least three courses in German literature and culture and two cognate courses pertaining to linguistics.

5. **The Study of Two Literatures.** This plan of study normally consists of five upper-level courses in the German department (at least three of which should be 300-level courses), and three upper-level courses in a second literature. Students who have not completed the language preparation for the second literature may engage in the program provided that they satisfy that language requirement during the junior year.

6. **Joint Program in German Culture and Politics.** In cooperation with the Department of Politics, students may combine a concentration in German intellectual history with a concentration in German/European politics and/or political theory. In this program, four courses will be taken in the German department (at least two of which should be 300-level courses) and four cognate courses in German/European politics or political theory will be taken in the Department of Politics (at least two of which should be 300-level courses). Recommended departmental courses are GER 207, 208, 211, 306, 307, 309, and 324. Recommended cognates in politics include POL 210, 230, 231, 240, 306, 372, 373, and 385. The senior thesis may focus on any political topic with a substantive German-related component. Upon graduation, a letter will be issued by the German department certifying completion of a program in German cultural studies with a concentration in politics.
Language Requirements

For areas 1 to 5, at least three, and for area 6, at least two of the departmentals should be courses taught in German. For areas 1 to 5, one of these three may be a course taught in English for which there is an appropriate German-language component. This option is available for all courses taught in the German department, but also for some courses in other departments. Students should consult with the course instructor regarding the German-language component at the beginning of the semester and submit the agreed-upon plan to the German departmental representative for approval by the end of the second week of classes.

Independent Work

Independent reading, the junior year essays, and the senior thesis constitute the student's total independent work, which is spread over the four upper-class terms. These elements can be profitably linked with departmental courses. Students will consult with the departmental representative under whose guidance they will develop their own program. During the first term of the junior year, students are required to write an essay of approximately 4,000 words on a subject in German philosophy, art, media, linguistics, literature, or politics. During the second term of the junior year, students will present a longer essay (of approximately 8,000 words). These essays, as well as the senior thesis, may be written in German or English. Early in May of the junior year students should discuss plans for their senior theses with the departmental representative.

During senior year students will write a thesis on a subject approved by their thesis adviser. By the end of the fourth week of the first senior term students will submit to their advisers a tentative outline of the proposed thesis. Further progress reports (as announced by the department) are required. Five weeks before the departmental examination students must deliver to the departmental office two spiral-bound readers' copies (signed). After the departmental exam and upon approval of the thesis, students must submit one bound copy for the department archive and one unbound copy for the library. Readers' copies will be returned to the student with comments in advance of the departmental exam. The title page must show the student's name and class numerals, the department in which the student is enrolled, the name of the adviser, and the month and year of presentation.

Senior Departmental Examination

The departmental examination will be oral, based on the thesis and the student's course of study. At least one fourth of the approximately hour-long exam will be conducted in German. Students should come prepared to give a 5-10 minute presentation about the argument and contribution of their thesis.

Study and Work Abroad

It is strongly recommended that students spend some time in a German-speaking country. This can be done through the Berlin Consortium for German Studies, the Princeton-in-Munich Study Abroad Program, or the department's Summer Work Program.

Berlin Study Abroad Program. Through the Berlin Consortium for German Studies, of which Princeton University is a member, Princeton undergraduates are eligible to spend either one semester or an entire academic year studying abroad at the Freie Universität Berlin for full Princeton academic credit. Students will pay normal Princeton tuition, and those on financial aid will continue to receive aid during their study abroad. Departmental students wishing to enroll in this or any other foreign study program may do so, provided they present an acceptable plan of study that includes fulfillment of the departmental requirements for independent work and their application is approved by the
Faculty Committee on Examinations and Standing. Early consultation with the departmental representative is strongly encouraged. Applications for the Berlin program are due in early October for the spring term and in early March for the following academic year. For application forms and additional information, contact the departmental representative or the Office of International Programs at (609) 258-5524.

Princeton-in-Munich Study Abroad Programs. We offer two programs for study in Munich, Germany. (1) Students enrolled in GER 102, 1025, or 105 may apply to participate in GER 105 or 107 in Munich. 2) Students enrolled in GER 107 or a 200 or 300 level seminar taught in German, or who have placed out of the language sequence, have the opportunity to apply to GER 3XXG in Munich. GER 105 and 107 are taught in a special month-long summer course at the Goethe-Institute and are partially subsidized by the University and the German department. GER 3XXG is taught by a Princeton professor. Successful completion of 107G in Munich satisfies the University's language requirement and qualifies students for upper-level courses in German, the Summer Work Program, and the Berlin Consortium. Successful completion of 3XXG reduces the required German language courses by one for major or certificate students. Interested students should consult with the departmental representative, Professor Thomas Y. Levin.

The Summer Work Program. The department places students in paid internships in Germany, Austria, and Switzerland in fields such as banking, newspaper and book publishing, radio, healthcare, and computing. Salaries usually cover living expenses, and scholarship funds are available to help with transportation to and from the job where needed.

Applications for this program are due in early November. Prerequisite for acceptance is a satisfactory speaking knowledge of German; that is, at least a C+ grade in German 107 or its equivalent. Further information may be obtained from the program office and by e-mail to swp@princeton.edu.

Certificate in Language and Culture

The Department of German offers students an opportunity to do sustained work in German language, philosophy, art, and media while concentrating in another department, leading to a certificate in German language and culture.

Program Requirements. The program is open to undergraduates in all departments. Students should consult the departmental representative by the middle of the sophomore year to plan a program of study.

The requirements for work done in the Department of German are:

1. Four courses at the 200 level or higher, at least two of which must be at the 300 level or higher.

2. Evidence of substantial upper-level course work in German. This requirement will be satisfied if three of the four courses taken for the certificate were conducted in German or if two were conducted in German and one was conducted in English but entailed an appropriate German-language component. This option is available for all courses taught in the German department, but also for some courses in other departments. Students should consult with the course instructor regarding the German-language component at the beginning of the semester and submit the agreed-upon plan to the German departmental representative for approval by the end of the second week of classes.
3. A substantial paper (20 pages if in English, 12-15 pages if in German) involving original research on a German-related topic. The paper may be an expanded and significantly revised version of a paper written for one of the four courses taken to fulfill the certificate. At least one third of the material submitted, by word count, must be new, and all of the remainder must be reworked and transformed. If the paper is written in German, revision can include grammatical improvements and corrections. If written in English, the paper must be accompanied by a two-page German abstract.

A copy of the original version of the paper should be submitted along with the revised and expanded version.

**Preparation for Graduate Study**

Departmental students who intend to pursue graduate studies in German are reminded that most graduate schools require a reading knowledge of a second modern foreign language, and, possibly, Latin. Students are therefore advised to prepare themselves as undergraduates to meet these requirements.

The Language Program. The normal program for beginners consists of 101, 102, 105, and 107. Students with a grade of A in 101 may combine 102 and 105 in a special second-term course, 102-5.

It is possible to start the study of German at Princeton and fulfill the language requirement in one year through the Munich Study Abroad Program (see above): 101 (fall term), 102-5 (spring term), 107G (summer study immediately following 102-5). German 105G is also offered through the Munich program.

Successful completion of 107, 107G, or immediate assignment to a higher course satisfies the degree requirement and qualifies the student for all advanced courses, for departmental concentration, and for participation in the Berlin Consortium and the Summer Work Abroad Program. All questions concerning placement, course changes, failures, summer study, or other matters related to any of the department's undergraduate courses should be referred to the departmental representative.

Note: Normally students electing a beginner's course in any language will receive credit only if two terms are completed.

**Areas of Study.** The department offers courses in:

2. German literature: 209, 301, 303, 305, 321, 323, 324, 325, 340, 362;
4. Media and aesthetics (lectures/seminars are in English unless otherwise noted): 211, 308, 337, 370, 371,373;
5. Germanic and European literatures in translation: 320;
6. Germanic linguistics: for relevant graduate courses open to undergraduates by permission, consult the German department's listing online.

**Courses**

**GER 101 Beginner's German I** Fall
This course lays the foundation for functional acquisition of German, with attention to interpretation (listening/reading), production (speaking/writing) and cultural understanding. Class time is devoted to interactive language tasks that foster comprehension, vocabulary acquisition and fluency. Five hours per week. No credit given for GER 101 unless followed by GER 102. J. Rankin

**GER 102 Beginner's German II**  
Spring  
Continuation of 101, with added emphasis on reading, communicative writing strategies, listening comprehension, vocabulary acquisition, and cultural analysis through film. Five hours per week. **Staff**

**GER 1025 Intensive Intermediate German**  
Spring  
Intensive training in German, building on 101 and covering the acquisitional goals of 102 and 105: communicative proficiency, mastery of discourse skills and reading strategies to interpret and discuss contemporary German short stories, film and drama. Successful completion of the course (B- or above) leads to automatic eligibility for GER 107G in the Princeton-in-Munich program. Limited to students with a grade of A/A- in 101. Nine hours per week. J. Rankin

**GER 103 Beginner's German in Review**  
Not offered this year  
The course provides students who have some background in German a brief review of material covered in 101, and then works on speaking, listening, reading, and writing skills at the level of 102. Five hours. Prerequisite: scores from placement/proficiency test administered during fall orientation and consultation with instructor. **Staff**

**GER 105 Intermediate German**  
Fall  
The course aims to solidify previously acquired German, while expanding the range of usable vocabulary and syntax. Emphasis in class on task-based approaches to grammar, writing, listening comprehension and cultural understanding, using texts and film. Prerequisite: SAT Subject Test score of 570 and demonstrated oral competence, or successful completion of 102. To be followed by 107 to satisfy the A.B. language requirement. Four hours per week. **Staff**

**GER 107 Advanced German**  
Fall/Spring  
Further acquisition of proficiency in speaking, listening, reading, and writing using online media, film, and texts as a basis for interaction and analysis. The fall course provides extensive review of basic structures and vocabulary for incoming students with high school German instruction; the spring course dovetails with 105 in terms of cultural and grammatical topics. Prerequisite: SAT Subject Test score of 650 and demonstrated oral competence, or successful completion of 105. Satisfies the A.B. language requirement. Three hours per week. **Staff**

**GER 207 Studies in German Language and Style: Society, Politics, and Culture in Germany, 1890-1945**  
Fall  
Discussions of exemplary texts from modern German society and culture, including essays, speeches, autobiographies, works of literature, art, and film. The course offers an introduction to important issues in modern Germany: the Kaisereich to the end of monarchy, Berlin as a modern metropolis, World War I, the democratic experiment of the Weimar Republic, and the rise and structures of National Socialism. Intensive practice in spoken and written German with emphasis on vocabulary acquisition and complex syntactical forms. Two 90-minute seminars. Prerequisite:107 or instructor's permission. **Staff**

**GER 208 Studies in German Language and Style: Contemporary Society, Politics, and Culture**  
Spring  
Continuation of 207 (which is not, however, a prerequisite). Discussions of social, political, and cultural aspects of contemporary Germany. Basis of discussions are essays, literary texts, and films. Individual assignments to develop
oral and written expression. Particularly recommended to students contemplating study or work in Germany. Two 90-minute seminars. Prerequisite: 107 or instructor's permission. Staff

GER 209 Introduction to German Literature after 1700 Fall/Spring LA
The main periods of German literature from Lessing to the present studied through texts chosen to help the student acquire fluency in reading German and in the principles of literary interpretation. Two classes. M. Jennings

GER 210 Introduction to German Philosophy Spring EC
Covers German intellectual history from the Enlightenment to the present by focusing on the theoretical texts of its major authors (Kant, Hegel, Marx, Nietzsche, Weber, Heidegger, Arendt, Habermas). In addition to addressing the core discipline of philosophy, this course focuses on aesthetics, social, and political thought as well. All readings in English. Two lectures, one preceptorial. Staff

GER 211 Introduction to Media Theory Spring EC
Traces the development of critical reflection on media through careful readings of a wide range of media theoretical texts from the late 19th to the early 21st century. Topics range from the birth of single-point perspective to photography, from gramophones to radio, from pre-cinematic optical devices to film and television, and from telephony and typewriters to cyberspace. Covers the relationship between representation and technology, the historicity of perception, the interplay of aesthetics, techniques, and politics, and transformations of reigning notions of imagination, literacy, communication, reality, and truth. Two 90-minute seminars. D. Fore, T. Levin

GER 301 Topics in German Drama and Theater (also HUM 301) Fall/Spring LA
Exploration of specific problems in the history of German theater, drama, and dramatic theory. Topics may range from the baroque drama to the importance of Brechtian theater for modernism, and from the dramatic representation of political conflicts to contemporary theater and performance studies. Staff

GER 303 Topics in Prose Fiction Fall LA
Critical investigations of particular problems in the development of German literary prose. Topics may include love as a mode of literary self-expression, the role of utopia in the rise of the modern novel, the history of the German novella, detective fiction, and the modern short story and experimental prose.
Prerequisite: 107. J. Vogl

GER 305 Topics in German Poetry Not offered this year LA
Studies of a particular question related to the development of German-language poetry and poetics. Topics may range from readings of major German poets (Goethe, Hölderlin, George, Rilke, Benn, Celan) to the paradigmatic status of the genre for 20th-century conceptions of the avant-garde. Prerequisite: 107. Staff

GER 306 German Intellectual History Fall/Spring EC
A study of major German philosophers and religious and social thinkers from the Reformation to the present. Selected works of Hegel, Marx, Nietzsche, Freud, Heidegger, or German-Jewish thinkers will be read together with contemporary interpretations. Two 90-minute seminars. Staff
GER 307 Topics in German Culture and Society Fall LA
Exploration of key moments in German culture in light of its history and institutions. Topics may range from Marxist aesthetics to theories of fascism to German women writers. Readings and discussion in German. Staff

GER 308 Topics in German Film History and Theory Fall EC
What is film? Is it a language? Can one speak of cinematic literacy? Does film transform perception? Is there filmic thinking? This seminar on the theory and poetics of cinema will examine the varieties of ways -- semiotic, psychoanalytic, narratological - that filmmakers, philosophers and critics have analyzed film form, the cinematic experience, the construction of cinematic subjectivity, questions of aesthetic politics and notions of medium specificity. Staff

GER 309 Literature, Philosophy, and Politics in the Weimar Republic LA
An interdisciplinary examination of continuity and change in the culture and the cultural politics of Germany between 1919 and 1933. Topics include expressionism in the visual arts and literature; Berlin Dada; the Conservative Revolution; abstract versus representational art (Thomas Mann, Neue Sachlichkeit; the Bauhaus and mass housing; montage in film and literature (Sergei Eisenstein, Walter Benjamin); the political theater (Bertolt Brecht, Erwin Piscator), and the optics of the modern metropolis (Walter Ruttmann, Alfred Döblin). Two 90-minute seminars. D. Fore

GER 314 Topics in the History and Theory of the Media Spring
What defines life? And where do we locate the boundary between its proper and improper instances, between the natural and the monstrous? First emerging in the early 19th century, the prospects of artificial life continue to provoke both exhilaration and anxiety today. By examining works of philosophy, literature and film over a historical period ranging from early Romanticism to contemporary nanoculture, this seminar explores humanity's desire to become like the gods, fashioning species, companions, and slaves at will, even as these creations menace us through their intractability and threaten to take on an uncanny life of their own. Staff

GER 320 Masterworks of European Literature: The Romantic Quest (also COM 320) Not offered this year LA
Works central to the tradition of modern European literature, including Goethe's Faust, Byron's Don Juan, Flaubert's Sentimental Education, Nietzsche's Beyond Good and Evil, and Mann's Doctor Faustus. Each work treats the quest for greatness; each will be examined as to its form and place in the history of ideas. Two 90-minute seminars. Staff

GER 321 Topics in German Medieval Literature (also GSS 321 / MED 321) Spring LA
Exploration of German medieval literature. Topics may include medieval German Arthurian literature and the relationship between gender and power in the medieval epics. S. Poor

GER 323 Fairy Tales: The Brothers Grimm and Beyond Not offered this year LA
What do fairy tales do? More than children's entertainment, they instruct, amuse, warn, initiate, and enlighten. Throughout history, they have functioned to humanize and conquer the bestial and barbaric forces that terrorize us. They have also disguised social anxieties about gender and sex. The history and social function of fairy tales will be explored in the context of Germany in the 18th-20th centuries. Texts include selections from the Grimms' Marchen,
as well as from the literature of the Romantic, Weimar, and postwar periods. Prerequisite: 107. Two 90-minute seminars. S. Poor

GER 324 Topics in Germanic Literatures Fall/Spring LA
Critical investigation of German language literature from 800 to present. Topics may include medieval German Arthurian literature, the Austrian literary avant-garde, love stories, as well as focused studies of selected authors. Two 90-minute Seminars. Staff

GER 325 Nietzsche and Modern European Literature Not offered this year LA
The philosophy of Friedrich Nietzsche as an important progenitor of the European modernist culture that arose in the period of urban capitalist modernity, roughly 1870-1930. Particular emphasis will be placed on a series of textual encounters between Nietzsche and such authors as Gide, Mann, Lawrence, Rilke, Yeats, Musil, and Malraux; their readings and rewritings of Nietzsche lent decisive impulses to the formal and thematic concerns of modernism. Two 90-minute seminars. M. Jennings

GER 332 The Cultural Theory of the Frankfurt School Not offered this year EC
An examination of the work of the Frankfurt School of critical social theory on questions of modern culture. The course will focus on the textual debates among Theodor Adorno, Walter Benjamin, Max Horkheimer, and Siegfried Kracauer on the complex relationship of aesthetics and politics. These often polemical socio-philosophical texts attempt to map a contemporary cultural landscape reconfigured by the "culture industry," transformations in perception, the emergence of the mass, and new technologies of reproduction such as radio, cinema, and television. One three-hour seminar. M. Jennings, T. Levin

GER 337 Court, Cloister, and City: Art and Architecture in Central and Eastern Europe (See ART 337)

GER 340 German Literature in the Age of Revolution Not offered this year LA
The major works of the classical period in German literature. Texts by Goethe, Schiller, Hölderlin, and Kleist in relation to European historical, social, and philosophical change. Two 90-minute seminars. N. Wegmann

GER 362 Contemporary German Literature Spring LA
An introduction to the poetry, drama, and prose of postwar Germany in the East and West. Emphasis on the political and social context of the major literary works from the '50s to the present. Two 90-minute seminars. Staff

GER 370 Weimar Germany: Painting, Photography, Film (also ART 331 / ECS 370 ) Not offered this year LA
The visual arts in Germany during the Weimar Republic (1918-1933). Works of art, cinema, and literature in historical context. Topics include: modernism and modernity; Expressionism, Dada, New Objectivity in painting, photography, cinema, and literature; historical conditions of bodily experience and visual perception; emergence of new artistic and technological media; expansion of mass culture; place of politics in art; experience and representation of metropolitan life; changes in the conceptualization and representation of individuality, collectivity, embodiment, race, class, gender, sexuality. Two 90-minute seminars, one film screening. B. Doherty

GER 371 Art in Germany Since 1960 (also ART 391 ) Not offered this year LA
The production and reception of art in the Federal Republic of Germany from c. 1960 to now, situating episodes in the history of painting, sculpture, and photography in relation to developments in literature and cinema. Topics include the problem of coming to terms with the past (Vergangenheitsbewältigung); the West German economic miracle (Wirtschaftswunder) and the functions and meanings of art in consumer society; violence, politics, and representation; abstraction and figuration in painting, sculpture, and photography; history, memory, and artistic tradition; art as a vehicle of socio-political critique. Two 90-minute classes. B. Doherty

GER 373 Modernist Colloquies: Photography and Literature (also ART 390 ) Not offered this year LA
Exemplary encounters between photography and literature in the 20th century. After providing students with a basis in the theory of photography, the course focuses on intersections between literary and photographic forms, producers, and movements. Topics will include modernism in New York (Williams, Strand, and Sheeler) and Mexico City (Lawrence, Bravo, Weston, Modotti), the New Photography and the photo essay in Germany (Benjamin, Moholy-Nagy, Renger-Patzsch, Sander), social criticism (Evans and Agee), surrealism (Breton), and the American road (Kerouac and Frank). Two 90-minute seminars. M. Jennings
Program in Global Health and Health Policy

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João G. Biehl, Co-Director
Andrea L. Graham, Co-Director

Acting Director
Thomas E. Shenk (fall)

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Peter A. Singer, University Center for Human Values
Erik J. Sorensen, Chemistry

Sits with Committee
Angus S. Deaton, Woodrow Wilson School
Daniel A. Notterman, Molecular Biology
Yi-Ching Ong, Woodrow Wilson School
The interdepartmental Program in Global Health and Health Policy enables undergraduates to study the determinants, consequences, and patterns of disease across societies; the role of medical technologies and interventions in health improvements; and the economic, political, and social factors that shape domestic and global public health policy.

Admission to the Program

The program is open to undergraduates of all disciplines. Students apply to the program in the second semester of their sophomore year and are accepted if they have met the following prerequisites: submission of an essay describing the rationale for completing the certificate and plans for the junior and senior years; completion of an approved basic science course (EEB 210, EEB 211, MOL 101, MOL 214, MOL 215 or ISC 231-234) by the end of sophomore year; completion of an approved statistics course (ECO 202, EEB 355, ORF 245, POL 345, PSY 251, SML 101, SML 201, SOC 301 or WWS 200) by the end of sophomore year; a minimum grade of B in each of the prerequisite courses and a minimum GPA requirement of 3.0 overall; and a demonstrated commitment to the field of global health through completion of a health-related internship, volunteer work, campus activities, intellectual commitment, and/or community service.

Students who have placed out of departmental requirements and/or introductory-level courses with Advance Placement (AP) credit have the option of taking higher-level courses in lieu of the standard science and statistics prerequisites, with program permission.

Advanced science course options: EEB 309, EEB 314, EEB 327, EEB 328

Advanced statistics course options: ECO 302, ECO 312, ORF 405, SOC 404

Students who have not completed the prerequisites can apply to the program; however, waivers of the prerequisites are granted only in exceptional circumstances. Applicants should explain in their essay why they have not completed the prerequisites and how they plan to address the issue in their future studies.

Students who do not meet the minimum grade requirements at the time of application are still encouraged to apply. The program may accept a student with grades below the minimum requirements when the rest of the application is strong and thoughtfully written.

Program Requirements

To obtain the certificate, students must complete the following requirements:

Completion of GHP 350 and GHP 351 by the end of junior year.

Four additional health-related electives approved by the global health and health policy program, at least one of which is in an area outside of the student's department of concentration. Three of the electives must be completed during the junior and senior years.

An approved research-focused internship or independent research project during the summer between the junior and senior years.
A senior thesis written in the student's department of concentration that addresses or relates to global health and health policy in an interdisciplinary manner.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in global health and health policy upon graduation.

Related Courses in Global Health and Health Policy. Courses that may be used to satisfy program requirements may be found on the program's website. If other courses in global health and/or health policy are offered, these may be added to the list of approved courses with program permission.

Courses

**GHP 350 Critical Perspectives in Global Health (also WWS 380 / ANT 380)**  
Fall SA  
Introduces disease and healthcare problems worldwide and examines efforts to address them. Via an interdisciplinary approach, identifies the main actors, institutions, knowledge, and values at play in the "global health system", and explores the environmental, social, political, and economic factors that shape patterns and variations in disease and health across societies. Topics include: development and governance of disease; technological change and public health; human rights and social justice; measuring health outcomes; and the shifting role of states, civil society, and public-private partnerships in healthcare delivery. Two lectures. *J. Biehl*

**GHP 351 Epidemiology: an ecological and evolutionary perspective (also WWS 381)**  
Spring  
Focuses on the distribution and determinants of disease. Diverse methodological approaches for measuring health status, disease occurrence, and the association between risk factors and health outcomes will be presented via classic and contemporary studies of chronic and infectious illness and disease outbreaks. Emphasis on: causal inference, study design and sampling, bias and confounding, the generalizability of research, health policy and research ethics. Prerequisite: an approved basic statistics course. Two 90-minute lectures, one preceptorial. *J. Amon*

**GHP 372 Public Health and Private Healing in the Atlantic World (See LAS 372)**

**GHP 400 Seminar in Global Health and Health Policy (also WWS 382 / MOL 499 / EEB 400)**  
Spring  
This course will examine four major topics in global health. Each topic will span two or three class meetings. The first session on a topic will feature a presentation by an expert invited from outside the University. Following the expert presentation, student discussants will lead a question/answer/commentary period. During the second and third class meetings for each topic, students will explore elements of the expert's presentation in greater depth as well as additional aspects relating to the topic of discussion. The student presentations will each be followed by student discussants. *A. Mahmoud, T. Shenk*

**GHP 401 Global Health in Africa (also ANT 480 / AFS 401)**  
Spring SA  
This seminar will examine the contemporary phenomenon of "global health" in Africa against the history and politics of health and healing. Topics include; colonial efforts to regulate race, gender, sexuality, and labor; African's responses to colonialism and missionization; the impact of colonialism on experience of health and healing; the training of African practitioners of biomedicine; the significance of healing practices to anti-colonial movements; and the relevance of these historical experiences to contemporary African public health and medicine. We will conclude with case studies of cutting-edge health issues in Africa. *B.*
GHP 404 Science, Society, and Health Policy  
This seminar introduces students to the interdisciplinary field of science and society studies, which investigates how science both shapes and reflects social values, institutions, and policies. Drawing from diverse perspectives, including philosophers, historians, economists and scientists, the course will examine the relationship between science and society and provide critical tools and conceptual frameworks for addressing contemporary debates on how science should be practiced and disseminated for social benefit. The primary focus will be on the life sciences and health with occasional consideration of other areas of science and policy. Y. Ong

GHP 405 Energy and Health: From Exhausted Bodies to Energy Crises (also ANT 481 )  
In this course we will examine how the production and consumption of energy are linked to questions of health. We will review how public health scholars, and academics from other disciplines have thought about energy. We will also examine what energy sustainability might mean in the face of repeated infrastructural failure and the concurrent loss of life. Finally, we will look to the past and present of nuclear energy, as a source of hope and a looming threat. B. Venkat

GHP 406 Health Reform in the US: The Affordable Care Act's Origins, Impact and Implementation Challenges (See WWS 393)

GHP 407 Health and Human Rights (See WWS 453)

GHP 408 Public Health, Politics & Public Policy  
This course will explore health topics from the perspective of population health, politics and policy. Bridging domestic and international health topics and perspectives, the course will focus on controversial and complex health issues. The course will weave examples through various topics to demonstrate how politics and competing stakeholder interests can play a critical role in the public health and public policy response to health problems. The class sessions will be comprised of presentations by the instructors, visiting experts and students. Class discussion and presentation will be core elements of the course. K. Graff, H. Howard

GHP 409 Mortality at the Margins: Race, Inequality and Health Policy in the United States (also AAS 410 )  
This course will critically examine the unequal distribution of disease and mortality in the United States along the axes of race, ethnicity, class and place. Through in-depth engagement with case studies, critical historical texts and public health literature we will explore why individuals from some race/ethnicities, class backgrounds, and geographies are more vulnerable to premature death and adverse outcomes than others. Student work will culminate in a policy memo and a presentation, allowing them to hone valuable skillsets for future participation in the research and policy processes. A. McGregor

GHP 410 Population Economics  
The course will apply analytical tools in economics to investigate various economic and social consequences of population change and conversely the demographic consequences of economic growth. The course will emphasize both microeconomic and macroeconomic approaches. We will examine the economic determinants of population
change and demographic behavior including household decisions, mortality (particularly infant mortality) and key forms of human capital investment including health, schooling and migration. *J. Thuilliez*
Program in Hellenic Studies

Director
Christian Wildberg

Acting Director
Charles E. Barber (fall)

Executive Committee
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Faculty
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Christian Wildberg, Classics

John F. Haldon, also History
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Jamie L. Reuland, Music
Jack Tannous, History

Sits with Committee
David T. Jenkins, Firestone Library
J. Michael Padgett, Art Museum
Alan Stahl, Firestone Library
James C. Steward, Art Museum

The Program in Hellenic Studies, under the general direction of the Council of the Humanities and with the support of the Stanley J. Seeger ’52 Center for Hellenic Studies is designed for students interested in the interdisciplinary study of the Greek world, ancient, Byzantine or modern, as well as the classical tradition. The program offers language courses in modern Greek and postclassical Greek (Hellenistic koine to Byzantine Greek); freshman seminars in Hellenic studies; introductory courses in Byzantine and modern Greek studies; upperclass seminars in classical, Byzantine, and modern Greek studies; global seminars and a senior thesis colloquium for concentrators in the program. These are complemented by cognate courses offered in several cooperating University departments.

Additional information about the program can be found at the program's website.
Admission to the Program

The program is open to undergraduates majoring in any department. Students should apply for admission during the sophomore or junior year. Students will be accepted into the program on the basis of interest and a coherent academic plan.

The formal requirements for admission are:

1. Satisfactory completion of the requirements for admission to a department.

2. Satisfactory completion of one of the following: HLS 107, HLS 206, HLS 210, HLS 240, HLS 266, HLS 346; HUM 216-217; or COM 205; or a freshman seminar on a Hellenic studies topic approved by the program executive director.

Program of Study

Program students may elect to follow one of three plans of study:

Plan A allows a specialization in the language and literature of modern Greece. Students in this plan must satisfy a language requirement (HLS 107 or its equivalent).

Plan B provides for a broad-based interdisciplinary study of modern Greek culture, including literature in translation, history, politics, and anthropology.

Plan C offers a diachronic survey of the Hellenic tradition, including the classical, Byzantine, and modern Greek periods.

Each student works out an individual program of study in consultation with the program executive director. Students in all three plans of study must complete the following requirements:

1. Completion of at least one of the following: HLS 206, HLS 210, HLS 240, HLS 266, HLS 346; or HUM 216-217; or COM 205. Plan A students must also complete HLS 107 or its equivalent.

2. Two upper-level HLS seminars or one upper-level HLS seminar and one upper-level cognate course.

3. A senior thesis with an appropriate Hellenic studies focus approved by the program executive director. For science and engineering majors, a substantial research paper on a Hellenic topic, approved by the program executive director.

The Seeger Center also sponsors Hellenic Studies Workshops, a lecture series, and occasional colloquia that provide a forum for discussion of research in progress on all aspects of Greek civilization by faculty members, students, members of the Institute for Advanced Study, and visiting scholars.
Students choosing Plan B or Plan C are encouraged to take at least two years of ancient or modern Greek.

Study Abroad

Program students are encouraged to pursue further study and research in Greece during the summer months and, on occasion, during the academic year. Interested students may apply for Stanley J. Seeger study/travel fellowships through the Seeger Center.

Under the auspices of the Study Abroad Program, students may complement their academic work in Hellenic studies by enrolling for one or two terms at selected institutions in Greece or England. The Princeton-Oxford Exchange Program provides additional opportunities for students in Hellenic studies.

The program also offers scholarships to qualified Greek nationals who have been admitted to Princeton for study at the undergraduate level.

Certificate of Proficiency

A student who completes the requirements of the program with satisfactory standing receives a certificate of proficiency in Hellenic studies.

Cognate Courses. A list of complete cognate courses may be found on the program's website. Any of these courses may provide an appropriate supplement to the program's core courses. Other courses may be added to this list with the approval of the appropriate department and the director of the program.

Courses

HLS 101 Elementary Modern Greek I (also MOG 101) Fall
Designed to serve as an introduction to the language of modern Greece. Practice in speaking, grammatical analysis, composition, and graded reading. Four classes. No credit is given for HLS 101 unless followed by HLS 102. Staff

HLS 102 Elementary Modern Greek II (also MOG 102) Spring
A continuation of 101, aiming to develop the skills of listening, speaking, reading, and writing modern Greek in a cultural context. Classroom activities include videos, comprehension and grammar exercises, and discussions. Four classes. Staff

HLS 105 Intermediate Modern Greek (also MOG 105) Fall
Advanced grammatical analysis, composition, and graded reading, with further practice in speaking. An introduction to themes in the Hellenic tradition through readings in modern Greek literature. Four classes. Prerequisite: 102 or instructor's permission. Staff

HLS 107 Advanced Modern Greek (also MOG 107) Spring
Advanced composition and oral practice aimed at developing idiomatic written and spoken style. Discussions entirely in Greek. Introduces students to contemporary Greek culture and literature through the study of works by Cavafy, Sikelianos, Seferis, Elytis, Ritsos, and Anagnostakis, among others. Readings from articles on current Greek topics. Four classes. Prerequisite: 105 or instructor's permission. Staff
HLS 203 The Classical Roots of Western Literature (See COM 205)
HLS 204 Classical Greek Art (See ART 204)
HLS 205 Medieval Art in Europe (See ART 205)
HLS 206 Byzantine Art and Architecture (See ART 206)
HLS 207 Medieval Art and Architecture of the Holy Land (See ART 207)
HLS 208 Introduction to Ancient Philosophy (See PHI 205)
HLS 210 The World of Late Antiquity (See HIS 210)
HLS 211 Rhetoric: Classical Theory, Modern Practice (See CLA 211)
HLS 212 Classical Mythology (See CLA 212)
HLS 217 The Greek World in the Hellenistic Age (See CLA 217)
HLS 230 Constantinople: A Literary Journey to the Capital of Byzantium (See CLA 230)
HLS 236 Rituals, Songs, and Stories: Balkan and East European Oral Traditions (See COM 236)
HLS 240 Introduction to Post-Classical Greek from the Late Antique to the Byzantine Era (See CLG 240)
HLS 244 Sex and Salvation in Early Christian Literature (See CLA 245)
HLS 253 Early Christian Women: From Mary Magdalene to Martyred Mothers (See REL 253)
HLS 300 Plato and His Predecessors (See PHI 300)
HLS 301 The Art of the Iron Age: The Near East and Early Greece (See ART 301)
HLS 302 Aristotle and His Successors (See PHI 301)
HLS 303 Ancient and Medieval Political Theory (See POL 301)
HLS 307 Hellenistic Art (See ART 307)
HLS 308 Toward an Environmental History of the Mediterranean (See HIS 308)
HLS 320 Topics in Medieval Greek Literature (See CLA 320)
HLS 322 Classical Historians and Their Philosophies of History (See CLA 324)
HLS 324 The Classical Tradition (See COM 324)
HLS 326 Tragedy (See COM 326)
HLS 327 Topics in Ancient History (See CLA 327)
HLS 330 The Muslim Mediterranean (See HIS 330)
HLS 332 Communication and the Arts (See ECS 331)
HLS 333 Religion and Philosophy in the Roman Empire (See CLA 333)
HLS 334 Modern Transformations of Classical Themes (See CLA 334)
HLS 335 Studies in the Classical Tradition (See CLA 335)
HLS 337 The Ottoman Empire, 1300-1800 (See NES 437)
HLS 338 Greek Ethical Theory (See PHI 335)
HLS 340 Greek Law and Legal Practice (See CLA 330)
HLS 342 The Making of the Ottoman Balkans, 1350-1500: Conquest, Settlement and Infrastructural Development (See NES 342)
HLS 343 The Civilization of the Early Middle Ages (See HIS 343)
HLS 345 The Crusades (See HIS 345)
HLS 350 Archaeology of the Roman Empire (See CLA 350)
HLS 351 Tolerance and Governance in the Mediterranean (See ANT 351)
HLS 355 Transformation of the Ancient World: Byzantium 500-1200 (See HIS 355)
HLS 356 The Apostle Paul in Text and Context: His Letters, His Communities, and His Interpreters (See REL 355)
HLS 358 History of the Balkans (See HIS 358)
HLS 361 Special Topics in Modern Greek Civilization Not offered this year LA
An aspect or period of modern Greek civilization since the War of Independence (1821) as it is illuminated by literary, historical, and other relevant sources. Emphasis will be given to the cross-cultural context of the topic, including the relation of modern Greece to Western, Eastern, or Balkan cultures, or the Hellenic diaspora in America and elsewhere. Staff
HLS 362 Special Topics in Byzantine Civilization Not offered this year
An aspect of the civilization of the Eastern Roman (Byzantine) Empire, from 312 to 1453, as illuminated by literary, historical, and other relevant sources. Emphasis will be given to the cross-cultural context of the topic, including relations of the Byzantine Empire with Sassanid Persia, the Arabs, the Slavs, and Western Europe. Two lectures, one preceptorial. Staff
HLS 363 Special Topics in Hellenic Studies Not offered this year
The diachronic development of a theme, genre, or institution, with emphasis on the continuities and discontinuities between successive periods of Hellenic culture--ancient, Byzantine, and modern. The approach will be interdisciplinary and cross-cultural. Staff
HLS 369 Beyond Crisis: Contemporary Greece in Context (See COM 369)
HLS 374 Afterlives of the Iliad (See COM 374)
HLS 382 Cultures of Enchantment (See ART 382)
HLS 410 Seminar. Greek Art (See ART 410)
HLS 414 The Transition from Late Antiquity to the Early Middle Ages as Evidenced by the Coinage (See ART 414)
HLS 416 Understanding the "Barbarians": Discovering Ethnicity in Ancient History, Art, and Archaeology (See ART 416)
HLS 420 Church and State in Late Antiquity (See NES 420)
HLS 421 Venice and the Mediterranean World (See HIS 421)
HLS 428 Empire and Catastrophe (See HIS 428)
HLS 430 Seminar. Medieval Art (See ART 430)
HLS 435 Mounted Nomads and Sedentary States in the Medieval World (See HIS 435)
HLS 437 Byzantium in the 10th Century: The Age of Reconquest (See HIS 437)
HLS 442 Making of the Ottoman Balkans, 1353-1500 (See NES 442)
HLS 461 Great Cities of the Greek World (also ART 461 ) Not offered this year LA
An intensive interdisciplinary study of the evolution of a city, such as Athens, Constantinople, Thessaloniki, Alexandria, or Antioch, where Greek civilization flourished through successive periods, from antiquity to the present. A study of the form and the image of the city as seen in its monuments and urban fabric,
as well as in the works of artists, writers, and travelers. Prerequisite: instructor's permission. Two 90-minute classes. *Staff*

**HLS 485 Rhodes and Malta: Art, Faith, Warfare (See ART 485)**

**HLS 496 Special Topics in Computer Science (See COS 496)**

**HLS 499 Architecture as Icon (See ART 499)**
Department of History

Chair
William C. Jordan

Associate Chair
Molly Greene

Acting Associate Chair
Janet Y. Chen (fall/spring)

Departmental Representative
Jacob S. T. Dlamini

Director of Graduate Studies
John F. Haldon (History)
Michael D. Gordin (History of Science)

Professor
Jeremy I. Adelman
David A. Bell
D. Graham Burnett
David N. Cannadine
Linda J. Colley
Thomas D. Conlan, also East Asian Studies
Angela N. H. Creager
Benjamin A. Elman, also East Asian Studies
Sheldon M. Garon, also East Asian Studies
Michael D. Gordin
Anthony T. Grafton
Molly Greene, also Hellenic Studies
Jan T. Gross
John F. Haldon, also Hellenic Studies
Hendrik A. Hartog
Tera W. Hunter, also African American Studies
Alison Isenberg
Harold James, also Woodrow Wilson School
William C. Jordan
Stephen M. Kotkin, also Woodrow Wilson School
Emmanuel H. Kreike
Kevin M. Kruse
Regina Kunzel, also Gender and Sexuality Studies
Michael F. Laffan
Philip G. Nord
Willard J. Peterson, also East Asian Studies
Gyan Prakash
Ekaterina Pravilova
Anson G. Rabinbach
Marina Rustow, also Near Eastern Studies

Martha A. Sandweiss
Emily A. Thompson
Keith A. Wailoo, also Woodrow Wilson School R.
Sean Wilentz
Julian E. Zelizer, also Woodrow Wilson School

Associate Professor
Margot Canaday
Vera S. Candiani
Janet Y. Chen, also East Asian Studies
Yaacob Dweck, also Judaic Studies
Joshua B. Guild, also African American Studies
Federico Marcon, also East Asian Studies
Erika Lorraine Milam
Yair Mintzker
Clare Teresa M. Shawcross, also Hellenic Studies
Max D. Weiss, also Near Eastern Studies

Visiting Associate Professor
Eric S. Yellin, also Woodrow Wilson School

Assistant Professor
He Bian, also East Asian Studies
Divya Cherian
Jacob S. T. Dlamini
James A. Dun
Katja Guenther
Eleanor K. Hubbard
Robert A. Karl
Matthew J. Karp
Beth Lew-Williams
Rosina A. Lozano
M’hamed Oualdi, also Near Eastern Studies
Jennifer M. Rampling
Rebecca A. Rix
Jack B. Tannous
Wendy Warren

Lecturer
Joseph M. Fronczak
David L.M. Minto, also Council of the Humanities
Ronny Regev

Associated Faculty
Wallace D. Best, Religion, African American Studies
Michael A. Cook, Near Eastern Studies
M. Şükrü Hanoğlu, Near Eastern Studies
Bernard A. Haykel, Near Eastern Studies
Eileen A. Reeves, Comparative Literature
Cyrus Schayegh, Near Eastern Studies
Information and Departmental Plan of Study

The plan of departmental study encourages the student to gain further knowledge of the major developments in, and problems of, history; to do independent historical research and writing; and to develop an authoritative knowledge of one particular field of history. The department's website describes the program and requirements in detail.

The department encourages students to master at least one language in addition to English. Knowledge of another language is invaluable for senior thesis research especially that on topics in the history of continental Europe or the non-Western world. Prerequisites

Students are required to take and pass at least two departmental courses before they enter the department. Students who wish to enter the department but who have not taken two departmental courses before their junior year must consult with the departmental representative. At least one of these two prerequisite courses must be selected from the following: HIS 201, 207, 208, 210, 211, 212, 241, 267, 277, 278, 280, 281, 282, 290, 291, or 292. Students who have not fulfilled the 200-level prerequisite must take one of the appropriate courses in the fall of their junior year. (HUM 216-17 or 218-19 may be used as a 200-level prerequisite but cannot be counted as one of the departmental requirements.)

Program of Study

On joining the history department, each student elects to concentrate in one of the following fields: Africa; Ancient Greece and Rome; Asia; Europe since 1700; Gender and Sexuality; Intellectual and Cultural History; Latin America; Middle Ages; Modern Imperialism and Colonialism; Near East; Russia; Science and Technology; United Kingdom; United States; and War, Revolution, and the State. The senior thesis will ordinarily be written in the field of concentration, and the senior departmental examination will always be written in the field of concentration. Students should select courses so as to create a coherent program in their field.

Course Advising. Before preregistration each term, each history student must consult with one of the department's designated undergraduate advisers.

Departmental Distribution Requirements. University regulations stipulate that undergraduates may not take more than 12 departmental courses. Departmental regulations stipulate that undergraduates must pass at least 10 courses, including HIS 400, in order to receive the A.B. degree. History courses taken in the freshman and sophomore years are numbered among the 10 to 12 required for graduation. Of the departmental courses, one must be a course in European history (including Russia); one a course in United States history; one a course in non-Western history; and one a course in premodern history. No one course may satisfy more than one of these distribution requirements. In addition, concentrators in the history of the U.S. are required to take at least two courses in pre-20th-century U.S. history. Courses fulfilling the European, non-Western, premodern, and pre-20th-century U.S. history requirements are listed on the department's website under "Distribution Requirements."

Cognates. The history department encourages students to take courses in other departments when they add depth and variety to their selected program of concentration. For example, a student concentrating in Russian history might identify an appropriate course in politics to take as a cognate; a student concentrating in intellectual history might take an appropriate course in philosophy as a cognate. Two such courses may be taken during the junior and senior years and counted as departmental courses provided they contribute significantly to the student's plan of study. Cognates cannot be used to fulfill departmental distribution requirements. Cognates can only be approved by
the departmental representative during the course enrollment period and prior to attending the class. Courses may
not be designated as cognates retroactively. Cross-listed courses (for example, CLA 217, also listed as HIS 217) are
automatically considered departmental courses, not cognates.

History of Science. History majors wishing to concentrate in the history of science need not meet the departmental
prerequisites or distribution requirements. But they must take 10 courses that satisfy the following pattern of
requirements (note: an asterisk indicates a one-time-only topic or course):

1. Two courses in science, engineering, or mathematics in addition to those used to fill the University's science
distribution requirement.

2. Four of the following courses:

*277 Technology and Society (see EGR 277)
290 The Scientific Worldview of Antiquity and the Middle Ages
291 The Scientific Revolution and European Order, 1500-1750
292 Science in the Modern World
293 Science in a Global Context: 15th to 20th Century*294 What is the Scientific Revolution?
*295 Making America: A Technological History of the United States
*391 History of Contemporary Science
*392 History of Evolution
393 Race, Drugs, and Drug Policy in America
*395 History of Medicine and the Body
396 History of Biology
*397 Translation in the History of Science
398 Technologies and Their Societies: Historical Perspectives
*399 In the Groove: Technology and Music in American History, from Edison to the iPod (see AMS 399)
*489 Interdisciplinary Studies in the Humanities (see HUM 470)
490 Perspectives on the Nature and Development of Science
*491 History of Ecology and Environmentalism
492 Problems in the Development of the Life Sciences
*493 Science and Religion: Historical Approaches
*494 Broken Brains, Shattered Minds: Disease and Experience in the History of Neuroscience *495 The
Soviet Science System
*498 History of Pseudoscience
*499 Things

With the permission of the departmental representative, one of these courses may be replaced by a cognate course
from another department, for example, in philosophy or sociology of science.

3. Four other history courses.
4. The independent work and comprehensive examination requirements are the same as for all other departmental majors.

Independent Work

Junior Year. In the fall term of the junior year students are required to enroll in HIS 400 Junior Seminars. Work in the junior seminars involves exercises in defining a topic for historical research and in identifying and evaluating a body of historical literature. Each student may expect to gain experience in the use of the library and bibliographical sources, to learn the correct technical form for presenting evidence clearly, and to develop a historical presentation convincingly. Students in HIS 400 will have the opportunity to choose from a number of seminars devoted to historical events or themes of wide importance, such as "Origins of World War I," "Comparative Revolutions," "The United States and Latin America," and "Marxist Social Analysis and Historical Interpretation."

In the spring term of the junior year, in consultation with his or her adviser, the student selects a topic and writes a research paper on an independent basis. Written work equivalent to that submitted in the first term is required. The two semesters of junior independent work must be focused in two different geographical fields and in two different time periods. Students should consult their advisers about this requirement.

Senior Year. The independent work consists of writing a thesis on an approved subject of the student's choice. The thesis usually relies on research in original source materials, but it may also involve reinterpretation of familiar materials.

Senior Departmental Examination

The senior comprehensive examination is given during the University examination period (after submission of the senior thesis). The exam is a set of take-home essays in the field of concentration designated by the student.

Study Abroad

Students in the department are encouraged to participate in those programs for foreign study recognized by the University (for further information, consult the Office of International Programs, 36 University Place, Suite 350). The department has the following policies:

1. Juniors majoring in the department may receive credit for up to four courses in history taken while abroad for either a full year or semester. These courses will require the prior approval of the departmental representative, and to secure that approval, students will be expected to produce some evidence of the work load and the material covered by the courses.

2. Sophomores intending to major in history may count one history course taken abroad toward the requirement to enter the department. The course cannot be used to substitute for the 200-level prerequisite (see above).

3. Recognizing the difficulties of doing research without Princeton's many resources, the department will try to be flexible regarding the deadlines for submission of independent work conducted abroad. Students will have to make arrangements for extensions with the department representative before leaving.
4. The department's spring HIS 400 junior seminar will be open to sophomores intending to go abroad in the fall of their junior year, thus enabling them to do their first junior paper in the spring of their sophomore year and preparing them to write the second while abroad or in the resident semester of their junior year (if they elect to spend only one semester abroad). Students who meet the requirements of junior independent work while at Princeton will still be expected to undertake a full course load while abroad. Moreover, to take full advantage of the international experience, study abroad should include some research work, and we urge students to take seminars that include a research component.

5. As opportunity arises, the history department will seek to identify former students and colleagues abroad willing to act as junior advisers for Princeton students studying in their region.

**Interdepartmental Programs.** Interdepartmental programs of particular interest to history department students are the Programs in African Studies, American Studies, Classics, East Asian Studies, European Cultural Studies, Gender and Sexuality Studies, Hellenic Studies, History and the Practice of Diplomacy, Judaic Studies, Latin American Studies, Medieval Studies, and Near Eastern Studies. Students should consult the departmental representative and the director of the relevant program.

**Courses**

**HIS 201 A History of the World Fall HA**
An overview of world history. Begins with Genghis Khan's Mongol Empire, which collided peoples, goods, and ideas across the Eurasian landmass, and traces the global transformations that connected or disconnected societies through time. The dynamism of Asia; environmental specificities of Africa and the Americas; slavery and other links across the Atlantic; the surprise onset of European predominance; colonialism, anti-colonialism, globalization. What is the past and future of Islam? How is China's staggering wealth up to 1750 and its recent ascent explained? Where did the U.S. come from and where is it going? Two lectures, one preceptorial. *J. Adelman*

**HIS 207 History of East Asia to 1800 (also EAS 207) Fall HA**
General introduction to major themes in the cultural, intellectual, and institutional history of China and Japan, with some attention to Korea and Southeast Asia. Two lectures, one preceptorial. *T. Conlan, W. Peterson*

**HIS 208 East Asia since 1800 (also EAS 208) Not offered this year HA**
The civilizations of East Asia at the beginning of the modern era; the impact of the West; the contrasting responses of China, Japan, and Korea to the confrontation; the development of the present societies. Assignments will be drawn from contemporary sources as well as from secondary accounts. Two lectures, one preceptorial. *S. Garon, H. Bian*

**HIS 211 Europe from Antiquity to 1700 Fall HA**
The course deals with four main topics: the Greek city-state, the Roman Empire and the rise of Christianity, the formation of medieval European society, and the Renaissance and Reformation. Emphasis will be laid on those social, political, intellectual, and religious developments that contributed most directly to forming modern European civilization. Two lectures, one preceptorial. *A. Grafton*

**HIS 212 Europe in the World: Monarchies, Nations, and Empires from 1776 to the Present Day Spring HA**
The emergence of modern societies from the Europe of the Old Regimes. Emphasis on problems and themes, including the French and Industrial Revolutions, nationalism, science and its discontents, popular culture, the mass movements of revolution and war. Intended as an introduction to Europe for students with little background in history. Two lectures, one preceptorial. D. Cannadine

HIS 216 Archaic and Classical Greece (See CLA 216)

HIS 217 The Greek World in the Hellenistic Age (See CLA 217)

HIS 218 The Roman Republic (See CLA 218)

HIS 219 The Roman Empire, 31 B.C. to A.D. 337 (See CLA 219)

HIS 220 Jews, Muslims, and Christians in the Middle Ages (See NES 220)

HIS 223 Introduction to the Middle East (See NES 201)

HIS 240 The Perception of China and Asia in the West (See EAS 240)

HIS 245 The Islamic World from its Emergence to the Beginnings of Westernization (See NES 245)

HIS 280 Approaches to American History Spring HA
An intensive introduction to concepts, methods, and issues in American history, especially recommended for prospective concentrators. The problems investigated in the course (the Revolution, class and cultural relations, literature and society, and others) will vary. Emphasis will be on the framing of historical questions and immersion in the actual sources of history. One lecture, two classes. J. Dun

HIS 281 Approaches to European History Not offered this year HA
An intensive introduction to the methods and practice of history through the close reading of sources on three different topics in European history. The class introduces students to the basic vocabulary of European historiography, focusing on the interpretation and analysis of documents, the framing of historical questions, and the construction of effective arguments. Two 90-minute classes. Staff

HIS 282 A Documents-based Approach to Asian History (also EAS 282) Not offered this year HA An intensive, documents-based introduction to methods and issues in Asian history, focusing on topics that embed Asia in the wider context of world history. Especially recommended for prospective concentrators. The problems investigated (Marco Polo in Asia, Jesuits in China, Russo-Japanese War, Japan's Greater East Asia Co-Prosperity Sphere, etc.) will vary. Emphasis will be on interpreting primary sources, framing historical questions, and constructing historical explanations. Two 90-minute classes. Staff

HIS 290 The Scientific Worldview of Antiquity and the Middle Ages Not offered this year HA
The emergence and development of natural philosophy in ancient Greece, with consideration of its Egyptian and Babylonian background and its subsequent articulation and modification in the medieval worlds of Islam and Western Europe. Emphasis is placed on the interplay of science and culture. Two lectures, one preceptorial. **Staff**

**HIS 291 The Scientific Revolution and European Order, 1500-1750**  
Not offered this year HA  
Beliefs about the nature of the universe, the Earth, and even the human body changed drastically during the early modern period. This course examines this transformation of natural knowledge as a process of both social and intellectual reorganization. Explores how Europeans developed a new mechanistic science for astronomy, physics, and medicine with a dynamic culture of new institutions and technologies. Two lectures, one preceptorial. **Staff**

**HIS 292 Science in the Modern World**  
Fall HA  
The evolution of science since Newton. Emphasis is placed on the major developments of scientific theory and practice since the chemical revolution of the late 18th century. Topics considered will also include: the development of science as a discipline; the connections between science and mathematics, philosophy, and technology; and the emergence of science as an integral part of modern societies. Two lectures, one preceptorial. **M. Gordin**

**HIS 293 Science in a Global Context: 15th to 20th Century**  
Not offered this year HA  
Science and technology have literally changed the world. This course examines how, with an emphasis on understanding the place of scientific knowledge in the history of European exploration and expanding global power. How did the sciences go out into the world? How did certain disciplines and practices take shape in global interactions since 1400? How does knowledge become universal? What instruments, institutions, and activities made this possible? Two 90-minute classes. **D. Burnett**

**HIS 303 Colonial Latin America to 1810 (also LAS 305)**  
Fall HA  
The principal themes of Iberian imperialism and colonial society from preconquest to the eve of independence. The main issues to be covered will be: Amerindian civilization, the conquest of the Americas, social and cultural change, and evolving economic relations. Two lectures, one preceptorial. **V. Candiani**

**HIS 304 Modern Latin America since 1810 (also LAS 304)**  
Spring HA  
A survey of Latin America from the wars of independence to recent struggles for democracy. The focus will be on state formation in the 19th century, relations with the world economy, and changing patterns of social and political life in the 20th century. Two lectures, one preceptorial. **R. Karl**

**HIS 305 History of the Modern Caribbean (also LAS 306)**  
Not offered this year HA  
This course treats major themes in Caribbean social and political history cutting across the various empires, nations, and cultures that have shaped the region. It focuses on slavery and freedom during the 19th century and imperialism, authoritarianism, revolution, migration, and transnationalism in the 20th century. Race, ethnicity, and nation are explored throughout the course. Two lectures, one preceptorial. **Staff**

**HIS 309 History of Modern Mexico (also LAS 312)**  
Not offered this year HA  
This course studies Mexico between two historic defeats: that of the mid-19th century, when it lost half of its territory to the United States, and the defeat of the PRI's single-party regime at the polls in 2000 after over 70 years of uneasy rule. Topics include Mexico's transition from the richest colony in the Americas to a nation with unresolved social, economic, and political struggles; the causes of internal tension and how have different groups sought to solve them; and the question of why drug cartels have gained ground. Two lectures, one preceptorial. **V. Candiani**
HIS 310 Religion in Colonial America and the New Nation (See REL 357)

HIS 311 History of Economic Thought (See ECO 386)

HIS 314 Precolonial Africa Not offered this year HA
A survey course that begins with an overview of the continent at the end of the third century A.D. and ends with the death of Moshoeshoe in the 19th century. Focuses on several great themes of African history: long-distance trade, state formation, migration, religious conversion to either Islam or Christianity, forms of domestic slavery, and the impact of the slave trade. Two lectures, one preceptorial. E. Kreike

HIS 315 Colonial and Postcolonial Africa Spring HA
The impact of European colonial rule on the traditional societies of Africa in the 19th and 20th centuries. One of the dominant themes will be the emergence of the intelligentsia in colonial areas as proponents of nationalism. Two lectures, one preceptorial. J. Dlamini

HIS 316 South African History, 1497 to the Present Not offered this year HA
Beginning with a brief precolonial regional overview, the course examines European occupation following 1652; explores slavery, the frontier, intergroup relations, the growth of nationalism, the Boer War and unification, African resistance movements, the structure of politics, constitutional developments, and debates over race and class; and ends with the 1980s constitutional crisis. Two lectures, one preceptorial. E. Kreike

HIS 317 The Making of Modern India and Pakistan Not offered this year HA
An exploration of three major themes in the history of India's emergence as a nation-state: colonial socioeconomic and cultural transformations, the growth of modern collective identities and conflicts, and nationalism. Topics covered include: trade, empire, and capitalism; class, gender, and religion; Gandhi, national independence, and partition; and postcolonial state and society. Two lectures, one preceptorial. G. Prakash

HIS 318 Early Chinese History to 221 (See EAS 335)

HIS 319 The Making and Transformation of Medieval China: 300-1200 (See EAS 336)

HIS 320 Early Japanese History (See EAS 320)

HIS 321 Early Modern Japan (See EAS 321)

HIS 322 20th-Century Japan (also EAS 324 ) Fall HA
An analysis of change and continuity in modern Japanese society, with emphasis on industrialization, social discontent, parliamentary democracy, war, defeat, the "economic miracle," and Japanese preoccupation with national identity in a Western-dominated world. Divided between the prewar and postwar periods. Two lectures, one preceptorial. S. Garon
HIS 324 Early Modern China (also EAS 354) Fall HA
China between the 1570s and the 1860s, from its early involvement in the new world economy to the crises of the Opium War era. Emphasis on the history and culture of the Qing empire, its success and challenges, with attention to family and society, religion, art, and literature. Two lectures, one preceptorial.

H. Bian

HIS 325 China, 1850 to the Present (also EAS 355) Spring HA
China's transformations and continuities from the civil wars of the mid-19th century to the economic reforms of the 1980s. Topics include the opium crisis, the impact of natural disasters, the fall of the imperial dynasty, China's struggle with Western and Japanese imperialism, and experiments in government and society on mainland China and Taiwan since 1949. Two lectures, one preceptorial. J.

Chen

HIS 326 Topics in Ancient History (See CLA 326)

HIS 327 Topics in Ancient History (See CLA 327)

HIS 328 Classical Historians and Their Philosophies of History (See CLA 324)

HIS 329 Roman Law (See CLA 325)

HIS 330 The Muslim Mediterranean (also HLS 330) Not offered this year HA
Although the word "Mediterranean" evokes images of Italy and Spain, much, if not most, of the Mediterranean has been under some form of Muslim rule, whether Arab or Turkish, since the 7th century C.E. This course will explore the Muslim experience of, and impact on, the Mediterranean world from the medieval period through the 20th century. Two 90-minute classes. M. Greene

HIS 331 Religion, Gender, and Sexuality in Early Latin America (See REL 378)

HIS 334 The Making of the Modern Middle East (See NES 337)

HIS 336 Modern Worlds of Islam (also NES 305) Not offered this year HA
An introduction to Islam in modern world history. What, and where, is "the Islamic world?" What have been the major developments in Muslims' historical experiences since the 18th century? How have Muslims themselves made, experienced, and understood modern history? How have Muslims and others shaped the world in which we live, and how are relationships between "Islamic" and other worlds to be characterized? What is the relationship between Islam and modernity? How can we better understand the place of Islam in history today? Two lectures, one preceptorial. M. Weiss

HIS 337 The Ottoman Empire, 1300-1800 (See NES 437)

HIS 340 Culture and Society in Late Imperial China: 1000-1900 (See EAS 340)
HIS 341 Between Resistance and Collaboration: The Second World War in Europe  Spring HA   In the broader context of conflict between fascism, communism, and liberal democracy, the course examines various patterns and methods of occupation, collaboration, and resistance during World War II in Western and Eastern Europe. Topics to be discussed include the Holocaust of European Jewry and the technology of terror; the impact of war and occupation on elites and other social strata. Students will read historical studies as well as personal narratives by eyewitneses and participants. Two lectures, one preceptorial. J. Gross

HIS 342 Southeast Asia's Global History (also EAS 342 / NES 343)  Spring HA   Provides an introduction to Southeast Asia and its prominent place in global history NES 343 through a series of encounters in time, from Marco Polo in Sumatra to the latest events in such buzzing cities as Bangkok, Jakarta, and Hanoi. For the early modern period we will read various primary sources before turning to consider a series of diverse colonial impacts across the region (European, American, and Asian), and then the mechanisms underpinning the formation of some of the most vibrant, and sometimes turbulent, countries on the world stage. Two 90-minute classes. M. Laffan

HIS 343 The Civilization of the Early Middle Ages (also CLA 343 / HLS 343)  Not offered this year HA   A study of the emergence of a distinctive Western European civilization out of Christian, Greco-Roman, and Germanic institutions and ideas from the decline of the Roman Empire to about A.D. 1050. Two lectures, one preceptorial. H. Reimitz

HIS 344 The Civilization of the High Middle Ages (also CLA 344)  Fall HA   An analysis of typical institutions, social and economic structures, and forms of thought and expression from about 1050 to about 1350. Emphasis is placed on the elements of medieval civilization that have influenced the subsequent history of European peoples. Two lectures, one preceptorial. W. Jordan

HIS 348 The Hispanic World, 1400-1800  Not offered this year HA   Long before Victorian Britain became synonymous with world empire, there was Spain. In the 16th century, the kingdoms of medieval Iberia banded together to forge the first global monarchy, reaching from Latin America to the Philippines--only to watch it disintegrate in the 17th and 18th centuries. Understanding Spain's Golden Age is essential for interpreting not only the histories of modern Spain and Latin America, but also the history of the early modern world. Topics include the creation of Spanish identity; Christian, Muslim, and Jewish relations; the Renaissance; the governance of Empire; imperial decline; and the Enlightenment. Staff

HIS 349 The Arab-Israeli Conflict (See NES 338)

HIS 351 France, 1815 to the Present  Spring HA   The political and social history of France from Napoleon to the Fifth Republic. The impact of revolution, industrialization, and war on French society in the 19th and 20th centuries. Particular attention will be paid to movements of popular revolt and the efforts of elites--rural, bourgeois, and technocratic--to maintain control in the face of social ferment. Two lectures, one preceptorial. P. Nord

HIS 352 From Luther to Napoleon: Early Modern Germany, 1495-1806  Not offered this year HA   This course traces the tumultuous history of the German lands in the early modern period, from the reforms in the institutions of the Holy Roman Empire of the German Nation in 1495 until the abolition of the Empire during the
Napoleonic Wars (1806). Topics covered include the Holy Roman Empire, the Reformation, the Thirty Years War, the Peace of Westphalia, Frederick the Great and the rise of Prussia, the German Enlightenment, the French Revolution in Germany, and the Napoleonic experience. Two lectures, one preceptorial. Y. Mintzker

HIS 355 Transformation of the Ancient World: Byzantium 500-1200 (also HLS 355 / CLA 355) Not offered this year HA
Introduces the history and culture of Byzantium, with some material on the medieval European world to the West and the Islamic states to the East. We will focus on the development of Byzantine society and economy, on how the state worked, and how Byzantium related to its neighbors to both the West and the East. Why did the Eastern Roman empire survive the barbarian invasions of the 5th and 6th centuries?
How was the state ruled and by whom? How did it deal with the powerful Islamic states to the East? How and why did the Byzantines arouse the hostility and suspicion of the medieval West and the papacy? Two lectures, one preceptorial. J. Haldon

HIS 358 History of the Balkans (also HLS 358) Not offered this year HA
Examines the rise of nationalism in the Balkans, beginning with an examination of Balkan society under the Ottomans and continuing up through the establishment of nation-states in the 19th and 20th centuries. Case studies will include Greece, Yugoslavia, Bulgaria, Romania, and Albania. Themes covered: social organization, prenational politics, imperialism, cultural and economic elites, the Ottoman heritage. One lecture, two preceptorials. M. Greene

HIS 359 Modern Jewish History: 1750-Present (also JDS 359) Not offered this year HA
This course surveys the breadth of Jewish experience from the era of the Enlightenment to the contemporary period. Tracing the development of Jewish cultures and communities in Europe and the United States against the background of general history, the course focuses on themes such as the transformation of Jewish identity, the creation of modern Jewish politics, the impact of anti-Semitism, and the founding of the State of Israel. Two 90-minute classes. Y. Dweck

HIS 360 The Russian Empire: From Peter the Great to Nicholas II Not offered this year HA
Eighteenth-century enlightened absolutism: reforms of Peter and Catherine the Great, shaping of national identity and a modern state. Nineteenth-century tensions between reform from above and revolution from below, with a focus on the political role of social groups and special attention to the origins of revolutionary conflict in 1905 and 1917. Two lectures, one preceptorial. E. Pravilova

HIS 361 The United States Since 1974 Spring HA
The history of contemporary America, with particular attention to political, social and technological changes. Topics will include the rise of a new conservative movement and the reconstitution of liberalism, the end of the divisive Cold War era and the rise of an interconnedted global economy, revolutionary technological innovation coupled with growing economic inequality, a massive influx of immigrants coupled with a revival of isolationism and nativism, a revolution in homosexual rights and gender equality coupled with the rise of a new ethos of "family values." J. Zelizer

HIS 362 The Soviet Empire Not offered this year HA
An examination of the transformation of the Russian Empire into the Soviet Empire. Topics include: the unfolding of single-party revolutionary politics, the development of Stalin's personal despotism, the violent attempt to create a noncapitalist society, the monumental war with Nazi Germany, and the nature of everyday life. Two lectures, one preceptorial. S. Kotkin
HIS 365 Europe in the 20th Century Fall HA
The history of Western and Central Europe since World War I viewed from the perspective of Europe's rapidly changing role in world history. Europe's political, social, and economic adjustment to the Russian Revolution, to the emergence of America and Russia as superpowers, and to the loss of overseas imperial possessions. Two lectures, one preceptorial. A. Rabinbach

HIS 366 Germany since 1806 Not offered this year HA
Sets German history after the Napoleonic invasion in a context of international politics, and shows how the development of a peculiarly German idea of the nation was a response to pressures exerted by European political changes and by the European state system. Examination of how, after national unification in 1871, German domestic policy in turn affected the whole world: in German foreign policy before the First World War, in the aftermath of 1918, and during the Nazi dictatorship. Treatment of the separate courses of the two Germanies since 1945 and of their position in world politics. Two lectures, one preceptorial. H. James

HIS 367 English Constitutional History Spring HA
A study of the development of the English Constitution to 1600, with special emphasis on the institutions and ideas that form the background for American constitutional history. Two lectures, one preceptorial. W. Jordan

HIS 368 England from the Wars of the Roses to the Glorious Revolution Spring HA
In the middle of the 15th century, England suffered a series of dynastic struggles for the crown. In the middle of the 17th another, rather different, civil war broke out. The course will trace the political, social, and cultural developments that rendered these apparently similar reactions to royal misrule so different from one another. In so doing, it will seek to describe and explain the origins and causes of the English Revolution. Two lectures, one preceptorial. E. Hubbard

HIS 369 Britain 1688-1815: From Revolution to Global Pre-eminence Not offered this year HA
Explores British society, politics, and culture between the English Revolution and the Industrial Revolution. Major themes include the emergence of Britain as an imperial power (equal attention will be given to Ireland, Scotland, and overseas expansion); aristocratic culture and commerce; the Enlightenment and religion; art and leisure; and changes in gender relations. Two lectures, one preceptorial. L. Colley

HIS 370 Britain 1815-1945: Empire, Democracy, and War Spring HA
Thematic survey of the social, cultural, and political transformations in the lives of women and men in Britain from the Industrial Revolution to the present. Topics include Britain's rise and fall as the first "modern" society and imperial power; national identities and civil society, gender, and class; democracy and imperialism; Irish nationalism and contemporary culture. Two lectures, one preceptorial. L. Colley

HIS 371 The Colonization of North America Spring HA
An overview of European colonization in North America, covering New France, New Spain, New England, the Middle Colonies, the Chesapeake area, South Carolina, and the sugar islands. Special emphasis upon social structures, labor systems, race, gender, religion, political cultures, and the problem of imperial control from Jamestown through the Great Awakening of the 1740s. Particular attention will be paid to the various and changing
encounters of Africans, Native American, and Europeans, and to the importance of slavery in the colonization process. Two lectures, one preceptorial. W. Warren

HIS 372 Revolutionary America Fall HA
The Old British Empire reaches its zenith, 1740-63. Crisis and disintegration, 1763-76. America's republican experiment and its difficulties, 1776-90. Two lectures, one preceptorial. J. Dun

HIS 373 Democracy and Slavery in the New Nation Fall HA
A survey of society, culture, and politics in the United States from the ratification of the Constitution to the Compromise of 1850. Topics include the rise of cotton slavery, Northern capitalism and class formation, the politics of cultural change, Jeffersonianism, Jacksonian democracy, and the political economy of sectionalism. Two lectures, one preceptorial. R. Wilentz

HIS 374 History of the American West Fall HA
The history of the place we now know as the U. S. West, from European contact to the mid-twentieth century. Primary focus on the struggles over access to land, resources, and power in old and new Wests, with particular attention given to the role of visual and popular culture in shaping the national imagination of the region. Two lectures, one preceptorial. M. Sandweiss

HIS 376 The American Civil War and Reconstruction Spring HA
Surveys the causes, issues, and consequences of the nation's bloodiest conflict. Topics include slavery and antislavery, Manifest Destiny, the growing sectional conflict, the clash of arms, the transforming impact of the Civil War, the transition from slave to free labor in the South, and postslavery race relations. Two lectures, one preceptorial. M. Karp

HIS 377 Gilded Age and Progressive-Era United States, 1877-1920 Not offered this year HA The rise of the modern corporate state in America. Primary focus on the development of big business in the years following the Civil War, accompanying social processes such as immigration and urbanization, and the political responses to these phenomena, particularly populism and progressivism. Other topics include labor, blacks and racism, women in progressive America, and the intellectual response to modernity. Concludes with the United States' entry into World War I. Two lectures, one preceptorial. R. Rix

HIS 378 American Economic History (See ECO 370)

HIS 379 The History of American Capitalism Not offered this year HA
This course offers a broad overview of American capitalism from colonial times up to the present. It introduces students to the economic transformation of America from a rural colonial outpost of the British Empire to the largest industrially developed economic power in the world. The course will consider the political, social, geographical, legal, moral, environmental, technological, and cultural dimensions of economic life—all together attempting to provide a total picture of the historical characteristics and dynamics of American capitalism. Staff

HIS 380 U.S. Foreign Relations Fall HA
The relations between the United States and other nations from the 1890s to the present, treating political, economic, and cultural aspects of American foreign policy as well as the more important diplomatic and strategic problems. Two lectures, one preceptorial. *J. Fronczak*

**HIS 381 The United States South, 1865 to the Present**  
Not offered this year HA  
A survey of the American South from the Confederate defeat and emancipation to the present. Topics will include cultural conflict and exchange, segregation and racism, class conflict within a racist society, southern women, race and class in a political setting, southern music, the civil rights movement, and the South today. Two lectures, one preceptorial. *Staff*

**HIS 383 The United States, 1920-1974**  
Fall HA  
The history of modern America, with particular focus on domestic political and social changes. Topics include the Roaring 20s; the Great Depression and the New Deal; the homefront of World War II and the Cold War; the civil rights movement and the Great Society; the Vietnam War; the sexual revolutions; the Silent Majority, the Nixon administration, and Watergate. Two lectures, one preceptorial. *K. Kruse*

**HIS 384 Gender and Sexuality in Modern America (also GSS 384)**  
Not offered this year HA  
An examination of changing patterns of manhood and womanhood, with an emphasis on women's experience. Topics include housekeeping, child rearing, birth control, sexuality, work, feminism, and the role of gender in religious and political movements and economic development. Two lectures, one preceptorial. *M. Canaday*

**HIS 385 The Role of Law in American Society**  
Not offered this year HA  
An analysis of selected problems in the development of public and private law in America. Lectures and class discussion, based on primary source materials, will emphasize law as a product of socioeconomic change rather than as a system of reasoning. Two lectures, one preceptorial. *H. Hartog*

**HIS 386 African American History to 1863 (See AAS 366)**

**HIS 387 African American History from Reconstruction to the Present (See AAS 367)**

**HIS 388 Cities and Suburbs in American History (also URB 388)**  
Not offered this year HA  
From the colonial era to the present, this course weaves together a comprehensive history of American cities and suburbs, cutting across social life, politics, economics, culture, and the built environment. Topics include urban planning and design, public and private spaces, social experience, urban investment and disinvestment, the metropolitan economy, politics and policy, arts and culture, city leadership, and the participation of ordinary people in shaping urban and suburban life. *A. Isenberg*

**HIS 389 American Cultural History since 1876**  
Not offered this year HA  
Ideas, popular values, and cultural expression in the last century. The quest for certainty, freedom, and social harmony, as seen through the writings of contemporary Americans. Two lectures, one preceptorial. *Staff*

**HIS 393 Race, Drugs, and Drug Policy in America (also AAS 364 / WWS 389)**  
Spring HA
From "Chinese opium" to Oxycontin, and from cocaine and "crack" to BiDil, drug controversies reflect enduring debates about the role of medicine, the law, the policing of ethnic identity, and racial difference. This course explores the history of controversial substances (prescription medicines, over-the-counter products, black market substances, psychoactive drugs), and how, from cigarettes to alcohol and opium, they become vehicles for heated debates over immigration, identity, cultural and biological difference, criminal character, the line between legality and illegality, and the boundaries of the normal and the pathological. K. Wailoo

HIS 396 History of Biology  Not offered this year HA
An examination of the emergence of biology as a scientific discipline since 1750, focusing on the cultural context and social impact of changes in biological knowledge. Particular attention will be paid to changing conceptions of life, the institutionalization and financial support of biological research, and how interactions with the physical sciences have shaped life sciences. Two lectures, one preceptorial. A. Creager

HIS 398 Technologies and Their Societies: Historical Perspectives  Not offered this year HA
A historical inquiry into technological systems as the nexus between technical processes and human beings employing them. Exploring topics such as medieval cathedral construction and mills, steam-powered factories of the Industrial Revolution, the assembly line, and software technology, the course moves from the technical structure, limits, and possibilities of the system to the interplay between the social needs it fills and the social demands it makes. Two lectures, one preceptorial. E. Thompson

HIS 400 Junior Seminars  Fall/Spring HA
The junior seminars serve to introduce departmental majors, in the fall of their junior year, to the tools, methods, and interpretations employed in historical research and writing. Students may choose from a range of topics; assignments to specific seminars are made on the basis of these choices at the beginning of the fall term. Seminar topics tend to be cross-national and comparative. All juniors must be enrolled in one of the seminars. One three-hour seminar. Staff

HIS 408 Selected Topics in 20th-Century Latin America (also LAS 408)  Not offered this year HA
Research and reading on topics related to economic development and political change with attention to specific national contexts, such as authoritarian state and society in Argentina and Brazil; revolution and social change in Mexico, Cuba, and Chile; problems in Latin American foreign relations. One three-hour seminar. R. Karl

HIS 411 War and Society in the Modern World  Not offered this year HA
The interrelationship of war and society from the 18th century to the nuclear age. Emphasis on the causes, conduct, and consequences of war. Particular attention is given to the American Revolution, the French Revolutionary and Napoleonic Wars, the American Civil War, and World Wars I and II. One three-hour seminar. Staff

HIS 415 Intellectual History of China to the Fifth Century (See EAS 415)

HIS 416 Intellectual History of China from the Ninth to the 19th Century (See EAS 416)

HIS 417 Gandhi: The Making of the Mahatma  Not offered this year HA
This seminar examines Gandhi's political life extending from his campaign for the rights of Indians in South Africa to his role in the struggle for Indian independence from British rule. Focus on those historical processes that turned
M. K. Gandhi into a major 20th-century figure--the Mahatma. Issues relating to imperialism and nationalism form
the context in which the seminar looks at Gandhi's life and seeks to understand Gandhian ideology and its different--
often conflicting--historical appropriations. One three-hour seminar. G. Prakash

HIS 419 Topics in History of Modern Syria (also NES 419 ) Fall HA
This seminar situates cultural production in Ba'thist Syria (1970-present)--in terms of its conditions of creation,
circulation and reception--within a broader framework, namely, the history of modern Syria. Through an exploration
of historical debates in the scholarly literature on politics, aesthetics and culture, students will both contextualize and
comment upon ongoing discussions surrounding contemporary Syria. The course engages with a wide range of
media, from literature and drama to television and film. All readings are in English, although those with
interests/abilities in French or Arabic will be encouraged to exercise them. M. Weiss

HIS 424 Intellectual History of Europe since 1880 Spring HA
Major themes and figures in European thought and culture in the transition from the 19th to the 20th century.
Focuses on the intellectual response to new forms of personal and social experience in the age of organized
capitalism and imperialism, and the attempt to come to terms with the waning of romantic and revolutionary
expectations inherited from the period before 1850. Two lectures, one preceptorial. A. Rabinbach

HIS 430 Communication and the Arts (See ECS 331)

HIS 431 Comparative Environmental History (also ENV 433 ) Not offered this year HA
Examines the processes, causes, and effects of environmental change. Drawing on different historical periods and
world regions, including Africa, the Americas, and Asia, class readings expose participants to different models and
approaches to the study of environmental change. The course focuses on such themes as environmental
determinism, ethno-ecology, biological imperialism, deforestation and desertification, the history of famine and
food, and the impact of war, technology, population growth, market forces, and globalization on earth's ecosystem.
One three-hour seminar. E. Kreike

HIS 433 Imperialism and Reform in the Middle East and the Balkans (See NES 433)

HIS 434 Nation, State, and Empire: The Ottoman, Romanov, and Hapsburg Experiences (See NES 416)

HIS 448 History: An Introduction to the Discipline Fall HA
An introduction to the discipline of history aimed at, but not limited to, history majors. Through case studies,
students will learn how historians of the last few generations have framed problems, found and interpreted evidence,
and built arguments. Participants will both study the major recent movements in the discipline of history and reflect
on and improve their own historical techniques. The course will culminate with an examination of history and
memory in the early 21st century. Prerequisites: successful completion of the department's junior requirements or
comparable work in another department. One three-hour seminar. A. Grafton

HIS 460 Topics in American Legal History Not offered this year HA
An in-depth exploration of a topic in American legal history. In some years the course will investigate an event, such
as a famous or infamous trial or case. In other years the course will explore historical dimensions of a particular
legal concept, such as "rights," "coercion," "dependency," the "family," or "property." One three-hour seminar. Staff
HIS 467 Financial History (See WWS 466)

HIS 477 The Civil Rights Movement (See AAS 477)

HIS 478 The United States and the Vietnam Wars  Spring HA
The American experience in Vietnam. The chronological scope extends from the outbreak of the Second World War to the collapse of the South Vietnamese government in 1975. Topics include the U.S. involvement in the French Indochina War, the commitment of military forces in defense of South Vietnam, the character of the anti-war movement, the consequences of the Tet Offensive, and the impact of war upon American society. Although the American experience receives primary emphasis, we also consider the background and role of Vietnamese nationalist and revolutionary movements. One three-hour seminar. J. Fronczak

HIS 489 Interdisciplinary Studies in the Humanities (See HUM 470)

HIS 490 Perspectives on the Nature and Development of Science (also PHI 490 )  Not offered this year HA
An overview of science studies, including approaches drawn from history, philosophy, sociology, anthropology, and political science, with these analytic frameworks applied to specific historical and contemporary case studies. Normally taken junior year. Open to other students with instructor's permission. One three-hour seminar. Staff

HIS 492 Problems in the Development of the Life Sciences  Not offered this year HA
A seminar emphasizing close reading of primary sources. Topics vary from year to year and may include: reductionism in physiology, evolution theory, the foundation of genetics, the history of bacteriology, and topics in disease and culture. One three-hour seminar. Staff
The Program in History and the Practice of Diplomacy offers undergraduate students the opportunity to pursue concentrated interdisciplinary study of history and diplomacy in concert with internships in the practice of diplomacy and related professions. Successful completion of the Program leads to the award of a certificate.

Admission to the Program

The program is open to undergraduates concentrating in any department. Students should apply online, preferably during the sophomore year, and seek the advice of the program manager or director to plan a course of study. Applicants will be accepted on the basis of interest and a coherent academic plan.

Program of Study

Students enrolling in the program are required to take an introductory course, WWS 315, usually in the spring semester of sophomore year. In exceptional circumstances and at the discretion of the director this course may be taken other than in the sophomore year. In addition to its pedagogical purpose, WWS 315 is designed to help create a sense of community among the cohort of students entering the program.

Students must additionally take four courses on topics of relevance to the program's focus. Two of these must be in the history department in international, global, diplomatic history, or ancient history, and two in the Woodrow Wilson School, politics department, or other departments, on subjects such as grand strategy, international relations, international organizations, international political economy, and other subjects related to war, peace, and global stability.
All such courses, to be counted toward fulfilling the program requirements, must be approved by the program director. Certificate students who are concentrating in history, the Woodrow Wilson School, or politics must take at least eight courses in the respective rosters that do not overlap with the courses designated for the certificate. The program director advises students as to other courses of study which may usefully supplement preparations for service in organizations like the State Department and NGOs, which help formulate and implement policies on the world scene.

Every senior is required to address a substantial part of his or her thesis to subjects of direct relevance to the program's focus. Each must also take a required but not-for-credit semester-long seminar which provides a venue for sharing of student work with peers and the seminar leader, typically the director of the program.

Each student must serve a summer internship, generally during the summer following the sophomore or junior year, with an appropriate government agency or official, international organization (governmental or nongovernmental), or think tank focused on international affairs. The program director advises students in identifying appropriate internships. In consultation with the executive committee the director gives final approval and provides the funding for those students whose internships are approved as meeting program goals. The number of students supported is limited by the availability of funds. It is assumed that any student who is remunerated for an internship will complete the entirety of the program.

The program also fosters the participation of practitioners of diplomacy and of other modes of international relations in student learning through visiting professorships, short-term fellowships, workshops, conferences, public lectures, and field trips.

**Certificate of Proficiency**

Students who fulfill the requirements of the program receive a certificate of proficiency in history and the practice of diplomacy.

If other courses in history and the practice of diplomacy are offered, these may be added to the list of approved courses with program permission.

**Courses Related to the Program in History and the Practice of Diplomacy**

- CHV 350/HIS 357/POL 469 The Age of Rights: Nature, Enlightenment, and Revolution
- CLA 217/HIS 217/HLS217 The Greek World in the Hellenistic Age
- CLA 219/HIS 219 The Roman Empire, 31 B.C. to A.D. 337
- HIS 201 A History of the World since 1300
- HIS 241 Faith and Power in the Indian Ocean Arena
- HIS 283 War in the Modern Western World
- HIS 300 History of International Human Rights
- HIS 304/LAS 304 Modern Latin America since 1810
- HIS 316 South African History, 1497 to Present
- HIS 322 20th-Century Japan
- HIS325/EAS 355 China, 1850 to the Present
- HIS 341 Between Resistance and Collaboration: The Second World War in Europe
- HIS 342/EAS 342/NES 343 Southeast Asia's Global History
HIS 362 Soviet Empire
HIS 363 The Napoleonic Wars
HIS 370 Britain 1815-1945: Empire, Democracy, and War
HIS 380 The United States and World Affairs
HIS 461/ENG 461 Writing a World: Encounters with Difference, 1650-1850
NES 315 War and Politics in the Modern Middle East
NES 394/HIS 409 Colonialism, Post-Colonialism and Islam
NES 406 "The Great War in the Middle East"
NES 433/HIS 433 Imperialism and Reform in the Middle East and the Balkans
NES 437/HIS 337/HLS 337 The Ottoman Empire, 1300-1800
POL 245 International Relations
POL 313 Global Justice
POL 332 Topics in American Statesmanship
POL 351/WWS 311 The Politics of Development
POL 385 International Political Economy
POL 388 Causes of War
POL 441 Seminar in International Relations: Conflict and Cooperation in International Politics, Security, Trade
POL 443 Seminar in International Relations: The Military Instrument of Foreign Policy
SOC 250 The Western Way of War
WWS 301/ECO 352 International Trade
WWS 315/POL 393 Grand Strategy
WWS 316/POL 399 China's Foreign Relations
WWS 318 U.S. Military and National and International Diplomacy
WWS 340/PSY 321 Psychology of Decision Making and Judgment
WWS 353/MAE 353 Science and Global Security
WWS 375 United States and Iran
WWS 420/POL 444 International Institutions and Law WWS
466/HIS 467 Financial History
Program in Humanistic Studies

Director
Rubén Gallo, Spanish and Portuguese
AnneMarie Luijendijk, Religion
Eric S. Gregory, Religion
Benjamin C. Morison, Philosophy
Philip G. Nord, History

Executive Committee
Esther H. Schor, English
Yelena Baraz, Classics
Keith A. Wailoo, History, Woodrow Wilson School
Leonard Barkan, Comparative Literature
Benjamin Conisbee Baer, Comparative Literature

The Program in Humanistic Studies, under the auspices of the Council of the Humanities, sponsors two kinds of offerings. HUM courses explore interrelated events, ideas, texts, and artifacts of Western and Asian cultures. Students in these courses may work toward a certificate in interdisciplinary studies in the humanities. Journalism courses (subject area JRN) examine topics related to writing and the media, from creative nonfiction to relations between the media and society. Both kinds of courses are described below.

Journalism

These seminars are taught by distinguished writers and journalists from different media who spend a term at Princeton as Ferris, McGraw, and Robbins Professors. Students work closely with these journalists and often visit their news organizations. The program provides grants to undergraduates who undertake summer internships in the media.

The seminars were inaugurated in 1957 by the bequest of former New York Herald journalist Edwin F. Ferris of the Class of 1899. In 1984 publisher Harold W. McGraw Jr. ’40 created the McGraw Professorship in Writing and Publishing in recognition of the importance of writing in all disciplines. Other seminars have been sponsored by a gift from the E. Franklin Robbins Trust in honor of the late William G. Michaelson ’59 and his daughter Robin L. Michaelson ’89. The program committee consists of the chairs of the English and Politics departments, the dean of the Woodrow Wilson School of Public and International Affairs, the director of the Creative Writing program, and the chair of the Council of the Humanities.

Humanistic Studies

Humanistic Studies courses offer broad interdisciplinary exploration to students in all fields. Those who wish to pursue this approach beyond their first two years may design a curriculum reflecting their specific interests. The interdisciplinary Program in Humanistic Studies is appropriate for students who are concentrating in a humanities or related social science department and who wish to reflect on the frontiers of disciplines, the bridges that connect them, and the insights that can be gained from approaching one field with the questions and methods of another. In
addition to acquiring a strong base in their home departments, students in the program create links to one or more fields that can illuminate their work.

**Information and Departmental Plan of Study**

*Prerequisites for the certificate in Humanistic Studies*

Candidates for the program must complete two interdisciplinary courses during their first two years. These might be: (1) HUM 216-217 or 218-219, Interdisciplinary Approaches to Western Culture; or (2) HUM 233-234, East Asian Humanities; or (3) two other, equivalent courses that provide a rigorous interdisciplinary approach to the arts and culture over a span of historical time. (Applicants who seek to fulfill the prerequisites through this third option must submit syllabi of the two courses for which they are requesting approval.) Students are admitted to the program during the second semester of their sophomore year.

*Plan of Study*

In addition to the two prerequisites, students complete six additional courses, which may also be used to fulfill departmental requirements. Four of these six courses must be explicitly interdisciplinary in their approach and/or subject matter. The remaining two are chosen in consultation with the program adviser to coordinate with the student's individual plan of study. In these courses, students are expected to forge their own interdisciplinary connections and pursue them in their written work. One of the six courses is an interdisciplinary capstone seminar created specifically for certificate students. Students in the program must also complete either a senior thesis in their home departments with an interdisciplinary focus or an interdisciplinary research paper written specifically for the program.

Applicants to the program are encouraged to reflect on the meaningful connections they wish to forge and to propose a curriculum for their junior and senior years that combines the requirements of their home departments with the pursuits that best complement their interests. These individual paths are likely to group into five major trajectories:

1. **Bridges among the humanities and arts**

   Students on this path deepen their study of one particular partnership among the possible combinations of religion, philosophy, history, literature, and the arts.

2. **Bridges between the humanities and related social sciences**

   Students on this path focus on the intersections between a specific branch of the humanities and a neighboring field of anthropology, sociology, or politics.

3. **Intercultural studies**

   Students might illuminate their study of Western culture with comparative approaches to other areas of the world, for example, or study one or more regions through different methodologies. In this pursuit, they might benefit from participating in global seminars or other opportunities for study abroad.
4. Bridges between the humanities and the sciences

These students, while concentrating in the humanities or social sciences, might explore links to cognitive science or other sciences.

5. Digital approaches to the humanities

Students in this group might create new kinds of knowledge by examining some area with the resources and insights of computer science.

Capstone Seminar

HUM 470 Interdisciplinary Studies in the Humanities

This team-taught seminar examines texts, objects, periods, and themes from an interdisciplinary perspective. The specific topic varies each year depending on the focus of the faculty team.

Courses

**HUM 202 Documentary Film and the City (See URB 202)**

**HUM 205 The Classical Roots of Western Literature (See COM 205)**

**HUM 206 Masterworks of European Literature (See COM 206)**

**HUM 207 The Bible as Literature (See ENG 390)**

**HUM 209 Thinking Translation: Language Transfer and Cultural Communication (See TRA 200)**

**HUM 212 Classical Mythology (See CLA 212)**

**HUM 216 Interdisciplinary Approaches to Western Culture I: Literature and the Arts** Fall LA This course, taken simultaneously with 217, forms the first part of an intensive, four-course (216-219) interdisciplinary introduction to Western culture. Part I extends from antiquity to the Middle Ages. These courses bring together students and several faculty members to discuss key texts, events, and artifacts of European civilization. Readings and discussions are complemented by films, concerts, museum visits, guest lectures, and other special events. Students enroll in both 216 and 217. Three lectures, two discussion sessions. *Y. Baraz, D. Heller-Roazen, E. Schor*

**HUM 217 Interdisciplinary Approaches to Western Culture I: History, Philosophy, and Religion** Fall HA In combination with 216, this is the first part of a year-long interdisciplinary sequence exploring Western culture. Students enroll in both 216 and 217. All meetings are listed under 216. *B. Kitzinger, A. Rigolio, B. Morison*
HUM 218 Interdisciplinary Approaches to Western Culture II: Literature and the Arts  Spring LA
This course, taken simultaneously with 219, forms the second part of an intensive, four-course (216-219) interdisciplinary introduction to Western culture. Part II extends from the Renaissance to the modern period. These courses bring together students and several faculty members to discuss key texts, events, and artifacts of European civilization. Readings and discussions are complemented by films, concerts, museum visits, and other special events. Students enroll in both 218 and 219. Prerequisites: 216-217 or instructor E.
Schor, J. Dolven, M. Gordin

HUM 219 Interdisciplinary Approaches to Western Culture II: History, Philosophy, and Religion  Spring EC
In combination with 218, this is the second half of a year-long interdisciplinary sequence exploring Western culture from the 15th to the 20th centuries. Prerequisite: 216-217 or instructor's permission. All meetings are listed under 218. D. Garber, C. Kitzinger, C. Mangone

HUM 222 Theories and Methods in the Study of Religion (See REL 222)

HUM 225 Frankenstein at 200 (also ENG 226)  Fall LA
Conceived in 1816, Mary Shelley's Frankenstein; or, The Modern Prometheus has given a name to strange, disturbing, ominous new developments by creators failing to think through the consequences. On its 200th anniversary, we'll study this brilliant novel--about an undergraduate's independent study project conducted without a faculty advisor--in several exciting contexts: literary aesthetics, forms, and traditions; classical mythology; scientific enthusiasm and perils; other tales of transgression, outcasts and "monsters"; philosophical ethics; alter-ego psychology; questions of gender and sexuality; cinematic riffs and adaptations. C. Azariah-Kribbs, S. Wolfson

HUM 227 The World of the Middle Ages (See MED 227)

HUM 229 Great Books in Buddhism (See REL 229)

HUM 233 East Asian Humanities I: The Classical Foundations (also EAS 233 / COM 233)  Fall EM
An introduction to the literature, art, religion, and philosophy of China, Japan, and Korea from antiquity to ca. 1400. Readings are focused on primary texts in translation and complemented by museum visits, films, and other materials from the visual arts. The lecturers include faculty members from East Asian studies, comparative literature, art and archaeology, and religion. Students are encouraged to enroll in HUM 234 in the spring, which continues the course from ca. 1400 into the 20th century. P. Keulemans, B. Steininger

HUM 234 East Asian Humanities II: Traditions and Transformations (also EAS 234 / COM 234)  Spring EM
An introduction to the literary, philosophical, religious, and artistic traditions of East Asia. Readings are focused on primary texts in translation. Lectures and discussions are accompanied by films, concerts, and museum visits. Lecturers include faculty members from East Asian studies, comparative literature, art and archaeology, and religion. Staff

HUM 275 La Serenissima: Music, Culture, and Society in Early Modern Venice (See MUS 275)

HUM 300 Urban Studies Research Seminar (See URB 300)

HUM 301 Topics in German Drama and Theater (See GER 301)
HUM 306 Creating the Universe: Buddhist Science, Ritual, and Art (See REL 306)

HUM 309 Political Philosophy (See PHI 309)

HUM 315 Buddhist Art and Material Culture: The Virtues of Objects (See REL 315)

HUM 316 Social Philosophy (See PHI 316)

HUM 326 Philosophy of Art (See PHI 326)

HUM 338 The Buddhist Individual (See REL 308)

HUM 341 What is Vernacular Filmmaking? (See COM 341)

HUM 343 Some Contemporary Shakespearean Afterlives (See THR 343)

HUM 346 Introduction to Digital Humanities (also ENG 349 ) Spring LA
Have you ever wondered how to measure the complexity of a literary text? What if you could map the personal connections in a Jane Austen novel or a Shakespeare play? Have you had an intuition that you haven't been able to follow because processing the information was too intimidating? If so, the digital humanities can help you. This course will explore the large and exciting field of digital humanities. You'll learn how to read and understand texts using DH methods and will start your own DH project. C. Wills

HUM 349 The Artist at Work (See ART 349)

HUM 355 Art & Nationalism in Modern Italy (See ECS 355)

HUM 357 The Human Comedy of Anton Chekhov Off and On Stage (In English Translation) (See SLA 357)

HUM 360 The Eagle and the Dragon: Comparing Ancient Rome and Han Empire (See CLA 360)

HUM 365 Freud on the Psychological Foundations of the Mind (also PSY 365 ) Fall EC
Freud is approached as a systematic thinker dedicated to discovering the basic principles of human mental life. For Freud, these basic principles concern what impels human thought and behavior. What moves us to think and act? What is it to think and act? Emphasis is placed on the close study and critical analysis of texts, with particular attention to the underlying structure of the arguments. Two 90-minute classes. S.
Sugarman

HUM 369 Beyond Crisis: Contemporary Greece in Context (See COM 369)

HUM 374 Afterlives of the Iliad (See COM 374)
HUM 379 Script, Screen, and Sexuality in East Asia (See COM 379)

HUM 385 Mapping Gentrification (See URB 385)

HUM 401 History of Neuroscience (See PSY 401)

HUM 407 Citizenship and Statelessness from Empire to Nation-State (See HIS 407)

HUM 421 Venice and the Mediterranean World (See HIS 421)

HUM 449 Making Sense of the City (See ARC 449)

HUM 452 Religion and Power in Grassroots Democracy (See REL 452)

HUM 470 Interdisciplinary Studies in the Humanities (also ART 470 / HIS 489 ) Spring LA
This team-taught seminar examines texts, objects, periods and themes from an interdisciplinary perspective. Although designed to be the capstone course for students pursuing a certificate in Humanistic Studies, it is open to other students if space is available. The specific topic varies each year depending on the focus of the faculty team. D. Feeney, J. Lande

JRN 240 Creative Non-Fiction (also CWR 240 ) Spring LA
This is a course in factual writing and what has become known as literary nonfiction, emphasizing writing assignments and including several reading assignments from the work of John McPhee and others. Enrollment is limited to 16 second-year students, by application only. One three-hour seminar. J. McPhee

JRN 400 The Media in America Spring LA
This seminar will discuss such topics as secrecy, national security and a free press; reputation, privacy and the public's right to know; muckraking and the "establishment" press; spin and manipulation; the rise of blogging; the economic impact of technological change on the news business. J. Stephens

JRN 440 The Literature of Fact Fall/Spring LA
This seminar offers a chance to think about and practice different kinds of writing. Students will strive to identify and emulate the best--the smartest, the most vivid, the most humane--in a variety of journalistic genres, from news analysis to arts criticism to foreign correspondence. Y. El Rashidi, E. Sciolino

JRN 441 The McGraw Seminar in Writing Not offered this year LA
Each year a different kind of writing is featured, depending on the specialty of the Harold W. McGraw Professor of Writing and Publishing. One three-hour seminar. Staff

JRN 445 Investigative Journalism Fall/Spring SA
This course looks at investigative reporting both as a practice, with its own methods of research, and as a force in society. Specific content and approach vary from year to year, depending on the expertise of the professor. One three-hour seminar. J. Stephens
JRN 447 Politics and the Media Fall SA
Examination of political journalism and the role of the press in society. The content and approach vary from year to year, depending on the interests of the professor. One three-hour seminar. K. McCleery

JRN 448 The Media and Social Issues Spring SA
An examination of the ways in which the media both cover and influence social issues. Specific content and approach vary from year to year, depending on the expertise of the professor. One three-hour seminar. Staff

JRN 449 International News Spring SA
This seminar explores the particular challenges of writing about other cultures, as well as the powers and limits of foreign reporting in shaping American public opinion. Specific content and approach vary from year to year, depending on the expertise of the professor. One three-hour seminar. Staff

JRN 450 Audio Journalism Fall LA
Students will learn to combine precise writing, compelling interviews, sound, scene, and narrative to produce thoughtful, compelling broadcast quality news and features. Readings, listening sessions and guest speakers will explore style, ethical issues and innovative models of audio storytelling in this digital landscape. Specific content and approach vary from year to year depending on the expertise of the professor. One three-hour seminar. R. Smith

JRN 452 Digital Journalism Not offered this year SA
Readers increasingly follow the news on television and the internet. This seminar explores the potential as well as the limitations and dangers of on-screen journalism. Specific content and approach vary from year to year, depending on the expertise of the professor. One three-hour seminar. Staff

JRN 457 Politics, Causes, and Culture in a Changing Media Landscape Fall EM
You have strong beliefs -- and you want to be a journalist. Is there a conflict between advocacy and good journalism? How do these issues play out in today's changing media landscape? Seminar participants will work out ethical issues, their own responsibility as journalists, individuals, and members of a global community, while working rigorously on their own reporting, self-editing, and non-fiction writing abilities. Students will also explore multi-media and digital options as outlets for their work. B. Sarwar
Program in Jazz Studies

Executive Committee
V. Kofi Agawu, Music
Rudresh K. Mahanthappa, Music
Imani Perry, African American Studies

The Program in Jazz Studies is dedicated to providing an educational forum for the study of the performance practices and rich cultural legacy of jazz. As constructed, it provides the student performers and composers (and others interested in the tradition) with the opportunity to study jazz by way of a wide range of course offerings. Students in the program will participate in a number of academic courses from the music department curriculum, as well as other approved interdisciplinary offerings, that encourage the study of the historical, cultural, social, theoretical, stylistic, and creative issues that pertain to the jazz idiom. They will also have the opportunity to be involved in a number of jazz outreach activities that are designed to enrich elementary, middle school, and high school students throughout the state, as well as the community at large.

While the Program in Jazz Studies is not designed to produce professional jazz performers, it will provide a foundation upon which a student may build in order to go on to further training while receiving a superior liberal arts education.

Admission to the Program

The Program in Jazz Studies is open to juniors and seniors who have the appropriate background and are committed to studying the performance practices and rich cultural legacy of jazz. Admission to the program will be by application. The number of students in the program will be limited by available resources. Although enrollment is restricted to juniors and seniors, students may begin taking courses that count toward certificate requirements in their freshman year.

Program of Study

To qualify for a program certificate, students are required to complete four related courses and participate as a performer in one of the music department's jazz performance groups. In addition, they must also be involved in educational outreach through the program's Jazz-in-the-Schools initiative.

Program Requirements

Students are required to take four courses from the following four categories (Note: an asterisk indicates a one-time-only course or topic). Other select music theory courses within the Department of Music may also be used to satisfy the elective requirement under the category of jazz theory with the permission of the program director. Such a course would need to feature a substantial emphasis on jazz theory and composition:

1. Jazz history (1 course):
MUS 262 Evolution of Jazz Styles (also AAS 262); or
*MUS 320 Jazz Performance Practice in Historical and Cultural Context

2. Jazz theory and composition (1 course):

MUS 311 Jazz Theory Through Improvisation and Composition I: The Bebop Paradigm; or
MUS 312 Jazz Theory Through Improvisation and Composition II: Modal Approaches

*MUS 319 Seminar in Jazz Composition; or MUS
306 Understanding Tonality

3. Jazz performance (1 course):

MUS 215 Projects in Jazz Performance
*MUS 321 The Improvising Ensemble

4. Historical/cultural context electives (1 course) to be chosen from the following list or with the approval of the program director. New courses will be added to this area as they are developed; please check the program's webpage within the Department of Music's website for an up-to-date list of electives. Students are encouraged to consider historical/cultural elective courses from outside of the music department as well as those within music, as listed below. (Note: Students may take either MUS 264 or MUS 265, but not both, to satisfy the historical/cultural context elective).

African American Studies (AAS)
201 Introduction to the Study of African American Cultural Practices
*305 The History of Black Gospel Music (also REL 391)
*310 Music from the Hispanophone Caribbean (also ENG 324/MUS 256)
*342 Rhythm Nation (also ENG 397/MUS 364)
*348 Black Popular Music Culture
*372 Postblack-Contemporary African American Art (also ART 374/AMS 372)

American Studies (AMS)
*301 Listening In: Sound, Music, Noise, and Technology in American History

English (ENG)
*366: African American Literature: Harlem Renaissance to Present (also AAS 355)

History (HIS)
*399: In the Groove: Technology and Music in American History, From Edison to the iPod

Music (MUS)
258 Music of Africa (also AFS 258)
In addition, students are required to participate in a University jazz ensemble during each semester of enrollment in the jazz studies program (junior and senior years).

**Independent Work**

Students will develop an educational lecture/demonstration to be presented by a student-led jazz small group at an assembly program for an area elementary school or middle school. This will take place as part of the certificate program's Jazz-in-the-Schools outreach initiative.

**Certificate of Proficiency**

Students who fulfill the requirements of the program receive a certificate of proficiency in jazz studies upon graduation.
Program in Judaic Studies

Director
Martha Himmelfarb

Executive Committee
Leora F. Batnitzky, Religion
Yaacob Dweck, also History
Eric S. Gregory, Religion, ex officio
Jonathan M. Gribetz, also Near Eastern Studies
Martha Himmelfarb, Religion
William C. Jordan, History
Eve Krakowski, also Near Eastern Studies
Lital Levy, Comparative Literature
Marina Rustow, Near Eastern Studies, History
Esther H. Schor, English
Moulie Vidas, Religion

Associated Faculty
Jill S. Dolan, English, Lewis Center for the Arts, Theater
Anthony T. Grafton, History
Jan T. Gross, History
Hendrik A. Hartog, History
Wendy Heller, Music
Thomas Y. Levin, German
AnneMarie Luijendijk, Religion
Deborah E. Nord, English
Sarah M. Pourciau, German
Anson G. Rabinbach, History
Lawrence Rosen, Anthropology
Stacy E. Wolf, Lewis Center for the Arts, Theater

Sits with Committee
Irena G. Gross, Slavic Languages and Literatures
Daniel C. Kurtzer, Woodrow Wilson School

David Bellos, French and Italian, Comparative Literature
The Program in Judaic Studies provides students the opportunity to explore more than three millennia of Jewish culture, history, religion, thought, politics, and literature from the Bible to contemporary Jewish thought and society from an interdisciplinary perspective. A wide variety of courses, lectures, conferences, film series, and exhibitions taking advantage of Princeton's rich resources in Judaic studies are offered. There is no "typical" certificate student; we serve students with a wide range of interests and welcome all who are motivated to deepen their knowledge of Judaic studies.

Program Requirements

In order to receive the certificate, students may choose from the following two options: (1) take a minimum of five courses in Judaic studies, which must include JDS 202 Great Books of the Jewish Tradition and at least one course from the premodern period or (2) take three courses to include JDS 202 Great Books of the Jewish Tradition and one course from the premodern period plus write a senior thesis that draws significantly on some aspect of Judaic studies.

A sound program of study will involve both historical range (courses in premodern and modern periods) and disciplinary breadth. While a junior paper in the field is not required, students are encouraged to explore the field of Judaic studies in their junior-year independent work. A freshman seminar may count as one of the required courses. Depending on other course work, Hebrew language courses may count toward the requirements with the approval of the program director.
Each student's course of study must be approved by the program director as well as by the departmental representative in the student's department of concentration. The certificate requirements are compatible with a concentration in any humanities or social sciences department.

Languages

Judaic studies has no specific language requirement apart from what is normally required by the University. However, when appropriate, students are expected to use foreign language skills in their senior thesis research. Students also are strongly urged to develop a competency in Hebrew and may use one advanced (300-level) Hebrew course, if they wish, to fulfill the general course requirements for the certificate.

Study Abroad

The program encourages students to consider studying in Israel, either for a semester or for a summer. Study in Israel provides an excellent opportunity to improve one's knowledge of Hebrew as well as to pursue other topics of interest. There are a number of intensive summer language programs in Hebrew and Yiddish in Israel, the United States, the United Kingdom, and elsewhere. Courses taken abroad, other than elementary language, may count for up to two of the program's required courses.

Certificate of Proficiency

Students who fulfill all the requirements of the program will receive a certificate of proficiency in Judaic studies upon graduation.

Courses

**JDS 201 Introduction to Judaism: Religion, History, Ethics (also REL 223 )**  
Not offered this year

HA  
Starting with ancient Israel's radically new conceptions of the divine, morality, and history, this course explores the complex nature of Judaism and its development as a religion and culture over millennia--a development marked by internal debates and external challenges to continuity and survival. Emphasis is on the traditional bases of Judaism, such as religious beliefs and practices, interpretations of sacred texts, and shared communal values. Attention also to the variety of Jewish encounters with modernity, philosophy, secularism, and non-Jewish cultures. Two classes, one preceptorial. **Staff**

**JDS 202 Great Books of the Jewish Tradition (also REL 202 )**  
Fall HA

Introduces students to the classical Jewish tradition through a close reading of portions of some of its great books, including the Bible, rabbinic midrash, the Talmud, Rashi's commentary on the Torah (probably the most influential Bible commentary among Jews ever), the Zohar (the central work of Kabbalah), and the *Guide for the Perplexed* (Maimonides's great philosophical work). Students will consider what these works say about the relationship between revelation and interpretation in Jewish tradition and how they come to define that tradition. Two 90-minute classes.  
**M. Himmelfarb**  
JDS 203 Introduction to Jewish Cultures (See COM 202)

**JDS 212 Jewish Thought and Modernity (See REL 212)**
JDS 213 Israeli Literature and Film, 1948-Present LA
Through fiction and film, the course explores the key topics in Israeli society and culture: the construction of the sabra, kibbutz and collectivist ideology, the impact of the Holocaust, military service and traumatic memory, gender and women's writing, Sephardim and Mizrahim, Israeli-Palestinian relations, and the religion nationalism and ultra-Orthodoxy. Staff

JDS 214 Masterworks of Hebrew Literature in Translation (See NES 214)

JDS 216 Love and Death from the Bible to Contemporary Israeli Fiction (See NES 216)

JDS 217 The Five Books of Moses (See REL 217)

JDS 220 Jews, Muslims, and Christians in the Middle Ages (See NES 220)

JDS 221 Philosophy After Auschwitz (also PHI 221) Spring
Focusing on the growing philosophical and theological literature about the Nazi concentration camps in general and about Auschwitz in particular, this seminar considers the challenges that the Nazi genocide brings to philosophy, theology, and conceptions of morality and politics. Sub topics will include: The theological questions Auschwitz poses to philosophy, Moral and political philosophy after Auschwitz, Representation and language after Auschwitz, and The concept of the Absolute after Auschwitz. O.
Schechter

JDS 223 Jerusalem Contested: A City's History from Jewish, Christian, and Muslim Perspectives (See NES 221)

JDS 230 Who Wrote the Bible (See REL 230)

JDS 233 Jews, Christians, and Conversion in the Early Islamic World (See NES 231)

JDS 242 Jewish Thought and Modern Society (See REL 242)
JDS 246 Ancient Judaism from Alexander to the Rise of Islam (See REL 246)

JDS 248 Kabbalah: Concepts and History (also REL 241) Spring HA
This course surveys the major concepts and historical developments of Jewish mystical traditions in the last thousand years. We will explore both theosophical (contemplative) and ecstatic (experiential) Kabbalah, including the ideas and practices of major figures, groups, and movements. D. Selar

JDS 300 Israeli History through Film (also NES 314) HA
An introduction to modern Israeli history and culture through the medium of film. The course examines the transitions and changes in Israeli society over the past 60 years and presents students with some of the major themes of the Israeli experience. The history of Israel is the tale of the conflict between East and West, Arabs and Jews, and between the Jewish past and the Zionist ethos. It is the story of a transformation from a highly mobilized nation to a
modern, self-doubting and pluralistic society that openly questions its past and constituting myths. Israeli cinema is a reflection of this history and culture. One three-hour seminar. Staff

**JDS 301 Topics in Judaic Studies (also GSS 309) LA**
The seminar, normally taken in the junior year, explores in depth a theme, issue, or problem in Jewish studies, often from a comparative perspective. Possible topics include gender and the family, comparative diasporas, messianic ideas and movements, Jewish history, anti-Semitism, authority, leadership, and conflict in Judaism, Jewish literature, Jewish popular culture. One three-hour seminar. Staff

**JDS 302 Elementary Biblical Hebrew I (also NES 302 / REL 302) Fall**
Students will achieve a basic ability to read the Hebrew Bible/Old Testament in its original language. During the semester, students will learn the script and grammar, develop a working vocabulary, and master the standard dictionaries while reading passages from the Bible itself. Two 90-minute classes. N. Meshel

**JDS 303 The Wise Guys: Readings in Biblical Wisdom Literature (also NES 311 / REL 303) Spring** A continuation of 302. Students will develop their ability to read the Hebrew Bible/Old Testament in its original language. During the semester, students will deepen their knowledge of the grammar, expand their working vocabulary, and practice reading larger passages from the Bible. Two 90-minute classes. J. Kraut

**JDS 306 Elementary Biblical Hebrew (also REL 316 / HEB 306)**
Students will achieve a basic ability to read the Hebrew Bible/Old Testament in its original language. During the semester, students will study the grammar and develop their vocabulary. Upon completing the grammar textbook, students will read large passages from the Bible from all genres. Staff

**JDS 309 Jewish Messianic Movements in the Early Modern Period**
Traditionally, Judaism has included an inherently redemptive quality. The Biblical Exodus serves as the supreme example of national redemption, while the Torah and later rabbinic literature speak of both national and individual redemptions. Messianism became a basic tenet of Jewish belief in the medieval period and served as a significant motivator during the early modern period. This course will explore Jewish messianism between the fifteenth and eighteenth centuries. Themes to be discussed include: Jewish unity across political and ethnic boundaries, power dynamics of rabbis and lay leaders, and individual religious expression. Staff

**JDS 310 The Invention of the Gentile: A Case-Study in Ethnic Distinctions (See REL 305)**

**JDS 311 Bible Now: The Bible in Contemporary Israel (See HEB 310)**

**JDS 315 The Family in Jewish Tradition (also GSS 310) SA**
This seminar will examine the historic flexibility and variability of the Jewish family in the context of selected times and places: Biblical period, early Common Era Diaspora, 20th-century Europe, contemporary United States and Israel. The major emphasis in this course will be on the different protocols and forms that may collectively be called the "Jewish Family." One three-hour seminar. Staff

**JDS 317 Recent Jewish and Christian Thought (See REL 317)**
The current state of Jewish-Islamic relations is fraught with mutual suspicion and competing historical narratives that are manifest as much in the religious as in the political arena. In the midst of this debate, it is sometimes forgotten that Jews have for centuries been a vital presence in the Islamic world and have contributed to Islamic civilization right up to modern times. This course explores the complex historical relationship of the Jews of the Islamic world from the rise of Islam in the seventh century to the mass exodus of Middle Eastern and North African Jewry from their ancestral communities in modern times. *E. Russ-Fishbane*

JDS 338 The Arab-Israeli Conflict (See NES 338)

JDS 340 Ancient Judaism and the Dead Sea Scrolls (See REL 340)

JDS 341 Jews and Judaism in Ancient Egypt and Other Diaspora Communities (See REL 341)

JDS 344 Sex in Ancient Judaism and Christianity (See REL 344)

JDS 346 Reason and Revelation in Jewish Thought (See REL 346)

JDS 347 Religion and Law (See REL 347)

JDS 348 Genesis and Cosmogony in Antiquity (See REL 348)

JDS 349 Texts and Images of the Holocaust (See COM 349)

JDS 350 Imagining Diasporas and Homelands (See NES 349)

JDS 355 Between Swords and Stones: Jerusalem, a History (also NES 355 / HIS 356) HA

For 3,000 years the city that is holy to all three monotheistic religions has known little peace and tranquility and has been the site of wars, conquests, and division. By drawing on historical, literary, religious, and cinematic sources, this course will explore the history of Jerusalem from antiquity to the modern period. It will examine its place in the religious imagination of Jews, Muslims, and Christians and trace the political history of a city that continues to be one of the most inflammable places on Earth. It will look at the conditions in today's "united" Jerusalem and explore the different contingencies to bring peace to it. *Staff*

JDS 359 Modern Jewish History: 1750-Present (See HIS 359)

JDS 362 Stolen Years: Youth under the Nazis in World War II (See COM 362)

JDS 369 Conflicted Desires: Gender, Love, and Sexuality in the Middle East (See NES 359)
JDS 373 Zionism: The Intellectual History of Jewish Nationalism (See NES 373)

JDS 377 Topics in American Literature (See ENG 356)

JDS 385 Comics, the Graphic Novel and the American Jew (See AMS 385)

JDS 388 Intimate Geographies: Space and Place in Modern Hebrew and Arabic Literature (See COM 388)

JDS 391 Holocaust Testimony (See ECS 391)

JDS 393 Spinoza: Philosophy, Religion, and Politics (See PHI 393)

JDS 399 Modern Israel (also NES 399) HA
This course examines the formation and development of modern Israel, following the transition in Israel from a conformist society dominated by Zionist ideology to a society seriously questioning its values, ideals, and norms. It will focus on these changes in a wide range of sources: political and diplomatic, cultural, literary, cinematic, and more. The course will focus on the role of: the ideological origins of Zionist ideology; the Holocaust; the Arab-Jewish conflict; the Ashkenazi-Mizrahi; and the secular-religious divide on the development of contemporary Israeli society. Two 90-minute classes. Staff

JDS 410 Jewish Identity and Performance in the US (See ENG 410)

JDS 427 Modern Hebrew Literature: A Historical Introduction (See COM 427)

JDS 446 Maimonides from Medieval Egypt to Modernity (See HIS 446)

JDS 458 Zionism: From Ideology to Practice (also HIS 458 / NES 458) HA
Examines the history of Zionism as a diverse political, social and cultural, movement. The course traces the origins of the Jewish national idea in Europe at the period of Jewish emancipation and the rise of modern anti-Semitism and examines the transformation of Zionism into a political and social movement in Palestine, the emergence of the Jewish-Arab conflict, and the 1948 War. Explores the impact of Zionist ideology on the early years of Israeli independence, and, lastly, the course surveys the post-Zionist debates and the relevance of the Zionist idea today. Two 90-minute seminars. Staff
Program in Language and Culture

Faculty
Katherine M. H. Reischl, Slavic Languages and Literatures (spring)
Thomas Y. Levin, German
Simone Marchesi, French and Italian
Brian R. Steininger, East Asian Studies

The Program in Language and Culture, administered through the individual language and literature departments, allows concentrators in any discipline to earn a certificate in language and culture. Certificates can be earned in the departments of classics, East Asian studies, French and Italian, German, Near Eastern studies, Slavic languages and literatures, and Spanish and Portuguese languages and cultures.

Admission to the Program

The program is open to undergraduates in all departments. Students should consult the appropriate departmental representative by the middle of the sophomore year. Ordinarily, students concentrating in language and literature departments, including comparative literature, will be eligible for the certificate in language and culture provided that: (a) the linguistic base for the language and culture certificate is different from the linguistic base of the concentration; and (b) the work required for the language and culture certificate does not duplicate the requirements of the major. Students pursuing area studies certificates may earn the certificate in language and culture provided that: (a) the courses they elect to satisfy the requirements of the area studies program are different from those they elect to satisfy the requirements of the language and culture certificate program; and (b) they submit a piece of independent work in addition to the independent work that satisfies the requirements of the area studies program and the home department.

Program Requirements

Because the length of time required to gain proficiency varies from language to language, the specific level and content of courses required for the certificate may vary from department to department. All language certificate programs will have the following common core:

1. The study of language beyond the level required for the completion of the University language requirement.
2. A minimum of three departmental courses in language, linguistics, literature, or culture, excluding courses that do not have a language prerequisite. Language courses above the level required for the completion of the University language requirement may be counted. At the discretion of the certificate granting department, a student may substitute one cognate course with a substantial language component for one of the three departmental courses.
3. A piece of independent work. This requirement can be satisfied in one of several ways, depending on the requirements of the respective departments as well as on the student's concentration and interest.
   a) A substantial paper growing out of one of the courses taken to fulfill the certificate requirement. This paper will be in addition to the work required in the course; or
b) A substantial paper on a topic agreed upon with an instructor in the department and approved by the program; or

c) With the agreement of the home department and the program, a piece of independent work that will satisfy the requirements of both the home department and the program. For example, a student could write a junior paper or senior thesis based in substantial part on foreign language sources.

**Study and Work Abroad**

Although not required, it is strongly recommended that students spend some time in the country whose language and culture they are studying. This can be done through an approved study abroad program or through a summer program of work and/or study. The area studies programs in East Asian, Latin American, Near Eastern, and Russian, East European, and Eurasian studies may be important resources in providing guidance, and students who are earning language certificates in these areas are urged to consult with the director of the relevant program in planning their course of study or work abroad.

**Certificate of Proficiency**

Students who have met all the requirements of the program will receive, upon graduation, a certificate of proficiency in the language and culture of the relevant department.


The Program in Latin American Studies promotes interdisciplinary study and seeks to inspire knowledge of and experience in Latin America.

Courses are offered by the Departments of Anthropology, Art and Archaeology, Comparative Literature, Ecology and Evolutionary Biology, Economics, English, French and Italian (appropriate French courses only), History, Music, Politics, Religion, Sociology, Spanish and Portuguese, the School of Architecture, the Woodrow Wilson School, the Center for African American Studies, the Program in Latino Studies, and the Program in Latin American Studies. Through various approaches in the humanities and the social and natural sciences, the program seeks to guide students toward an understanding of Latin American culture, history, socioeconomic conditions, politics, and society. The student's work is supervised by a departmental adviser and is combined with a departmental program in a regular field of concentration.
Admission to the Program

Students normally enter the program in the sophomore year, but an earlier start is encouraged. The requirements for admission are:

1. Satisfactory completion of the requirements for admission to a department.

2. Satisfactory completion of SPA 107, POR 109, or FRE 107 (for students focusing on the French-speaking Caribbean).

Program of Study

The Program in Latin American Studies offers two tracks of study: Latin American Studies and Brazilian Studies. For satisfactory completion of the program, a student must meet the following requirements:

1. Completion of the normal departmental program in the major department.

2. Satisfactory completion of the language requirement in Spanish, Portuguese, or French (for students focusing on the French-speaking Caribbean). This requirement also applies to certificate candidates who are pursuing degrees in the sciences and engineering.

3. For students pursuing the Latin American Studies track: Satisfactory completion of four courses in Latin American subjects sponsored or cross-listed by the program. At least one of these courses must be in Spanish American or Brazilian literature; one must be in one of the following fields: anthropology, economics, history, politics, or sociology. The remaining two courses may be selected from any field. At least one of the qualifying courses must be a seminar in Latin American studies that examines significant problems of the region in an interdisciplinary fashion.

Additional courses that may be used to satisfy program course requirements are:

ANT 335 Medical Anthropology
ECO 351 Economics of Development
SPA 346 Modern Latin American Fiction in Translation

Written course work for ANT 335 and ECO 351 must be on a Latin American topic.

With the program director's permission, a maximum of two courses not listed above or from study abroad may, if they are relevant to the student's area of research, be designated as "cognates" and counted toward satisfaction of the course requirement.

Students pursuing science studies may fulfill program requirements by taking a number of approved courses in ecology and evolutionary biology and environmental studies.
No course may be taken pass/D/fail or audit for program credit.

3a. For students pursuing the Brazilian Studies track: Satisfactory completion of three courses in Latin American subjects sponsored or cross-listed by the Program in Latin American Studies. At least one of these courses must be in Brazilian literature and culture; the two remaining courses may be selected from any field, and must have a strong Brazil-related content. Courses that are not focused entirely on Brazil must be preapproved by the program director, and the final written work must be Brazil related. At least one of the qualifying courses must be a seminar in Brazilian studies.

With the program director's permission, one of the three courses may be taken abroad, being designated as a "cognate," and will then count toward satisfaction of the course requirement.

No course may be taken pass/D/fail or audit for program credit.

4. For students pursuing the Latin American Studies Track: Completion of a senior thesis on a Latin American subject. Normally it should be written under the supervision of a faculty member associated with the program. If this is not the case, a faculty member associated with the program should be consulted early in the senior year concerning available sources. The thesis should also demonstrate an ability to use primary source materials in the original language. If the senior thesis is not devoted exclusively to a Latin American topic, the director and relevant program faculty will determine its acceptability. Ordinarily, at least half of the thesis content will deal with Latin America, or a substantial portion of the research for the thesis should be conducted in a language -- other than English -- spoken in Latin America.

4a. For students pursuing the Brazilian Studies track: Completion of a senior thesis on a Brazilian subject. Normally, it should be written under the supervision of a faculty member associated with the program. If this is not the case, a faculty member associated with the program should be consulted early in the senior year concerning available sources. The thesis should also demonstrate an ability to use primary source materials in Portuguese. If the senior thesis is not devoted exclusively to a Brazilian topic, the director and relevant program faculty will determine its acceptability. Ordinarily, at least half of the thesis content will deal with Brazil, and a substantial portion of the research for the thesis should be conducted in Portuguese.

5. Students majoring in science or engineering but whose thesis cannot be devoted to a Latin American or Brazilian topic may complete the program requirements by writing a research paper of sufficient complexity and length to substitute for the thesis requirement. The topic should be determined in consultation with the director and relevant program faculty.

Certificate of Proficiency

Students who have met the requirements of the program and of their departments will receive upon graduation a certificate of proficiency in Latin American studies.

PLAS has funds available to support student travel to Latin America for research purposes. First- and second-year students are eligible for exploratory research grants; juniors can apply for senior thesis research funding. Please refer to the PLAS website for details.
Courses

LAS 210 Urban Sociology: The City and Social Change in the Americas (See SOC 210)
LAS 220 El Género Negro: Crime Fiction (See SPA 220)
LAS 221 Art of Hispania (See ART 221)
LAS 222 Introduction to Latin American Cultures (See SPA 222)
LAS 223 Introduction to the Literature and Culture of the Portuguese-Speaking World (See POR 221)
LAS 238 Contemporary Latin American Literature (See COM 238)
LAS 248 Modern Mexican Society (See SOC 248)
LAS 259 Caribbean Music from Contradanza to Reggae, Salsa and Beyond (See MUS 259)
LAS 267 Mesoamerican Art (See ART 267)
LAS 268 Introduction to Mesoamerican Material Culture (See ART 268)
LAS 275 Religion and Social Change in Early Latin America (See REL 275)
LAS 276 Saints and Sinners: Women and the Church in Colonial Spanish America (See REL 276)
LAS 278 Histories and Themes in Mexican Religion (See REL 278)
LAS 300 The Literature and Culture of Spain and Colonial Latin America: Medieval, Renaissance, and Baroque (See SPA 300)

LAS 301 Seminar, Research Methods, Sources, and Trends in LAS Not offered this year
An examination of research trends, techniques, and resources necessary for the study of Latin America and the Caribbean in the social sciences and the humanities. The seminar is designed to expose students to the most relevant trends, scenarios, and strategies in both bibliographic and ethnographic field research. Prerequisites: reading knowledge of Spanish and/or Portuguese. Open to freshmen and sophomores. Staff

LAS 303 Modern Brazilian Literature and Culture (See POR 301)
LAS 304 Modern Latin America since 1810 (See HIS 304)
LAS 305 Colonial Latin America to 1810 (See HIS 303)
LAS 306 History of the Modern Caribbean (See HIS 305)
LAS 309 Topics in the Sociology of Latin America (See SOC 309)
LAS 310 Gender and Development in the Americas (See SOC 310)
LAS 311 Topics in Brazilian Cultural and Social History (See POR 304)
LAS 312 History of Modern Mexico (See HIS 309)
LAS 314 Topics in the Study of Gender (See GSS 302)
LAS 315 Luso-Afro-Brazilian Literary Traditions (See POR 300)
LAS 316 Race, Ethnicity, and Nationalism in Latin America (See SOC 315)
LAS 319 Brazilian Cinema (See POR 319)
LAS 321 Topics in the Intellectual History of Modern and Contemporary Spain (See SPA 321)
LAS 327 Modernism in Fiction (See COM 327)
LAS 330 Social Exclusion in Latin America (See SOC 331)
LAS 331 Modern Latin American Fiction (See SPA 331)
LAS 332 Modern Latin American Poetry (See SPA 332)
LAS 333 Latino Politics in the U.S. (See POL 333)
LAS 336 Latinos in American Life and Culture (See LAO 200)
LAS 337 Race Relations in Twentieth Century Cuba Spring HA
The Cuban revolution has been one of the most radical sociopolitical experiments of the past century. Comparing historiographical accounts with the recollections of individuals involved in the actual events, this course investigates the impact of the revolutionary process on Cuban racial politics. At the center of our enquire is an attempt to understand how Cubans see themselves in terms of race, and the role of those perceptions on the production of discourses and silences regarding racial inequality and discrimination. A. Lopez-Denis

LAS 338 The Sociology of Latinos in the U.S. (See SOC 338)
LAS 342 Topics in Latin American Modernity (See SPA 342)
LAS 343 The Invention of Latin American Traditions (See SPA 343)
LAS 344 Literature and Society in Early Latin America (See SPA 344)
LAS 345 Topics in Latin American Literature and Ideology (See SPA 345)
LAS 347 Topics in the Culture of Cities (See SPA 351)
LAS 348 Fictions and Communities in the Andes (See SPA 348)
LAS 349 Topics in Latin American Cultural Studies (See SPA 350)
LAS 350 Pre-Columbian Peoples of Tropical America and Their Environments (See EEB 332)
LAS 351 Tropical Biology (See EEB 338)
LAS 352 Contemporary Latin America in Literature and Visual Arts (See COM 353)
LAS 353 Topics in Gender and Representation (See SPA 353)
LAS 355 The Itinerant Languages of Photography (See SPA 355)
LAS 356 Topics in the Politics of Writing and Difference (See SPA 352)
LAS 359 Technologies of Empire - 1493 and Beyond (See SPA 359)
LAS 360 Urban Modernism and Its Discontents (See POR 306)
LAS 361 Brazilian Cinema in a Global Context (See POR 351)
LAS 363 Medicine and Society in Contemporary Cuba (also ANT 387 ) Spring SA
This course will approach human encounters with disease and wellness in contemporary Cuba from the point of view of medical anthropology. It will be based on the notion that understanding how Cuba achieves its impressive public heath indicators requires the study of both policies from above and practices from below. A. Lopez-Denis

LAS 364 Modern Latin American Fiction in Translation (See SPA 346)
LAS 365 Roberto Bolaño: Adventures in Cultureland (See SPA 356)
LAS 366 Ancient Arts of Mexico (See ART 366)
LAS 367 Latin American Politics (See POL 367)
LAS 368 Borges and the Universal Library (See SPA 318)
LAS 371 Cuban History, Politics and Culture (also SPA 372) Fall SA
This seminar constitutes an introduction to the study of Cuba from a historical perspective. During the first half of the semester the course follows a chronological approach, covering the political and socioeconomic development of the country from the sixteenth century to the present. In the second half of the semester, it examines a series of sociocultural issues that are central to the life of contemporary Cubans, on the island and abroad. At the core of the class lies an interrogation of the relevance of the Cuban case for larger discussions on colonialism, modernity, socialism and development. A. Lopez-Denis

LAS 372 Public Health and Private Healing in the Atlantic World (also SPA 373 / GHP 372) Fall SA
This seminar explores the impact of transatlantic exchanges between Europe, Africa and the Americas on the development of the environmental, political and sociocultural trends that affect our health and our ability to heal today. During the first half of the semester we will reconstruct the interconnected histories of the medicalization of the West and the westernization of the Rest, from the Renaissance to the end of the twentieth century. In the second half of the semester we will explore the contemporary consequences of these historical developments. A. Lopez-Denis

LAS 375 Cuban Cinema and Literature under an Authoritarian Regime: 1960-2010 (also SPA 375) Fall LA
An overview of Cuban cinema since the beginnings of the national film industry - and the start of censorship - until the proliferation of today's independent and oppositional films. There will be a parallel discussion of literature during the same period, emphasizing individual attitudes ranging from rebellion to publishing abroad. We will discuss the self-representation of political power and the image of contemporary Cuba constructed in recent films. A. Ponte Mirabal

LAS 379 Religion, Gender, and Sexuality in Early Latin America (See REL 378)

LAS 380 Religious Experience, Expression, and Authority in Colonial Latin America (See REL 370)

LAS 394 Pre-Columbian Maya Art: Elite and Popular Discourses (See ART 394)

LAS 398 Comparative Studies in Spanish and Portuguese Literatures in Latin America (See SPA 399)

LAS 401 Latin American Studies Seminar (also SPA 412 / LAO 401) Not offered this year LA
The seminar will concentrate upon themes and topics in Latin American history, politics, society, literature, and/or culture. The focus will vary from year to year. Staff

LAS 402 Latin American Studies Seminar Not offered this year SA
The seminar will concentrate upon themes and topics in Latin American history, politics, society, literature, and/or culture. The focus will vary from year to year. Staff

LAS 403 Latin American Studies Seminar LA
The seminar will concentrate upon themes and topics in Latin American history, politics, society, literature, and/or culture. The focus will vary from year to year. Staff

LAS 404 Latin American Studies Seminar (also SPA 410 / POR 411) Not offered this year LA The seminar will concentrate upon themes and topics in Latin American history, politics, society, literature, and/or culture. The focus will vary from year to year. Staff
LAS 405 Latin American Studies Seminar
The seminar will concentrate upon themes and topics in Latin American history, politics, society, literature, and/or culture. The focus will vary from year to year. Staff

LAS 406 Latin American Studies Seminar
The seminar will concentrate upon themes and topics in Latin American history, politics, society, literature, and/or culture. The focus will vary from year to year. Staff

LAS 408 Selected Topics in 20th-Century Latin America (See HIS 408)
LAS 409 Writing and Urban Life (See POR 406)
LAS 415 Latin American Essays (See POR 405)
LAS 426 Modern Latin American Cinema (See SPA 427)
LAS 428 Topics in Hispanic Culture (Europe and America) (See SPA 401)
LAS 443 Global Exchange in Art and Architecture (See ART 443)
LAS 447 Shooting the Enemy in Non-Fiction Cinema (See POR 401)
LAS 448 Las Ciudades del Boom: Economic Growth, Urban Life and Architecture in the Latin American City (See ARC 448)
LAS 460 Theorizing the Archive in Latin American Art (See ART 460)
LAS 463 A Social and Multi-Dimensional Exploration of Structures (See CEE 463)
LAS 468 The Art and Politics of Ancient Maya Courts (See ART 468)
LAS 469 Maya Painting (See ART 469)
Program in Latino Studies

Director
Marta Tienda

Executive Committee
Anne Cheng, English, African American Studies
Jessica Delgado, Religion
Patricia Fernández-Kelly, Sociology
Marta Tienda, Woodrow Wilson School, Sociology
Ali A. Valenzuela, Politics

Associated Faculty
Jeremy I. Adelman, History
Vera S. Candiani, History
Miguel A. Centeno, Sociology, Woodrow Wilson School
Rubén Gallo, Spanish and Portuguese

Tod G. Hamilton, Sociology
Hendrik A. Hartog, History
Brian E. Herrera, Lewis Center for the Arts, Theater
Amaney A. Jamal, Politics
Christina H. Lee, Spanish and Portuguese
Rosina Lozano, History
Douglas S. Massey, Woodrow Wilson School, Sociology
Dan-El Padilla Peralta, Classics
Deborah J. Yashar, Woodrow Wilson School, Politics

Sits with Committee
Fernando Acosta-Rodríguez, Library

The Program in Latino Studies offers an interdisciplinary curriculum that traverses the arts, humanities, and social sciences which is designed to provide students with a broad understanding of the emergence, transformation, and consolidation of Latinos as a pan-ethnic group, and to appreciate the range of Hispanic imprints on American society and culture.

Courses that satisfy the program certificate are offered by the departments of anthropology, English, history, politics, sociology, and Spanish and Portuguese languages and cultures, as well as the Woodrow Wilson School of Public and International Affairs, the Center for African American Studies, the Program in American Studies and The Lewis Center for the Arts. Faculty affiliated with the program direct the study plans of students seeking a certificate in Latino studies, which is pursued in tandem with a disciplinary concentration.

Admission to the Program

Students from all departments are welcome to the program, but interested students are encouraged to complete the required gateway course, LAO 200 Latinos in American Life and Culture, by the end of their sophomore year.

Program of Study

In addition to the required gateway course, students must complete four courses outside their department of concentration that draw from both the social sciences and the arts and humanities. Of these, at least one should be a seminar (please consult with the program for the most current list of options), and one must emphasize comparative race relations. In order to qualify for the Latino studies certificate, a course must devote at least half of its content to the U.S. Hispanic population.

Students are also required to write a senior thesis on a topic relating to the Hispanic population of the United States. With the program director's approval, students majoring in one of the sciences, mathematics, or engineering whose
senior thesis does not deal with the Hispanic population of the United States may complete the program by submitting an original piece of research dealing with a topic relating to Latinos in the United States. This should be written under the supervision of a faculty member associated with the program.

An up-to-date list of courses fulfilling the seminar and comparative race relations requirements, as well as Latino studies-related courses in the social sciences, arts, and humanities, may be found on the program's website.

Certificate of Proficiency

Students who fulfill all program requirements will receive a certificate of proficiency in Latino studies upon graduation.

Courses

**LAO 200 Latinos in American Life and Culture (also SOC 341 / LAS 336)**  
Spring SA  
This required gateway course will consider how Latinos are transforming the United States even as they embrace a racialized pan-ethnic identity. Readings expose students to the demographic underpinnings of the dramatic growth and historically unprecedented geographic dispersal, the ethical dilemmas posed by undocumented immigration, the historical and contemporary trends in social, economic, and political participation, and the hybrid cultural imprints forged in musical, literary, and artistic work. Two lectures, one preceptorial. *Staff*

**LAO 210 Urban Sociology: The City and Social Change in the Americas (See SOC 210)**

**LAO 222 Introduction to Latin American Cultures (See SPA 222)**

**LAO 278 Histories and Themes in Mexican Religion (See REL 278)**

**LAO 306 Latino History (See HIS 306)**

**LAO 316 Special Topics in Poetry: Race, Identity and Innovation (See CWR 316)**

**LAO 327 Latino Global Cities (See SPA 327)**

**LAO 329 Immigrant America (See SOC 329)**

**LAO 333 Latino Politics in the U.S. (See POL 333)**

**LAO 354 We Out Here: An Introduction to Latino Literature (See ENG 354)**

**LAO 401 Latin American Studies Seminar (See LAS 401)**

**LAO 465 Latino Urban History (See HIS 465)**
Lewis Center for the Arts

Chair
Michael W. Cadden

Professor
Jill S. Dolan, also English, Theater
Jeffrey K. Eugenides, also Creative Writing
Su Friedrich, also Visual Arts
Judith Hamera, also Dance
Jhumpa Lahiri, also Creative Writing
Susan Marshall, also Dance
Paul B. Muldoon, also Creative Writing
James Richardson, also Creative Writing
Joseph S. Scanlan, also Visual Arts
Tracy K. Smith, also Creative Writing
Susan Wheeler, also Creative Writing
Jeffrey Whetstone, also Visual Arts
Edmund V. White, also Creative Writing
Stacy E. Wolf, also Theater

Assistant Professor
Brian E. Herrera, also Theater
Deana Lawson, also Visual Arts
Kirstin Valdez Quade, also Creative Writing

Senior Lecturer
Michael W. Cadden, also Theater
Jane F. Cox, also Theater
Rebecca J. Lazier, also Dance

Lecturer with Rank of Professor
Joyce Carol Oates, Creative Writing
James Welling, Visual Arts

Visiting Lecturer with Rank of Professor
John M. Doyle, Theater

Lecturer
Suzanne Agins, Theater
Elena Araoz, Theater
Eve M. Aschheim, Visual Arts
Fia Backstrom, Visual Arts
Michael C. Dickman, Creative Writing
Tina Fehlandt, Dance
Martha Friedman, Visual Arts
A.M. Homes, Creative Writing
Shawn Jaeger
Christina Lazaridi, Creative Writing
Pamela Lins, Visual Arts
Afia Nathaniel
David Reinfurt, Visual Arts
Rebekah Rutkoff
Robert N. Sandberg, Theater
Aynsley Vandenbroucke, Dance Pacho Velez
Monica Youn, Creative Writing Pavel Zustiak

Visiting Lecturer
Fintan O'Toole, Theater

Hodder Fellow
NoViolet Bulawayo, Creative Writing
Jenny Johnson, Creative Writing
Jiehae Park, Theater
Joshua Sanchez, Visual Arts
Karen Sherman, Dance

The Lewis Center for the Arts is an academic unit made up of the programs in creative writing, dance, theater, music theater, and visual arts, as well as the Princeton Atelier. It is designed to embrace the arts as an essential part of the Princeton educational experience. Lewis Center courses are offered with the conviction that exposure to the arts,
particularly to the experience of making art, helps each of us make sense of our lives and the lives of our neighbors. Lewis Center students, whether pursuing a certificate in one of its programs or simply trying something artistic for the first time, come from every concentration the University has to offer. Students who are first and foremost interested in fields as wide ranging as choreography, costume design, sculpture, screen writing, printmaking, photography, film, performance art, painting, poetry, or fiction writing, or indeed any aspect of the creative or performing arts, will discover that Princeton's faculty and facilities are second to none. Students concentrating in molecular biology or mechanical engineering, chemistry or physics, mathematics or neuroscience will find that each of these subjects has a natural connection to the making of art. The Lewis Center provides a home for those who know they want lives in the arts and for those who want to learn something about how and why artists do what they do.

**Academic Opportunities in the Creative and Performing Arts**

*Certificate Programs.* The certificate programs in creative writing, dance, theater, music theater, and visual arts are offered under the auspices of the Lewis Center for the Arts, while the certificate Program in Musical Performance is offered under the auspices of the Department of Music. For information about each of these programs of study and the courses they offer, please refer to their separate entries in this catalog.

*Academic Concentrations Involving Creative Work.* Various academic departments offer special opportunities and tracks that involve creative work. The Department of English offers tracks in creative writing, theater and performance studies, and arts and media. The Department of Art and Archaeology offers a concentration in the history of art and studio arts (Program 2). The Department of Comparative Literature offers a track in literary study and the creative arts. For more information about these opportunities, please refer to the specific department entries in this catalog.

*University Scholar Program.* Finally, the University Scholar Program is designed for "a small group of students with outstanding and demonstrated talent in an academic or creative area that requires a substantial commitment of time and that cannot be pursued within the regular curriculum," such as artists who are already balancing the demands of a professional career with their educational requirements.

**Visiting Artists and Fellows**

The [Lewis Center for the Arts](https://www.princeton.edu/) is the home of two fellowship programs designed to bring emerging artists to Princeton. Hodder Fellowships invite artists in the early stages of their careers to campus to spend an academic year of "studious leisure" working on independent projects. Princeton Arts Fellowships bring artists with extraordinary potential and a significant record of achievement to spend two years at Princeton, to create new work, to teach classes and to collaborate with students on other artistic endeavors.

**Princeton Atelier**

The [Princeton Atelier](https://www.princeton.edu/) is a unique program that brings together professional artists from different disciplines to collaborate on new work. A painter might team with a composer, a choreographer might join with an electrical engineer, a company of theater artists might engage with environmental scientists, or a poet might connect with a pianist. How do artists who work in different media create art together? How do their different practices, experiences, methods, and assumptions influence each other's art making? Each Atelier finds entirely new answers to these questions. Each collaboration involves Princeton students as witnesses to the creative process, as participants in the new work and, most importantly, as developing artists in their own rights.
Unlike studio courses in other programs, Atelier courses are one-time events built around the visiting artists' newest work and current preoccupations. As the artists negotiate their collaborative partnership, they share their expertise and experience with students. Atelier courses typically include reading assignments and creative projects; the day-to-day activities usually include both discussion and "action." Although Ateliers are process oriented, they almost always culminate in a work-in-progress reading, showing, exhibition, or performance of some kind.

Princeton Atelier courses are open to all students but admission is determined by application, audition, or portfolio review. At least two Atelier courses are offered each fall and spring, and each Atelier course is cross-listed with another program or department. Please see each semester s course listings at the Lewis Center website.

| Courses |
|------------------|------------------|
| **ATL 494 Princeton Atelier (also THR 494)** | Spring LA |
| - Staff |
| **ATL 495 Princeton Atelier** | Not offered this year LA |
| - Staff |
| **ATL 496 Princeton Atelier (also ENV 496)** | Not offered this year LA |
| - Staff |
| **ATL 497 Princeton Atelier (also DAN 497 / VIS 497)** | Fall LA |
| - Staff |
| **ATL 498 Princeton Atelier (also THR 498 / VIS 498)** | Fall LA |
| - Staff |
| **ATL 499 Princeton Atelier** | Spring LA |
| - Staff |
Lewis-Sigler Institute for Integrative Genomics

**Director**
Michael S. Levine

**Associate Director**
Ned S. Wingreen

**Faculty**
Peter Andolfatto, also Ecology and Evolutionary Biology
Julien F. Ayroles, also Ecology and Evolutionary Biology
William Bialek, also Physics
Thomas Gregor, also Physics
Michael S. Levine, also Molecular Biology
Coleen T. Murphy, also Molecular Biology
Joshua D. Rabinowitz, also Chemistry
Joshua W. Shaevitz, also Physics
Stanislav Y. Shvartsman, also Chemical and Biological Engineering
Mona Singh, also Computer Science
John D. Storey, Lewis-Sigler Institute for Integrative Genomics

**Associated Faculty**
Clifford P. Brangwynne, Chemical and Biological Engineering
Curtis G. Callan Jr., Physics
Ileana M. Cristea, Molecular Biology
Barbara Engelhardt, Computer Science
Tom Muir, Chemistry
Howard A. Stone, Mechanical and Aerospace Engineering

**Lewis-Sigler Fellow**
Amanda A. Amodeo
Anastasia Baryshnikova
Benjamin B. Machta
Quan Wang

The Lewis-Sigler Institute for Integrative Genomics was established with a mandate to develop novel approaches to the study of biology in a post-genome-sequence era. The institute comprises a multidisciplinary group of scientists and students working at the interface of biology and the more quantitative sciences and computation. This is meant to include, among others, the fields of genomics, biophysics, computational neurobiology, systems biology, population biology and quantitative genetics, molecular evolution, computational biology, and microbial interactions. Unlike other genomics institutes, the Lewis-Sigler Institute does not focus on generating large amounts of sequence data. Rather, the focus is to extract from these enormous amounts of data an understanding of how biological systems organize and integrate complex processes.

The institute consists of 12 to 15 research groups. All tenured and tenure-track faculty in the institute have appointments in one of the University's departments; among them are molecular biology, ecology and evolutionary biology, physics, chemistry, computer science, chemical and biological engineering, and potentially others.

The institute's mandate includes innovation in teaching, specifically the teaching of biology integrated fully with the more quantitative sciences, mathematics, and computation. Education is carried out formally through the undergraduate certificate and graduate program in Quantitative and Computational Biology (QCB).

In sum, the Lewis-Sigler Institute is a hub of intellectual activity for quantitatively oriented biologists at every level: undergraduate, graduate, and faculty.
Program in Linguistics

Director
Sarah-Jane Leslie

Executive Committee
Byron T. Ahn, Council of the Humanities, Linguistics
Delia Graff Fara, Philosophy
Denis Feeney, Classics
Laura Kalin, Council of the Humanities, Linguistics
Joshua T. Katz, Classics

Sarah-Jane Leslie, Philosophy
Gideon A. Rosen, Philosophy

Associated Faculty
David M. Bellos, French and Italian, Comparative Literature
Adele E. Goldberg, Psychology
Gilbert H. Harman, Philosophy
Daniel Heller-Roazen, Comparative Literature Casey Lew-Williams, Psychology
Edwin S. Williams, Council of the Humanities

Linguistics is the study of the distinctive properties of human language and the cognitive capacities of language users, including the rules that govern the patterns of particular languages and universal principles governing all languages. Linguists investigate the grammatical principles and processes that determine the structure of human languages, their evolution over time, and their psychological underpinnings. The basic areas of study include phonology (the study of the sound patterns of language), morphology (the study of the structure and meaning of words), syntax (the study of the structure of sentences), and semantics (the study of linguistic meaning). In addition to these basic areas, the Program in Linguistics offers courses in historical linguistics, language universals, language acquisition, and psycholinguistics. An understanding of these properties of human language provides a valuable analytic framework for students of language and literature, anthropology, computer science, philosophy, and psychology.

Students with a particular interest in language and linguistics can pursue a certificate in linguistics. Participants satisfy the requirements of their chosen departmental major and develop a complementary course of study in linguistics as outlined below. Students may also apply to the University to be an Independent Concentrator in Linguistics.

Admission to the Program

The program is open to undergraduates majoring in any department. Students should meet with the program director, usually during the sophomore year, to apply to the program and plan a course of study. Applicants will be accepted on the basis of interest and a coherent academic plan.

Program of Study

The program of study will be approved by the program director. It will include completion of the following requirements:
1. Satisfactory completion of LIN 201/ENG 213, Introduction to Language and Linguistics. Permission may be granted by the Director to substitute a different LIN course in place of 201; decisions will be made on a case-by-case basis.

2. Satisfactory completion of four additional courses from the list of linguistics courses and related courses available on the Program in Linguistics website. These four courses must include at least three courses bearing the LIN designation, or cross-listed with LIN. The program director may approve additional courses on an individual basis.

3. Senior independent work. Ideally some aspect of linguistics will be incorporated into the senior thesis. Other arrangements can be made if this is not practical.

Certificate of Proficiency

A student who fulfills the requirements of the program with satisfactory standing receives a certificate of proficiency in linguistics upon graduation.

Other Linguistics and Related Courses. Linguistics related courses in other departments and programs may be counted toward certificate completion with the approval of the program director.

Courses

LIN 201 Introduction to Language and Linguistics (also ENG 241 / CGS 205) Fall/Spring EC

An introduction to the scientific analysis of the structure and uses of language. Core areas covered include phonetics and phonology, morphology, the lexicon, syntax, semantics and pragmatics, with data from a wide range of languages. Topics include the biological basis of language, language and cognition, the neurology of language and language disorders, and first and second language acquisition. C. Fellbaum

LIN 208 Origins and Nature of English Vocabulary (See CLA 208)

LIN 209 Introduction to the History of the Russian Language (See RUS 209)

LIN 212 Human Language: A User's Guide Not offered this year EC

Where does language come from? How do we know that you can't say it that way? And who has the authority to tell you? Why are some sentences better than others? Why do the same words differently organized have different effects? This course is about human language, its nature, use, users, and origin, based primarily on English. Major topics include the structure of sentences, paragraphs, words; language and thought; and the historical and biological origins of language. Two 90-minute classes. Staff

LIN 216 Language, Mind, and Brain (also PSY 216) Not offered this year EC

This course examines the complex mental and neurological processes that underlie linguistic knowledge and behavior. It will be concerned with the precise description and measurement of language activity, with its governing principles, and with available indices for the associated neural computations and their location in the brain. Seminar. Staff
LIN 220 Language at Princeton Spring LA
An introduction to linguistic analysis, with an emphasis on hands-on work. Making use of as many different sorts of resources as possible -- animate, inanimate; written, spoken; town, gown -- we will try as a group to understand the history and current state of language at Princeton University and in Princeton, NJ just outside the "Orange Bubble." What languages and what modes of communication have and have not been used here? When? Why? How? By whom? We will discover the answers by exploring archives, conducting interviews, and generally engaging in original and creative research. *J. Katz*

LIN 250 Language in Its Contexts Fall SA
This course investigates language in its social, cultural, political, and historical contexts. Does your native language influence your perception, your behavior, and your culture? How does your identity influence properties of your language? What happens when unrelated languages come into contact for prolonged periods? How are new languages born? Why isn't English the official language of the United States, and should it be? We will explore these questions (and more) by engaging with the often contradictory opinions of specialists and the public, as well as with the empirical realities behind these different language situations. *Staff*

LIN 301 Phonetics and Phonology Spring EC
The analysis of sound patterns of human languages. Examination of articulatory phonetics as incorporated into a system of phonological rules accounting for these patterns. Survey of basic concepts and relations including levels of representation (phonetic versus phonemic), types and ordering of rules, and phonological change. Three classes. Prerequisite: 201 or instructor *Staff*

LIN 302 Syntax Fall EC
Methods of syntactic analysis of natural language (primarily English, with brief consideration of other languages). Foundations of a theory of generative grammar, covering phrase structure, transformations, and conditions on rules and representations. The general principles of syntactic structure that determine the form and interpretation of sentences are a major focus. Two 90-minute classes. Prerequisite: 201 or instructor's permission. *R. Freidin*

LIN 303 Linguistic Semantics Spring EC
The central issues and leading theories of linguistic semantics for natural languages. Analyses of specific linguistic phenomena will be used to illustrate the interaction of syntax and semantics, the relation between language and the world, and the role of linguistic meaning in communication and understanding. Prerequisite: 201 or instructor's permission. *E. Williams*

LIN 304 Introduction to Machine Translation (See TRA 301)

LIN 306 The Structure and Meaning of Words Not offered this year EC
The structure of words and the overall lexicon for human languages. Topics include word formation rules; the relation between syntax and the lexicon; the psychology of the lexicon, especially word storage and access; the semantics of complex words; the phonology of word formation; lexical redundancy and the learning of the lexicon. Two 90-minute classes. Prerequisite: 201 or instructor's permission. *E. Williams*

LIN 308 Bilingualism (also TRA 303) Spring EC
Covers the linguistic, psycholinguistic, neurolinguistic, and sociolinguistic aspects of bilingualism. Topics include: language acquisition in mono- and bilingual children; the "critical age" for first and second language acquisition;
definitions and measurements of bilingualism; effects of bilingualism on other cognitive domains; neurolinguistic evidence comparing language processing in mono- and bilingual individuals; and the origins and circumstances of bilingualism and language death. Also addresses the contrasting societal and governmental attitudes towards multilingualism in countries like India and the U.S. Two 90-minute lectures. *C. Fellbaum*

**LIN 309 Psychology of Language (See PSY 309)**

**LIN 310 Melodies of English (and Other Languages) Fall EC**
Methods of exploration and analysis of English melodic patterns, addressing questions such as: How do you pronounce a question differently from a statement? How do you pronounce a comma? Students learn how to analyze prosodic data (intonation, phrasing, and prominence) using computer software and standard annotation conventions, leading to student-run research. Comparisons of the English intonational system to systems of other languages of the world. *Staff*

**LIN 314 Linguistics and Language Acquisition (also PSY 302 ) Not offered this year EC** What does it mean to know a language? Is it something we learn or something the brain "grows?" What aspects of language are innate? Is parents' speech important in language learning? An examination of the properties of child language through the lens of current linguistic theory. Two 90-minute classes. *A. Goldberg*

**LIN 316 Second Language Acquisition: Theory and Praxis (See GER 316)**

**LIN 336 Introduction to Indo-European (See CLA 336)**

**LIN 346 Introduction to Formal Semantics (See PHI 346)**

**LIN 355 Field Methods in Linguistics Spring SA**
In this course, students learn both the logistical components of doing field research as well as tools for conducting effective elicitations with native speakers, including background in linguistic typology and methods for elicitation. To develop these skills, approximately half of this course will be dedicated to linguistic elicitation with a native speaker of the language chosen for the semester. This course is designed to be beneficial to students interested in pursuing both documentary/descriptive linguistic work as well as those interested in incorporating linguistic data into research in theoretical linguistics. *K. Jerro*

**LIN 360 Linguistic Universals and Language Diversity Fall EC**
Linguistic theory accounts for what the grammars of all human languages share in common (linguistic universals) and the ways they differ (language diversity). The universality and diversity of syntactic subject, topic, voice, case, word order, and of constructions involving causatives, nonfinite verbal categories, relative clauses, and impersonal sentences. Two 90-minute classes. *Staff*

**LIN 408 Situated Language Usage: Conversations, Dialogues, and Other Goal-Based Communications (also PSY 408 / CGS 408 ) Fall EC**
From ordering a cup of tea from a barista to exchanging abstract ideas with coursemates, human interactions are frequently goal-based and collaborative. To achieve shared goals, people exchange information and coordinate joint
action using some form of spoken, gestured, or written language. In this course we will cover our current understanding of how people use and learn to use language in situated interactions and how this sheds light on our language abilities and language's relationship to general cognition. We will cover topics that range from speech production and comprehension, word usage, pragmatic inference, and learning. *Staff*

**LIN 412 Advanced Syntax**  
Not offered this year EC  
Development of a modular theory of grammar involving subtheories of case, government, predicate/argument structure, and binding. Investigation of parametric variation across languages for principles of grammar. Two 90-minute classes. *E. Williams*

**LIN 445 Introduction to Sanskrit (See CLA 445)**

**LIN 475 Introduction to Sanskrit (See CLA 475)**

**LIN 476 Introduction to Sanskrit II (See CLA 476)**
Program in Materials Science and Engineering

Director
Claire F. Gmachl, Electrical Engineering

Executive Committee
Claire F. Gmachl, Electrical Engineering
Bruce E. Koel, Chemical and Biological Engineering
Alejandro W. Rodriguez, Electrical Engineering
James C. Sturm, Electrical Engineering

Sits with Committee
Nan Yao, Princeton Institute for the Science and Technology of Materials

The certificate Program in Materials Science and Engineering is offered by the Princeton Institute for the Science and Technology of Materials (PRISM) and its eight affiliated departments. The program emphasizes the multidisciplinary nature of the study of materials and the engineering application of their properties. The program is designed primarily for students in science and engineering departments who are considering careers in materials, although students from other disciplines may join with appropriate background. Participants in the program will take courses in their own department together with a group of materials courses chosen from a selected list offered by the participating departments. Satisfactory completion of the program is recognized by the award of a certificate in materials science and engineering upon graduation.

Admission to the Program

Admission to the program normally occurs during the sophomore or junior years. Students are expected to have satisfactorily completed a freshman year program that would permit them to enter one of the participating departments. Departments that are currently participating in the certificate program are: chemical and biological engineering, chemistry, civil and environmental engineering, electrical engineering, geosciences, mechanical and aerospace engineering, molecular biology, and physics, although students from other departments can be admitted into the program. Application for admission can be obtained from the undergraduate coordinator. Upon acceptance into the program, the director of undergraduate studies assists students in planning a program of study and research that emphasizes the multidisciplinary nature of the materials arena.

Program of Study

Participants in the program will satisfy the degree requirements for their department as well as the course and independent work requirements for the program. A coherent course of study will be developed in conjunction with the program adviser and the departmental representative and will include materials courses outside the student's department. The program will be designed to expand the student's knowledge of topics essential for the understanding of materials beyond that normally encountered in a single department. In some cases, courses meeting the program requirements will also satisfy the regular requirements of the student's department. Specific program requirements are listed below.

Program Requirements

All program students must:
1. Take one year of general physics (PHY 103, 104, or 105, 106), one term of general chemistry with laboratory (CHM 201, 202, or 207), one year of mathematics, and a course in thermodynamics, such as CBE 246, ELE 342, MAE 221, CHM 306, or PHY 301. In addition, a course in quantum mechanics is recommended.

2. Take one core course in materials (selected from the following options: MSE 301, CEE 364, and MSE 324) and a course in experimental methods: MSE 302 or CHM 371.

3. Take three additional approved courses at or above the 300 level in at least two different areas from the program list.

4. Write a two-semester senior thesis on a materials topic approved by the program committee.

To remain a member of the program in good standing, and to be awarded the program certificate upon graduation, students must achieve a minimum grade average of B- in program courses. Program courses may not be taken on a pass/D/fail basis.

Courses

MSE 287 Materials for Energy Technologies and Efficiency (See ENE 267)

MSE 301 Materials Science and Engineering Spring
An introduction to the structure and properties of important current and future materials, including metals, semiconductors, and polymers from an atomic and molecular perspective. Emphasis will be placed on the phase behavior and processing of materials, and on how structures in these materials impact their macroscopic physical, electrical, and thermal properties. Three lectures. L. Loo

MSE 302 Laboratory Techniques in Materials Science and Engineering Fall STL
Laboratory techniques and structure property relationships in materials. The course includes lectures on the fundamentals and modern applications of materials science, from electrical and mechanical properties to electron microscopy, nanotechnology, polymers, and biomaterials. Corresponding laboratory sessions introduce students to techniques for modification of structure, properties, and function at different length scales. Critical practice in scientific writing, oral presentation, and literature analysis will be featured. Prerequisite: 301 or equivalent. Two 90-minute lectures, one laboratory. J. Sturm, R. Priestley, N. Yao

MSE 324 Structure and Properties of Materials (See MAE 324)

MSE 440 Advanced Mineralogy (See GEO 440)

MSE 455 Mid-Infrared Technologies for Health and the Environment (See ELE 455)
Department of Mathematics

Chair
David Gabai

Associate Chair
János Kollár

Acting Associate Chair
Christopher M. Skinner (fall)

Departmental Representative
Christopher Skinner (fall)
Christine Taylor (fall)
János Kollár (spring)
Jennifer M. Johnson (spring)

Director of Graduate Studies
Javier Gómez Serrano
Peter Ozsváth

Professor
Michael Aizenman, also Physics
Manjul Bhargava
Sun-Yung Alice Chang
Maria Chudnovsky, also Applied and Computational Mathematics
Fernando Codá Marques
Peter Constantin, also Applied and Computational Mathematics

Mihalis C. Dafermos
Weinan E, also Applied and Computational Mathematics
Charles L. Fefferman
David Gabai
Robert C. Gunning
Alexandru D. Ionescu
Nicholas M. Katz
Sergiu Klainerman
János Kollár
Elliott H. Lieb, also Physics
John N. Mather
Sophie Morel
Assaf Naor
Peter S. Ozsváth
John V. Pardon
Igor Y. Rodnianski
Peter C. Sarnak
Paul D. Seymour, also Applied Computational Mathematics

Yakov G. Sinai
Amit Singer, also Applied Computational Mathematics
Christopher M. Skinner,

Allen M. Sly
Zoltán Szabó Gang Tian Paul C. Yang
Shou-Wu Zhang

Visiting Professor
András I. Stipsicz

Associate Professor
Zeev Dvir, also Computer Science

Visiting Associate Professor
Jake P. Solomon
Susan L. Schmoyer

Assistant Professor
Stefanos Aretakis
Javier Gómez Serrano
Adam S. Levine
Adam W. Marcus, also Applied and Computational Mathematics
Fabio G. Pusateri
Tetiana Shcherbyna
Nicholas J. Sheridan
Vlad Vicol

Instructor
Nicolas A.S. Boumal
Otis Chodosh
Lucas Culler
Hansheng Diao
Tarek Elgindi
Ziyang Gao
Mihaela Ignatova
Ilya Khayutin
Francesco Lin
Chun-Hung Liu
Ana Menezes
Evita Nestoridi
Florian Sprung
Konstantin Tikhomirov
Xiaoheng Wang

Senior Lecturer
Jonathan Fickenscher
Jennifer M. Johnson
Mark W. McConnell

Associated Faculty
John P. Burgess, Philosophy
René A. Carmona, ORFE
Bernard Chazelle, Computer Science
Information and Departmental Plan of Study

Most freshmen and sophomores interested in science, engineering, or finance take courses from the standard calculus and linear algebra sequence 103-104-201-202, which emphasizes concrete computations over more theoretical considerations. Note that 201 and 202 can be taken in either order.

Students who are not prepared to begin with 103 may take 100, a rigorous precalculus/prestatistics refresher offered only in the fall semester and intended for students whose highest math SAT score is below 650.

Prospective economics majors can minimally fulfill their mathematics prerequisites with (100)-103-175. Note that 175 covers selected topics from 201, with biology and economics applications in mind. Prospective math-track economics/finance majors will need the standard sequence 103-104-201-202 instead of 175.

More mathematically inclined students, especially prospective physics majors, may opt to replace 201-202 with 203-204, for greater emphasis on theory and more challenging computational problems.

Prospective mathematics majors must take at least one course introducing formal mathematical argument and rigorous proofs. The recommended freshman sequence for prospective majors is 215-217. Prospective majors who already have substantial experience with university-level proof-based analysis courses may consider the accelerated sequence 216-218 instead. Other possible sequences for prospective majors include 214-204-203 and 203-204-215, although the latter two are relatively rare. Note that 203 and 204 can be taken in either order.

Placement. Students with little or no background in calculus are placed in 103, or in 100 if their SAT mathematics scores indicate insufficient background in precalculus topics. To qualify for placement in 104 or 175, a student should score 5 on the AB Advanced Placement Examination or a 4 on the BC Advanced Placement Examination. To qualify for placement into 201 or 202, a student should have a score of 5 on the BC Examination. Students who possess in addition a particularly strong interest in mathematics as well as a SAT mathematics score of at least 750 may opt for 203 or 214 or 215 or 216 instead. For more detailed placement information, consult the Department of Mathematics home page or placement officer.

Advanced Placement

One unit of advanced placement credit is granted when a student is placed in MAT 104 or 175. Two units of advanced placement credit are granted when a student is placed in MAT 201, 203, or 217.

Prerequisites

Generally, either 215-217 or 216-218 or 203-204-215 are strongly recommended for admission to the department. Prospective mathematics majors should consult the department early and plan a program that includes as much of the
215-217 or 216-218 sequence as possible. Most majors begin taking courses at the 300-level by the second semester of the sophomore year, in preparation for their junior independent work.

Further information for prospective majors is available on the department home page.

**Program of Study**

Students must complete four core requirements:

- one course in real analysis (e.g. 320 or 325 or 425 or 385)
- one course in complex analysis (e.g. 330 or 335)
- one course in algebra (e.g. 340 or 345)
- one course in geometry or topology (e.g. 350 or 355 or 365 or 560)

It is recommended that students complete some of these core requirements by the end of the sophomore year. Completing these core courses early gives more options for junior and senior independent work.

Note: One course in discrete mathematics (e.g. 375, 377 or 378) can replace the geometry/topology core requirement, if desired.

**In addition to the four core requirements**, students must complete an additional four courses at the 300 level or higher, up to three of which may be cognate courses outside the mathematics department, with permission from the junior or senior advisers or departmental representative.

The departmental grade (the average grade of the eight departmental courses) together with grades and reports on independent work is the basis on which honors and prizes are awarded on graduation.

Students should refer to Course Offerings to check which courses are offered in a given term. Programs of study in various fields of pure mathematics and applied mathematics are available. Appropriate plans of study may be arranged for students interested in numerical analysis, discrete mathematics, optimization, physics, the biological sciences, probability and statistics, finance, economics, or computer science. For students interested in these areas, a coherent program containing up to three courses in a cognate field may be approved.

**Independent Work**

All departmental students engage in independent work, supervised by a member of the department chosen in consultation with a departmental adviser. The independent work of the junior year generally consists of participating actively in a junior seminar in both the fall and the spring semesters. Alternatively, a student may opt to replace one junior seminar with supervised reading in a special subject and then writing a paper based on that reading. The independent work in the senior year centers on writing a senior thesis. A substantial percentage of our majors work with faculty in other departments on their senior project.

**Senior Departmental Examination**

Each senior takes an oral examination based on the senior thesis and the broader subfield to which it contributes. A departmental committee conducts the examination in May.
Courses

MAT 100 Precalculus/Prestatistics  Fall QR
An intensive and rigorous treatment of algebra and trigonometry as preparation for further courses in calculus or statistics. Topics include functions and their graphs, equations involving polynomial and rational functions, exponentials, logarithms and trigonometry. .J. Johnson

MAT 102 Survey of Calculus  Not offered this year QR
One semester survey of the major concepts and computational techniques of calculus including limits, derivatives and integrals. Emphasis on basic examples and applications of calculus including approximation, differential equations, rates of change and error estimation for students who will take no further calculus. Prerequisites: MAT100 or equivalent. Restrictions: Cannot receive course credit for both MAT103 and MAT102. Provides adequate preparation for MAT175. Three classes. Staff

MAT 103 Calculus I  Fall/Spring QR
First semester of calculus. Topics include limits, continuity, the derivative, basic differentiation formulas and applications (curve-sketching, optimization, related rates), definite and indefinite integrals, the fundamental theorem of calculus. The fall offering will emphasize applications to physics and engineering in preparation for MAT104; the spring offering will emphasize applications to economics and life sciences, in preparation for MAT175. Prerequisite: MAT100 or equivalent. Three classes. Staff

MAT 104 Calculus II  Fall/Spring QR
Continuation of MAT103. Topics include techniques of integration, arclength, area, volume, convergence of series and improper integrals, L'Hopital's rule, power series and Taylor's theorem, introduction to differential equations and complex numbers. Prerequisite: MAT103 or equivalent. Three classes. Staff

MAT 175 Mathematics for Economics/Life Sciences  Fall/Spring QR
Survey of topics from multivariable calculus as preparation for future course work in economics or life sciences. Topics include basic techniques of integration, average value, vectors, partial derivatives, gradient, optimization of multivariable functions, and constrained optimization with Lagrange multipliers. Students preparing for math track econometrics and finance courses need MAT201/202 instead. Students who complete 175 can continue in 202 if they wish. Staff

MAT 191 An Integrated Introduction to Engineering, Mathematics, Physics (See EGR 191)  MAT 192 An Integrated Introduction to Engineering, Mathematics, Physics (See EGR 192)

MAT 199 Math Alive (See APC 199)

MAT 201 Multivariable Calculus  Fall/Spring QR
Vectors in the plane and in space, vector functions and motion, surfaces, coordinate systems, functions of two or three variables and their derivatives, maxima and minima and applications, double and triple integrals, vector fields, and Stokes's theorem. Prerequisite: 104 or equivalent. Three classes. Staff

MAT 202 Linear Algebra with Applications  Fall/Spring QR
Companion course to MAT201. Matrices, linear transformations, linear independence and dimension, bases and coordinates, determinants, orthogonal projection, least squares, eigenvectors and their applications to quadratic forms and dynamical systems. Three classes. Staff

MAT 203 Advanced Vector Calculus Fall QR
Vector spaces, limits, derivatives of vector-valued functions, Taylor's formula, Lagrange multipliers, double and triple integrals, change of coordinates, surface and line integrals, generalizations of the fundamental theorem of calculus to higher dimensions. More abstract than 201 but more concrete than 218. Recommended for prospective physics majors and others with a strong interest in applied mathematics. Prerequisite: MAT104 or MAT215 or equivalent. Three classes. Staff

MAT 204 Advanced Linear Algebra with Applications Spring QR
Companion course to MAT203. Linear systems of equations, linear independence and dimension, linear transforms, determinants, (real and complex) eigenvectors and eigenvalues, orthogonality, spectral theorem, singular value decomposition, Jordan forms, other topics as time permits. More abstract than MAT202 but more concrete than MAT217. Recommended for prospective physics majors and others with a strong interest in applied mathematics. Prerequisite: MAT104 or MAT215 or equivalent. Three classes.

MAT 214 Numbers, Equations, and Proofs Fall QR
An introduction to classical number theory to prepare for higher-level courses in the department. Topics include Pythagorean triples and sums of squares, unique factorization, Chinese remainder theorem, arithmetic of Gaussian integers, finite fields and cryptography, arithmetic functions, and quadratic reciprocity. There will be a topic from more advanced or more applied number theory such as p-adic numbers, cryptography, and Fermat's Last Theorem. This course is suitable both for students preparing to enter the mathematics department and for non-majors interested in exposure to higher mathematics. Z.

MAT 215 Honors Analysis (Single Variable) Fall/Spring QR
An introduction to the mathematical discipline of analysis, to prepare for higher-level course work in the department. Topics include the rigorous epsilon-delta treatment of limits, convergence, and uniform convergence of sequences and series. Continuity, uniform continuity, and differentiability of functions. The Heine-Borel theorem, the Riemann integral, conditions for integrability of functions and term by term differentiation and integration of series of functions, Taylor's theorem. M. McConnell, A. Naor

MAT 217 Honors Linear Algebra Spring QR
A rigorous course in linear algebra with an emphasis on proof rather than applications. Topics include vector spaces, linear transformations, inner product spaces, determinants, eigenvalues, the Cayley-Hamilton theorem, Jordan form, the spectral theorem for normal transformations, bilinear and quadratic forms. Staff

MAT 218 Accelerated Honors Analysis II Spring QR
Continuation of MAT216, Accelerated Analysis I from the fall. A rigorous course in analysis with an emphasis on proof rather than applications. Topics include metric spaces, completeness, compactness, total derivatives, partial
derivatives, inverse function theorem, implicit function theorem, Riemann integrals in several variables, Fubini.
See the department website for details: http://www.math.princeton.edu, R. Gunning

MAT 305 Mathematical Logic Not offered this year QR
A development of logic from the mathematical viewpoint, including propositional and predicate calculus,
consequence and deduction, truth and satisfaction, the Goedel completeness and incompleteness theorems.
Applications to model theory, recursion theory, and set theory as time permits. Some underclass background in logic
or in mathematics is recommended. Staff

MAT 306 Advanced Logic (See PHI 323)

MAT 320 Introduction to Real Analysis Fall QR
Introduction to real analysis, including the theory of Lebesgue measure and integration on the line and ndimensional
space and the theory of Fourier series. Prerequisite: MAT201 and MAT202 or equivalent. T. Elgindi

MAT 323 Topics in Mathematical Modeling (also APC 323) Not offered this year QR
Draws problems from the sciences & engineering for which mathematical models have been developed and
analyzed to describe, understand and predict natural and man-made phenomena. Emphasizes model building
strategies, analytical and computational methods, and how scientific problems motivate new mathematics. This
interdisciplinary course in collaboration with Molecular Biology, Psychology and the Program in Neuroscience is
directed toward upper class undergraduate students and first-year graduate students with knowledge of linear
algebra and differential equations. Staff

MAT 325 Analysis I: Fourier Series and Partial Differential Equations Spring QR
Basic facts about Fourier Series, Fourier Transformations, and applications to the classical partial differential
equations will be covered. Also Fast Fourier Transforms, Finite Fourier Series, Dirichlet Characters, and applications
to properties of primes. Prerequisites: 215, 218, or permission of instructor.
Staff

MAT 330 Complex Analysis with Applications Spring QR
The theory of functions of one complex variable, covering power series expansions, residues, contour integration,
and conformal mapping. Although the theory will be given adequate treatment, the emphasis of this course is the
use of complex analysis as a tool for solving problems. Prerequisite: MAT201 and MAT202 or equivalent. Staff

MAT 335 Analysis II: Complex Analysis Fall QR
Study of functions of a complex variable, with emphasis on interrelations with other parts of mathematics. Cauchy's
theorems, singularities, contour integration, power series, infinite products. The gamma and zeta functions and the
prime number theorem. Elliptic functions, theta functions, Jacobi's triple product and combinatorics. An overall view
of Special Functions via the hypergeometric series. This course is the second semester of a four-semester sequence,
but may be taken independently of the other semesters. A. Ionescu

480
MAT 345 Algebra I  Fall QR
This course will cover the basics of symmetry and group theory, with applications. Topics include the fundamental theorem of finitely generated abelian groups, Sylow theorems, group actions, and the representation theory of finite groups. Prerequisites: MAT204 or 217. X. Wang

MAT 346 Algebra II  Spring QR
Continuation of MAT345. Further develop knowledge of algebraic structures by exploring examples that connect to higher mathematics. There will be opportunities for a student to explore an advanced topic in great depth, possibly for a junior project. Staff

MAT 355 Introduction to Differential Geometry  Spring QR
Introduction to geometry of surfaces. Surfaces in Euclidean space, second fundamental form, minimal surfaces, geodesics, Gauss curvature, Gauss-Gonnet formula, uniformization of surfaces, elementary notions of contact geometry. Prerequisite: MAT218 or 350 or equivalent. Staff

MAT 365 Topology  Fall QR
Introduction to point-set topology, the fundamental group, covering spaces, methods of calculation and applications. Prerequisite: MAT202 or 204 or 218 or equivalent. Z. Szabó

MAT 375 Introduction to Graph Theory (also COS 342)  Spring QR
The fundamental theorems and algorithms of graph theory. Topics include: connectivity, matchings, graph coloring, planarity, the four-color theorem, extremal problems, network flows, and related algorithms. Prerequisite: MAT202 or 204 or 217 or equivalent. P. Seymour

MAT 377 Combinatorial Mathematics (also APC 377)  Fall QR
Combinatorics is the study of enumeration and structure of discrete objects. These structures are widespread throughout mathematics, including geometry, topology and algebra, as well as computer science, physics and optimization. This course will give an introduction to modern techniques in the field, and how they relate to objects such as polytopes, permutations and hyperplane arrangements. C. Liu

MAT 378 Theory of Games  Spring QR
Games in extensive form, pure and behavioral strategies; normal form, mixed strategies, equilibrium points; coalitions, characteristic-function form, imputations, solution concepts; related topics and applications. Prerequisite: MAT202 or 204 or 217 or equivalent. MAT215 or equivalent is recommended. Staff

MAT 380 Probability and Stochastic Systems (See ORF 309)

MAT 385 Probability Theory  Spring QR
Sequence of independent trials, applications to number theory and analysis, Monte Carlo method. Markov chains, ergodic theorem for Markov chains. Entropy and McMillan theorem. Random walks, recurrence and non-recurrence; connection with the linear difference equations. Strong laws of large numbers, random series and products. Weak convergence of probability measures, weak Helly theorems, Fourier transforms of distributions. Limit theorems of probability theory. Prerequisite: MAT203 or 218 or equivalent. Y. Sinai
MAT 390 Introduction to Modern Applied Mathematics  
Not offered this year QR
Classical topics blended with modern topics involving numerical methods and discrete mathematics, including both theory and application. Symmetric linear equations, Fourier series and Laplace's equation, initial value problems, design and stability of difference methods, conjugate gradients, combinational optimization and network flows. Staff

MAT 391 Mathematics in Engineering I (See MAE 305)

MAT 392 Mathematics in Engineering II (See MAE 306)

MAT 393 Mathematical Programming  
Not offered this year QR
Linear programs, duality, Dantzig's simplex method; theory of dual linear systems; matrix games, von Neumann's minimax theorem, simplex solution; algorithms for assignment, transport, flow; brief introduction to nonlinear programming. Staff

MAT 407 Theory of Computation (See COS 487)

MAT 419 Topics in Number Theory QR
Topics introducing various aspects of number theory, including analytic and algebraic number theory, L-functions, and modular forms. See Course Offerings listing for topic details. Prerequisites: MAT 215, 345, 346 or equivalent. Staff

MAT 425 Analysis III: Integration Theory and Hilbert Spaces  
Spring QR
The theory of Lebesgue integration in n-dimensional space. Differentiation theory. Hilbert space theory and applications to Fourier Transforms, and partial differential equations. Introduction to fractals. This course is the third semester of a four-semester sequence, but may be taken independently of the other semesters. Prerequisites: MAT215 or 218 or equivalent. Staff

MAT 427 Ordinary Differential Equations QR
Introduction to the study of ordinary differential equations; explicit solutions, general properties of solutions, and applications. Topics include explicit solutions of some non-linear equations in two variables by separation of variables and integrating factors, explicit solution of simultaneous linear equations with constant coefficients, explicit solution of some linear equations with variable forcing term by Laplace transform methods, geometric methods (description of the phase portrait), and the fundamental existence and uniqueness theorem. Staff

MAT 429 Topics in Analysis  
Not offered this year QR
Introduction to incompressible fluid dynamics. The course will give an introduction to the mathematical theory of the Euler equations, the fundamental partial differential equation arising in the study of incompressible fluids. We will discuss several topics in analysis that emerge in the study of these equations: Lebesgue and Sobolev spaces, distribution theory, elliptic PDEs, singular integrals, and Fourier analysis. Content varies from year to year. See Course Offerings listing for topic details. Staff

MAT 449 Topics in Algebra  
Fall QR
Topics in algebra selected from areas such as representation theory of finite groups and the theory of Lie algebras. Three classes. Prerequisite: MAT 345 or MAT 346. S. Morel
MAT 459 Topics in Geometry QR
Topics in geometry selected from areas such as differentiable and Riemannian manifolds, point set and algebraic topology, integral geometry. Prerequisite: departmental permission. Staff

MAT 473 Cryptography (See COS 433)

MAT 474 Introduction to Analytic Combinatorics (See COS 488)

MAT 481 Introduction to Nonlinear Dynamics (See CBE 448)

MAT 486 Random Processes Not offered this year QR
Wiener measure. Stochastic differential equations. Markov diffusion processes. Linear theory of stationary processes. Ergodicity, mixing, central limit theorem for stationary processes. If time permits, the theory of products of random matrices and PDE with random coefficients will be discussed. Prerequisite: MAT385. Staff

MAT 493 Mathematical Methods of Physics (See PHY 403)
Department of Mechanical and Aerospace Engineering

Chair
Howard A. Stone

Departmental Representative
Michael G. Littman

Director of Graduate Studies
Clarence W. Rowley

Professor
Craig B. Arnold
Emily A. Carter, also Applied and Computational Mathematics
Edgar Y. Choueiri
Mikko P. Haataja
Yiguang Ju
N. Jeremy Kasdin
Chung K. Law
Naomi E. Leonard
Michael G. Littman
Clarence W. Rowley
Alexander J. Smits
Robert F. Stengel
Howard A. Stone

Associate Professor
Alexander Glaser, also Woodrow Wilson School
Luigi Martinelli

Assistant Professor
Daniel M. Nosenchuck
Marcus N. Hultmark
Egemen Kolemen, also Andlinger Center for Energy and the Environment
Andrej Košmrlj
Julia Mikhailova
Michael E. Mueller
Daniel A. Steingart, also Andlinger Center for Energy and the Environment

Associated Faculty
Ilhan Aksay, Chemical and Biological Engineering
Elie R. Bou-Zeid, Civil and Environmental Engineering
Nathaniel Fisch, Astrophysical Sciences
Bruce E. Koel, Chemical and Biological Engineering
Jean-Hervé Prévost, Civil and Environmental Engineering
George W. Scherer, Civil and Environmental Engineering
David N. Spergel, Astrophysical Sciences
Salvatore Torquato, Chemistry
Robert J. Vanderbei, Operations Research and Financial Engineering

Information and Departmental Plan of Study

The Department of Mechanical and Aerospace Engineering recognizes that students have a variety of career objectives. Some enter industry directly in an engineering capacity and some continue their studies in graduate school in engineering or applied science. Other MAE graduates pursue careers in business, law, or medicine. The Department offers sufficient flexibility to students planning an undergraduate program that meets any of these objectives and guides them to build fundamental knowledge in key engineering disciplines and develop practical skills in problem-solving and design. The subjects of solid and fluid mechanics, thermodynamics, dynamics, control systems, materials, and applied mathematics, combined with the experience of engineering design, are core to the
department's curriculum. Both the mechanical and aerospace engineering programs are accredited by the Engineering Accreditation Commission of ABET.

**General Requirements**

Requirements for study in the department follow the general requirements for the School of Engineering and Applied Science. In addition, the following four courses and one laboratory are normally completed by departmental students before entry into the junior year.

Mechanical and Aerospace Engineering

206 Introduction to Engineering Dynamics
221 Thermodynamics
222 Mechanics of Fluids
223 Modern Solid Mechanics
224 Integrated Engineering Science Laboratory

Some of the above can be satisfied by equivalent courses. For example, students with an interest in structures may take CEE 205 Mechanics of Solids in place of MAE 223; and students with an interest in engineering physics may take PHY 205 Classical Mechanics or PHY 207 Mechanics and Waves in place of MAE 206.

Each departmental student will be introduced to instrumentation and computer-based data acquisition in the MAE 224 laboratory.

**Departmental Requirements**

In order to qualify for graduation each departmental student must satisfactorily complete the following:

I. One upper-level course involving applications of mathematics

II. MAE 305 Mathematics in Engineering I

III. Eight upper-level departmental courses

A. Among these are engineering science courses selected from the following list:

Dynamics and Control

331 Aircraft Flight Dynamics
341 Space Flight
433 Automatic Control Systems
434 Modern Control
Fluid Mechanics/Thermal Sciences

328 Energy for a Greenhouse-Constrained World
335 Fluid Dynamics
423 Heat Transfer
426 Rocket and Air-Breathing Propulsion Technology
427 Energy Conversion and the Environment: Transportation Applications

552 Viscous Flows--Viscous Flows and Boundary Layers

Materials/Structures

324 Structure and Properties of Materials
MSE 301 Materials Science and Engineering
CEE 312 Statics of Structures
CEE 361 Structural Analysis and Introduction to Finite-Element Methods

B. A minimum of three courses must be in the area of engineering design. At least two of these must be selected from the following list:

321 Engineering Design (required for all students)
322 Mechanical Design (required for mechanical engineering or 412)
332 Aircraft Design (required for aerospace engineering or 342)
342 Space System Design (required for aerospace engineering or 332)
412 Microprocessors for Measurement and Control (required for mechanical engineering or 322)

IV. All students are required to participate in a self-directed research or engineering project. (See Independent Work below.)

The remainder of the 36 courses required for the B.S.E. may be chosen from a wide variety of options. At least seven of these must be in the humanities or social sciences, as required by the School of Engineering and Applied Science. The rest of the courses may be used to pursue a specialty within the department, combine studies with another department, follow one of the topical program curricula, or further expand studies within the humanities or social sciences.

Each student's program is planned individually in consultation with the class adviser. Suggested plans of study for each of the programs in the department are available from the departmental representative.

Program of Study

The department offers two programs of study: mechanical engineering and aerospace engineering. These programs draw on courses in the underlying fundamental sciences and mathematics during the first year, which lead to broad introductory engineering science courses during the second year, where students are introduced to the creative
application of this knowledge to the solution of technical problems. Aspects of engineering design, the process of devising a system to meet a need, are introduced to the student through laboratories in the second year and continue through the upperclass years. During the third year all students take a two-semester design sequence as well as further engineering science courses dealing with analysis and application in the areas of energy sources and power systems, structures, aerodynamics and flow systems, and the dynamics of machines and their control. The introduction of design during the third year, combined with further depth in engineering science, enables students to undertake realistic design projects during their senior year. The programs are designed to prepare the graduate for an engineering career and give him or her the ability to continue to grow professionally.

Mechanical Engineering. This program deals with the analysis and design of machines, their motion, power sources, and control. The curriculum is based on dynamics, thermodynamics, and the study of the structure and behavior of fluid and solid materials; it is accredited by the Engineering Accreditation Commission of ABET. Students are exposed to the process of engineering design through 321 Engineering Design, 322 Mechanical Design, or 412 Microprocessors for Measurement and Control, and one additional design elective.

All mechanical engineering students must take:

423 Heat Transfer or 335 Fluid Dynamics and
433 Automatic Control Systems and a mathematics elective normally

selected from the following list:

Mechanical and Aerospace Engineering
306 Mathematics in Engineering II

Operations Research and Financial Engineering
245 Fundamentals of Engineering Statistics
307 Optimization
309 Probability and Stochastic Systems

Mathematics
330 Complex Analysis with Applications
393 Mathematical Programming

Computer Science
340 Reasoning about Computation

Physics
403 Mathematical Methods of Physics.

The dynamics and design option is recommended for students desiring an emphasis on the study of the motion and control of vehicles and machines. The departmental requirements (II. A. above) are normally satisfied by:
331 Aircraft Flight Dynamics
341 Space Flight
344 Introduction to Bioengineering and Medical Devices
345 Robotics and Intelligent Systems
423 Heat Transfer
434 Modern Control

The energy sciences option is recommended for students desiring an emphasis on power sources. The departmental requirements (II. A. above) are normally satisfied by:

328 Energy for a Greenhouse-Constrained World
423 Heat Transfer
426 Rocket and Air-Breathing Propulsion Technology
427 Energy Conversion and the Environment: Transportation Applications
434 Modern Control

In either case, in order to satisfy the departmental requirement for upper-level courses, at least one is to be selected from each of the three stems (Dynamics and Control; Fluid Mechanics and Thermal Sciences; and Materials/Structures).

Aerospace Engineering. This program deals with the analysis and design of aerospace vehicles. The curriculum is based on the applications of principles from dynamics, control, thermodynamics, fluid mechanics and solid mechanics; it is accredited by the Engineering Accreditation Commission of ABET. Part of the departmental design requirement (II. B. above) is satisfied by 321 Engineering Design and 332 Aircraft Design or 342 Space System Design.

The departmental requirements (II. A. above) are normally satisfied by:

331 Aircraft Flight Dynamics or 341 Space Flight
335 Fluid Dynamics
427 Energy Conversion and the Environment: Transportation Applications OR
426 Rocket and Air-Breathing Propulsion Technology
433 Automatic Control Systems

Independent Work

All seniors are required to participate in a research or engineering project by completing at least one semester of independent work. A year-long senior thesis or senior project also meets this requirement. All projects must include engineering design (engineering design is the process of devising a system, component, or process to meet desired needs). The following courses satisfy this requirement: senior independent work (439) (one semester offered in fall); senior independent work (440) (one semester offered in spring); senior thesis (442) (year-long individual effort); senior project (444) (year-long team or group effort). Any of these courses may satisfy the third design requirement in either the Aerospace or Mechanical programs. Students are strongly encouraged to select the year-long thesis or project. For the senior thesis or project, a final grade is issued in the spring.
Preparation for Graduate Study

Students who are considering graduate work in applied science may elect the engineering physics option by combining the engineering courses in the department with the requirements of the interdepartmental engineering physics program.

Program in Sustainable Energy. This program provides an understanding of Earth, global climate, and environmental change from the perspective of engineering, technology, and policy. The future of societies, the global economy, and the global environment depend on collaborative research into renewable energy, alternative fuels, advanced energy conversion and storage systems, technology transfer to developing countries, and prudent judgment on policies to support sustainable energy technology. Innovations and inventions require multidisciplinary approaches and entrepreneurship, as well as grounding in theory and practice, in topics that are not covered by a single department. This certificate program offers an integrated set of core and elective courses, introducing students to fundamental concepts, providing depth in specific fields of interest, gaining laboratory and site visit experiences, and setting the stage for further work in the field. See the Program in Sustainable Energy entry or view program information online.

Program in Robotics and Intelligent Systems. Robotics and intelligent systems have become focal points for research and development, and they are central to advances in manufacturing technology. New approaches for analysis, design, and synthesis of systems are being developed using symbolic representation of knowledge, electronic neural networks, and parallel supercomputers. Students have an opportunity to learn the theory and practice of automation and to pursue independent study projects in related areas. The mechanical and aerospace engineering department offers a number of courses in this area and is preparing a new generation of engineers in robotics and intelligent systems. For more information, see the Program in Robotics and Intelligent Systems entry or view program information online.

Program in Materials Science and Engineering. The materials concentration in mechanical engineering is designed to provide a coherent understanding of the structure, properties, and performance of materials from a mechanics and materials perspective. The materials concentration will provide a foundation in basic and applied science, as well as an introduction to the design and applications of materials. Students are given the opportunity to specialize in areas such as structural materials, biological materials, microand nanotechnology, and materials modeling and simulations. This can be achieved by taking a sequence of electives drawn from different departments, and also by engaging in a materials-related senior thesis topic designed to facilitate the specializations. This course of study will prepare students for graduate education in a wide range of areas, or the beginning of a professional career in materials engineering. Students electing this concentration will receive a degree in mechanical engineering. Students are encouraged to simultaneously participate in the Program in Materials Science and Engineering. Most students in this concentration normally take:

MAE 324 Structure and Properties of Materials
MAE 325 Structural Analysis and Finite-Element Methods
MAE 344 Introduction to Bioengineering and Biomedical Devices

MSE 302 Laboratory Techniques in Materials Science

Other Programs. Students in mechanical and aerospace engineering with an interest computing, in addition to their departmental studies, may wish to follow the Program in Applications of Computing. Students may also wish to
pursue the Program in Engineering Physics, the Program in Engineering Biology, the Program in Applied and Computational Mathematics, and the Program in Engineering and Management Systems. Some of the courses in these programs may also satisfy departmental requirements.

**Energy and Environmental Studies.** Students with an interest in energy conversion and the generation and control of environmental pollutants normally take:

328 Energy for a Greenhouse-Constrained World  
423 Heat Transfer  
427 Energy Conversion and the Environment: Transportation Applications  

See also the Program in Environmental Studies.

**Courses**

**MAE 102A Engineering in the Modern World (See CEE 102A)**

**MAE 102B Engineering in the Modern World (See CEE 102B)**

**MAE 206 Introduction to Engineering Dynamics**  
Spring QR  
Formulation and solution of equations governing the dynamic behavior of engineering systems. Fundamental principles of Newtonian mechanics. Kinematics and kinetics of particles and rigid bodies. Motion relative to moving reference frames. Impulse-momentum and work-energy relations. Free and forced vibrations of mechanical systems. Introduction to dynamic analysis of electromechanical and fluid devices and systems. Two lectures, one laboratory. Prerequisites: MAT 201, PHY 103, and MAE 223 or CEE 205. *Staff*

**MAE 221 Thermodynamics (also ENE 221)**  
Fall STL  
Heat and work in physical systems. Concepts of energy conversion and entropy, primarily from a macroscopic viewpoint. Applications to engines, heat pumps, refrigeration, and air-conditioning systems. In the laboratory students will carry out experiments in the fields of analog electronics and thermodynamics. For MAE concentrators only, a combined final laboratory grade will be issued in the spring laboratory course 224, which includes the laboratory work of both 221 and 224. Three lectures, one class, and one three-hour laboratory. Prerequisites: PHY 103 and MAT 201, which may be taken concurrently. *D. Steingart*

**MAE 222 Mechanics of Fluids (also CEE 208)**  
Spring  
Introduction to the physical and analytical description of phenomena associated with the flow of fluids. Topics include the principles of conservation of mass, momentum, and energy; lift and drag; open channel flow; dynamic similitude; laminar and turbulent flow. Three lectures, one preceptorial. Prerequisites: MAT 104 and 202; MAT 202 may be taken concurrently. *A. Smits*

**MAE 223 Modern Solid Mechanics (also CEE 323)**  
Fall  
Fundamental principles of solid mechanics: equilibrium equations, reactions, internal forces, stress, strain, Hooke's law, torsion, beam bending and deflection, and deformation in simple structures. Integrates aspects of solid mechanics with applications to mechanical and aerospace structures (engines and wings), and microelectronic and biomedical devices (thin films). Topics include stress concentration, fracture, plasticity, fatigue, visco-elasticity and...
thermal expansion. The course synthesizes descriptive observations, mathematical theories, and engineering consequences. Two 90-minute lectures. Prerequisites: MAT 104, and PHY 103. A. Kosmrlj

MAE 224 Integrated Engineering Science Laboratory Spring STL
Core laboratory course for concentrators, who carry out experiments in the fields of digital electronics, fluid mechanics, and dynamics. Students also complete an independent research project. Continuation of the laboratory component of 221; a combined final grade will be issued based upon laboratory work in both 221 and 224. Prerequisite: 221 Typically taken concurrently with 222. One three-hour laboratory, one class. M. Hultmark

MAE 228 Energy Technologies in the 21st Century (also EGR 228 / CBE 228 / ENE 228) Fall STN
Addresses issues of regional and global energy demands, including sources, carriers, storage, current and future technologies, costs for energy conversion, and their impact on climate and the environment. Also focuses on emissions and regulations for transportation. Students will perform cost-efficiency and environmental impact analyses from source to end-user on both fossil fuels and alternative energy sources. Designed for both engineering and non-engineering concentrators. Two 90-minute lectures, one preceptorial. J. Benziger


MAE 309 Science and Technology of Nuclear Energy: Fission and Fusion (See AST 309)

MAE 321 Engineering Design Fall
Focus on design processes and procedures using modern engineering tools. Parametric design techniques are introduced in the computer-design laboratory along with simulation tools. Instruction in basic and computer-based manufacturing methods is given in the manufacturing laboratory. Teams of students conduct projects that involve the complete design cycle from concept and first principles through optimization, prototype, and test. Two lectures, one laboratory. Prerequisites: 206, 221, 222, and 223 or CEE 205, or instructor's permission. G. Northey

MAE 322 Mechanical Design Spring
This course builds on the technical foundation established in 321, and extends the scope to include a range of advanced mechanical design. Teams of students will design and fabricate a wheeled robotic system that will draw upon multidisciplinary engineering elements. The robot will facilitate common daily tasks which vary each year. CAD, CAE, and CAM will be utilized in the design/simulation/prototype process. Labs are designed to reinforce and
expand CAD and CAE skills. Two 90-minute lectures, one laboratory. Prerequisites: 321 or instructor's permission.  

*D. Nosenchuck*

**MAE 324 Structure and Properties of Materials (also MSE 324)**  
Fall  
An introduction to the properties of engineering materials that emphasizes the correlation between atomic and microscopic structure and the macroscopic properties of the materials. Topics include structural, mechanical, thermodynamic, and design-related issues important to engineering applications. Two lectures, one preceptorial.  
*C. Arnold*

**MAE 325 Matrix Structural Analysis and Introduction to Finite-Element Methods (See CEE 361)**

**MAE 328 Energy for a Greenhouse-Constrained World (also EGR 328 / ENV 328 / ENE 328)**  
Spring STN  
This course addresses, in technical detail, the challenge of changing the future global energy system to accommodate constraints on the atmospheric carbon dioxide concentration. Energy production strategies are emphasized, including renewable energy, nuclear fission and fusion, the capture and storage of fossilfuel carbon, and hydrogen and low-carbon fuels. Efficient energy use is also considered, as well as intersections of energy with economic development, international security, local environmental quality, and human behavior and values. Two 90-minute lectures.  
*J. Mikhailova*

**MAE 331 Aircraft Flight Dynamics**  
Fall  
*R. Stengel*

**MAE 332 Aircraft Design**  
Spring  
Building on strength of materials and calculus, this course integrates physical laws to analyze stress and displacement fields in structures. The course introduces basic concepts and equations in three dimensions and then applies them to aircraft structures. Phenomena to be discussed include elastic anisotropy, bending, buckling, fracture, and fatigue. The course is important for anyone interested in structured design. Two 90-minute lectures. Prerequisites: 335 or instructor's permission.  
*L. Martinelli*

**MAE 335 Fluid Dynamics**  
Fall  
Low-speed incompressible potential flow theory and high speed compressible flows. Low-speed topics include circulation, vorticity, d'Alembert's paradox, potential flows, and finite wing theory. High-speed topics include speed of sound, nozzles, shock waves, expansion waves, and effects of heat addition and friction. Three lectures, one preceptorial. Prerequisites: 221, 222 or instructor's permission.  
*D. Nosenchuck*

**MAE 339 Independent Work**  
Fall  
Independent work is intended for juniors doing only a one-term project. Students develop a topic of their own or select from a list of topics prepared by the faculty. They develop a work plan and select an adviser and are assigned a second reader. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in either 339 for fall or 340 for spring. This course does not fulfill the departments independent work or thesis requirement.  
*M. Littman*
MAE 339D Independent Work with Design  Fall
Independent work with design is intended for juniors doing only a one-term project. Similar to 339, with the principal difference that the project must incorporate aspects and principles of design in a system, product, vehicle, device, apparatus, or other design element. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in 339D for fall, or 340D for spring. This course does not fulfill the departments independent work or thesis requirement. 
M. Littman

MAE 340 Independent Work  Spring
Independent work is intended for juniors doing only a one-term project. Students develop a topic of their own or select from a list of topics prepared by the faculty. They develop a work plan and select an adviser and are assigned a second reader. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in either 339 for fall or 340 for spring. This course does not fulfill the departments independent work or thesis requirement. L. Martinelli

MAE 340D Independent Work with Design  Spring
Independent work with design is intended for juniors doing only a one-term project. Similar to 340, with the principal difference that the project must incorporate aspects and principles of design in a system, product, vehicle, device, apparatus, or other design element. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in 339D for fall, or 340D for spring. This course does not fulfill the departments independent work or senior thesis requirement. L. Martinelli

MAE 341 Space Flight  Not offered this year
This course addresses the various concepts that form the basis of modern space flight and astronautics. The focus is on space flight analysis and planning and not hardware or spacecraft design. The topics include space flight history, orbital mechanics, orbit perturbations, near-Earth and interplanetary mission analysis, orbit determination and satellite tracking, spacecraft maneuvers and attitude control, launch, and entry dynamics. Use of advanced software for the planning and analysis of space missions. Two 90-minute lectures. Prerequisite: 305 or instructor's permission. N. Kasdin

MAE 342 Space System Design  Not offered this year
This course examines the design of a modern spacecraft or complex space system, including the space environment and its impact on design. The principles and design aspects of the structure, propulsion, power, thermal, communication, and attitude subsystems are studied. The course also introduces systems engineering, project management, manufacturing and test, mission operations, mission design, and space policy. Acting as a single project team, students will design a satellite or space system from conception to critical design review. Two 90-minute lectures. Prerequisite: 305; 341 recommended, or instructor's permission. Staff

MAE 344 Introduction to Bioengineering and Medical Devices  Fall STN
The fundamental concepts required for the design and function of implantable medical devices, including basic applications of materials, solid mechanics and fluid mechanics to bone/implant systems. The course examines the interfaces between cells and the surfaces of synthetic biomaterials that are used in orthopedic and dental applications. Prerequisites: MAT 103 and 104, and PHY 103 and 104. Two 90-minute lectures.
W. Soboyejo
MAE 345 Robotics and Intelligent Systems  Not offered this year
This course provides students with a working knowledge of methods for design and analysis of robotic and intelligent systems. Particular attention is given to modeling dynamic systems, measuring and controlling their behavior, and making decisions about future courses of action. Topics include system modeling and control, principles of decisionmaking, Monte Carlo evaluation, genetic algorithms, simulated annealing, neural networks, and expert systems. Prerequisites: MAT 202 or 204, and COS 111 or COS 126 or ORF 201. A.B. students must have met ST requirement; B.S.E. students must have met freshman science requirement. Two 90-minute lectures. R. Stengel

MAE 353 Science and Global Security: From Nuclear Weapons to Cyberwarfare (See WWS 353)

MAE 412 Microprocessors for Measurement and Control  Fall
Introduction to microcontroller applications. A laboratory course dealing with the design and construction of self-contained computer-based electronics projects. Major topics include a review of digital and linear electronics, an introduction to microcomputer architecture and assembly language programming, device interfacing, and system design. Two lectures, two two-hour laboratories. Prerequisite: 221 and 224, or equivalent. M. Littman

MAE 423 Heat Transfer (also ENE 423 )  Fall
Covers the fundamentals of heat transfer and applications to practical problems in energy conversion and conservation, electronics, and biological systems. Emphasis will be on developing a physical and analytical understanding of conductive, convective, and radiative heat transfer, as well as design of heat exchangers and heat transfer systems involving phase change in process and energy applications. Students will develop an ability to apply governing principles and physical intuition to solve multi-mode heat transfer problems. Three lectures, one preceptorial. D. Nosenchuck

MAE 425 Introduction to Ocean Physics for Climate (See GEO 425)

MAE 426 Rocket and Air-Breathing Propulsion Technology  Spring
The study of principles, flight envelopes, and engine designs of rocket and ram/scramjet propulsion systems. Topics include jet propulsion theory, space mission maneuver, combustion control, and system components of chemical and non-chemical rockets (nuclear and electrical propulsion), gas turbine, ramjet, and scramjet engines. Characteristics, optimal flight envelopes, and technical challenges of combined propulsion systems will be analyzed. Prerequisites: 221 and 222. Three lectures. Y. Ju

MAE 427 Energy Conversion and the Environment: Transportation Applications (also ENE 427 ) Spring
An overview of energy utilization in, and environmental impacts of, current and future propulsion systems for ground, air, and space propulsion applications. Introduces students to principles of advanced internal combustion, electric hybrid, and fuel cell energy conversion systems for ground transportation. Relevant thermodynamics, chemistry, fluid mechanics, and combustion fundamentals will be stressed. Performance properties of power plants, control of air pollutant emissions, and minimization of resource-to application carbon emissions will be explored. Three lectures, one preceptorial. Prerequisites: 221, 222, or instructor's permission. M. Mueller

MAE 433 Automatic Control Systems  Fall
Introduction to the analysis and design of automatic control systems. Mathematical models of mechanical and electrical feedback systems. Block diagram algebra. Accuracy, speed of response, and stability. Root locus, Bode,
and Nyquist techniques. Introduction to digital control. Regulation, tracking, and compensation. Effects of nonlinearity, disturbance, and noise. Prerequisite: 305 or instructor's permission. Two 90-minute lectures, one three-hour laboratory. C. Rowley III, M. Littman

MAE 434 Modern Control Spring

MAE 435 Special Topics in Mechanical and Aerospace Engineering Not offered this year
Presentation of timely and advanced topics in mechanical and aerospace engineering. Subject matter will vary depending upon the interest of the faculty and students. Possible topics could include acoustics and noise, biomechanics, lasers, space propulsion, solar energy conversion. Three lectures. Staff

MAE 436 Special Topics in Mechanical and Aerospace Engineering Not offered this year Presentation of timely and advanced topics in mechanical and aerospace engineering. Subject matter will vary depending upon the interest of the faculty and students. Possible topics could include acoustics and noise, biomechanics, lasers, space propulsion, solar energy conversion. Staff

MAE 439 Senior Independent Work Fall
Senior independent work is the culminating experience for the mechanical and aerospace engineering programs. Students select a subject and adviser, define the problem to be studied and propose a work plan. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. A list of possible subjects of particular interest to faculty and staff members is provided. Students must submit a written final report and present their results to faculty, staff, fellow students, and guests. M. Littman

MAE 440 Senior Independent Work Spring
Senior independent work is the culminating experience for the mechanical and aerospace engineering programs. Students select a subject and adviser, define the problem to be studied and propose a work plan. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. A list of possible subjects of particular interest to faculty and staff members is provided. Students must submit a written final report and present their results to faculty, staff, fellow students, and guests. L. Martinelli

MAE 442 Senior Thesis Spring
Senior thesis is a year-long independent study for individual students. It is the culminating experience for the mechanical and aerospace programs. Work begins in fall, but enrollment is in spring when a double grade is recorded. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. Students develop their own topic or select a faculty proposed topic. Students create a work plan and select an adviser. A written progress report is expected at the end of the fall term. Students submit a written final report and make an oral presentation at the end of the spring term. L. Martinelli

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MAE 444 Senior Project Spring
The senior project is a year-long independent study intended for students who choose to work in teams of two or more. Work begins in fall, but enrollment is in spring when a double grade is recorded. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. Groups develop their own topic or select a faculty proposed topic. Groups create a work plan and select an adviser. A written progress report is expected at the end of the fall term. Students submit a written final report and make an oral presentation at the end of the spring term. L. Martinelli

MAE 455 Mid-Infrared Technologies for Health and the Environment (See ELE 455)

MAE 456 Global Technology Not offered this year
An introduction to key ideas in science, technology, humanities, and social sciences relevant to global development. Highlights essential needs in the rural environment and considers how to develop environmentally friendly scientific and technological solutions to satisfy these needs. Also examines the potential role of global technology in the development of rural and urban areas within the developing world. Morning lectures will be followed by field activities and group projects. Enrollment is restricted to students participating in the Tropical Biology Program in Kenya. W. Soboyejo
The Program in Medieval Studies encourages the interdisciplinary study of the Middle Ages: its art, literature (Latin and vernacular), music, religion, science, philosophy, politics, and economic and social structures. Supported by the vast resources for medieval studies at Princeton (including an outstanding medieval manuscript collection and the photographic archive known as the Index of Christian Art), the program sponsors one course: an introductory seminar, and a (non-credit) thesis writers' colloquium for seniors. Approximately another 40 courses directly relevant to medieval studies are listed following this description.

Admission to the Program
During the freshman or sophomore year each student who wishes to enroll in the program should take MED 227 The World of the Middle Ages or discuss with the director what other kinds of preparation might be acceptable instead. At the time of the selection of a major in a department, a student wishing to obtain a certificate in medieval studies at graduation should also seek admission to the program from the director. At this time, an on-line application (accessible from the Program website) to the program should be filled out and submitted.

Program of Study
MED 227 (or the equivalent such as HUM 216 and HUM 217) is required, as is, in the senior year, the thesis writers' colloquium. In addition, the student should take and pass four courses either that are crosslisted in Medieval Studies (for example, those listed in the following roster) or that are not cross-listed but cover a medieval topic. At least one of the four additional courses should be at the 400 level or above and not all can be from the same department. The senior thesis and at least one junior paper must deal directly with the Middle Ages. The student's course of study must receive the prior approval of the departmental representative (in the major) and the director of the Program in Medieval Studies.

Languages
Most students, especially those interested in pursuing medieval studies at the graduate level, are urged to take Latin, including medieval Latin, or Greek. But many students will be interested in the vernacular traditions; in the absence of competency in Latin or Greek (or as a supplement to competency), students will need to demonstrate appropriate proficiency in another medieval language (Old or Middle English, Old French or Provençal, Middle High German, Old Norse, medieval Italian, medieval Spanish, Hebrew or
Certificate of Proficiency
Students who fulfill all requirements of the program will receive a certificate of proficiency in medieval studies upon graduation.

Senior Thesis Colloquium. Separate from any other departmental requirements, this noncredit colloquium will regularly bring together all seniors in the program in order to discuss mutual problems of data, research strategies, organization, and writing. In consultation with the director of the colloquium, students will choose a date to report to and discuss with the other members of the colloquium their work in progress.

Courses
MED 207 Medieval Art and Architecture of the Holy Land (See ART 207)
MED 218 An Unnatural History of the Middle Ages (See ENG 218)
MED 220 Jews, Muslims, and Christians in the Middle Ages (See NES 220)
MED 227 The World of the Middle Ages (also HUM 227 ) Fall LA
An introduction to medieval Europe from late Antiquity to 1400. The course focuses on themes such as collective mentalities and dominant social practices, and addresses major forms of cultural expression in various media. Two 90-minute lectures. S. Poor

MED 230 Music in the Middle Ages (See MUS 230)
MED 231 Constantinople: A Literary Journey to the Capital of Byzantium (See CLA 230)
MED 244 Sex and Salvation in Early Christian Literature (See CLA 245)
MED 245 The Islamic World from its Emergence to the Beginnings of Westernization (See NES 245)
MED 303 Dante's "Inferno" (See ITA 303)
MED 308 The Literature of Medieval Europe (See COM 310)
MED 309 The Medieval Period (See ENG 311)
MED 310 The Old English Period (See ENG 310)
MED 312 The Erotics of Medieval Literature (See ENG 313)
MED 313 Art and Ideology in Medieval Iberia: Jews, Christians, and Moors (See SPA 313)
MED 320 Topics in Medieval Greek Literature (See CLA 320)
MED 321 Topics in German Medieval Literature (See GER 321)
MED 329 Sex and Gender in the Ancient World (See CLA 329)
MED 330 Medieval Philosophy: The Golden Century (See PHI 330)
MED 332 Women and the Classical Tradition (See CLA 332)
MED 335 Studies in the Classical Tradition (See CLA 335)
MED 345 The Crusades (See HIS 345)
MED 400 Touching Books -- An Introduction to the History of the Book (See ENG 400)

MED 412 Topics in Medieval Studies Not offered this year LA
An intensive seminar devoted to a particular aspect of European medieval life and culture. Topics change yearly. One three-hour seminar. Staff

MED 421 Beowulf (See ENG 421)
MED 422 Loss and Longing in the Anglo-Saxon Era: Elegy & Elegaic (See ENG 422)
MED 428 Empire and Catastrophe (See HIS 428)
MED 430 Seminar. Medieval Art (See ART 430)
Department of Molecular Biology

Chair
Bonnie L. Bassler

Associate Chair
Jean E. Schwarzbauser

Departmental Representative
S. Jane Flint
Elizabeth R. Gavis (Director)
Frederick M. Hughson
Thomas J. Silhavy
Jared E. Toettcher

Director of Graduate Studies
Zemer Gitai

Professor
Bonnie L. Bassler
Carlos D. Brody, also Princeton Neuroscience Institute
Ileana M. Cristea
Lynn W. Enquist, also Princeton Neuroscience Institute
S. Jane Flint
Elizabeth R. Gavis
Zemer Gitai
Frederick M. Hughson
Yibin Kang
Michael S. Levine, also Lewis-Sigler Institute for Integrative Genomics
Coleen T. Murphy, also Lewis-Sigler Institute for Integrative Genomics
Mark D. Rose
Paul D. Schedl
Gertrud M. Schüpbach
Jean E. Schwarzbauser
Thomas E. Shenk
Thomas J. Silhavy
Jeffrey B. Stock
David W. Tank, also Princeton Neuroscience Institute
Shirley M. Tilghman, also Woodrow Wilson School
Samuel S.H. Wang, also Princeton Neuroscience Institute
Eric F. Wieschaus, also Lewis-Sigler Institute for Integrative Genomics
Ned S. Wingreen, also Lewis-Sigler Institute for Integrative Genomics
Virginia A. Zakian

Associate Professor
Michael J. Berry, also Princeton Neuroscience Institute
Rebecca D. Burdine
Alexei Korennykh
Mala Murthy, also Princeton Neuroscience Institute

Assistant Professor
Mohamed S. Abou Donia
Danelle Devenport
Sabine Petry
Alexander Ploss
Jared E. Toettcher Engineering
Martin H. Wühr, also Lewis-Sigler Institute for Integrative Genomics

Senior Lecturer
Alan Gelperin, also Princeton Neuroscience Institute
Heather A. Thieringer

Lecturer with Rank of Professor
Adel A. Mahmoud, also Woodrow Wilson School
Daniel A. Notterman

Lecturer
Philip G. Felton
Abby Notterman
Bruce Patterson
Jaclyn A. Schwalm
M. Elizabeth Wright

Associated Faculty
Peter Andolfatto, Ecology and Evolutionary Biology, Lewis-Sigler Institute for Integrative Genomics
Jose L. Avalos, Chemical and Biological Engineering, Andlinger Center for Energy and the Environment
Lisa M. Boulanger, Princeton Neuroscience Institute
Clifford P. Brangwynne, Chemical and Biological Engineering
Mark P. Brynildsen, Chemical and Biological Engineering
Jannette L. Carey, Chemistry
Thomas Gregor, Physics, Lewis-Sigler Institute for Integrative Genomics
Michael H. Hecht, Chemistry
A. James Link, Chemical and Biological Engineering
Carolyn McBride, Ecology and Evolutionary Biology, Princeton Neuroscience Institute
Tom Muir, Chemistry
Celeste M. Nelson, Chemical and Biological Engineering
Joshua D. Rabinowitz, Chemistry, Lewis-Sigler Institute for Integrative Genomics
Mohammad R. Seyedsayamdost, Chemistry
Joshua W. Shaevitz, Physics, Lewis-Sigler Institute for Integrative Genomics
Stanislav Y. Shvartsman, Chemical and Biological Engineering, Lewis-Sigler Institute for Integrative Genomics
Mona Singh, Computer Science, Lewis-Sigler
At Princeton, courses in the biological sciences are offered in two departments. Students with interests in molecular, cellular, and developmental processes should enroll in the Department of Molecular Biology. Those with an evolutionary orientation and interest in organismal, population, and community processes should enroll in the Department of Ecology and Evolutionary Biology.

Students considering a concentration in molecular biology are encouraged to attend a departmental sophomore open house that is held in the spring term to introduce them to the departmental requirements, courses, faculty, and research topics.

**Information and Departmental Plan of Study Prerequisites**

To enter the Department of Molecular Biology, students must have completed one of the two introductory courses, either MOL 214 or MOL 215, with a grade of C or better. CHM 201/207 and 202, or one unit of chemistry AP credit and CHM 202 or 215, or two units of chemistry AP credit, are also required to enter the department.

An alternate path into the department is through the integrated science curriculum (see below).

**Program of Study**

**General requirements.** The following courses are required:

*Organic Chemistry* CHM 303 and 304/304B, or ISC 335. Courses taken at other institutions can be used toward fulfillment of the organic chemistry requirements with prior approval from the Department of Chemistry. The organic chemistry requirement must be completed before the beginning of the junior year.

*Quantitative* Students without AP credit in calculus can satisfy the quantitative requirement for the MOL major by taking SML 201 (recommended), ORF 245, or NEU 314 and either COS 126 (recommended) or MAT 103. For students with AP credit in calculus, the quantitative requirement for the MOL major can be met by taking SML 201 (or an approved alternative) and either COS 126 (recommended) or a higher-level math course. Neither AP credit nor courses taken at other institutions can substitute for SML 201. Courses in computer science or mathematics taken at another institution can be substituted for the second required course, if pre-approved by the corresponding department.

*Physics* Physics 108 (strongly recommended), or PHY 103 and 104, or PHY 101 & 102. PHY 108 is a one-semester, biologically oriented alternative to the traditional full-year sequences. Pre-medical students needing two semesters of physics can combine PHY 108 with PHY 101 or PHY 103. Neither AP credit nor courses taken at other institutions can be used toward the fulfillment of the physics requirement.
**Departmental core courses.** The following core courses are required: MOL 342, MOL 345, MOL 348, and MOL 350. Except under very special circumstances, these courses must be taken before senior year. All count toward departmental credit. No substitutions are allowed except in the case of integrated science courses (see below) and study abroad which, if it entails intensive research and with advanced permission, can substitute for MOL 350.

**Other departmentals.** All students must take a total of at least eight departmentals. In addition to the four departmental core courses, students must take at least one 300, 400, or 500-level course with MOL as the primary listing. The remaining three departmental courses can be chosen from among all 300-or-higherlevel MOL, MOL-crosslisted, or other approved courses (see list on department website). Note that CHM 303, CHM 304/304B, and ISC 325 qualify as departmentals. Only Princeton courses count as departmentals; there are no exceptions to this rule.

All prerequisites, required courses, and departmentals must be taken for a letter grade (no P/D/F).

**For the Classes of 2017 and 2018:** For those subjects in which the general requirements have changed (physics, math, ecology and evolutionary biology), students can fulfill either the current or former requirements. Please consult the 2014-2015 Undergraduate Announcement regarding the former requirements.

**Students in the Class of 2018** must follow the new requirements for "Other departmentals" as specified above.

**Independent Work**

**Junior Independent Work.** In the fall semester of the junior year students participate in tutorials in which they read papers from the original literature and prepare two short papers on assigned topics. In the spring semester, students carry out independent work with a faculty adviser with whom they will eventually do their senior thesis research, culminating in a paper in the form of a grant proposal.

**Senior Independent Work.** During the senior year each student, with the guidance of a faculty adviser, undertakes a major research effort. This research project can be a laboratory or non-laboratory-based study that will be written and presented as a senior thesis.

**Senior Departmental Examination**

Students are required to present their work to two faculty thesis readers during an oral exam at which the adviser is not present. The exam usually takes about 30 minutes and students should be prepared to describe the background of the thesis, defend its contents, and propose future directions.

**Study Abroad**

Juniors who wish to study abroad must fulfill chemistry requirements, and if possible MOL 345, beforehand.

While abroad, students must complete the equivalent of the fall semester junior paper. This requirement may be fulfilled by completing an independent scientific literature reading program, including weekly communication with a molecular biology faculty member and written reports. Alternatively, students may join a journal club in a research laboratory abroad, with close monitoring by a molecular biology faculty member.
Study abroad that entails intensive laboratory research can, with advance permission, substitute for MOL 350. None of the other departmental core courses can be completed abroad.

### Integrated Science Sequence

An alternative path into the department is through the integrated science curriculum. ISC 231-234 (a fullyear, double-credit course) can be taken in the freshman year and substitute for MOL 214/215, CHM 201/207 and 202, COS 126, and PHY 103 and 104. Students who complete this sequence will not be required to take SML 201. ISC 335 offers an alternative to CHM 303 and 304/304B. ISC 326 offers an alternative to MOL 342. Students cannot receive credit for both an ISC course and its alternative. For full course descriptions and more information, see the integrated science website.

### Approved Courses for Departmental Credit

See the departmental website for an up-to-date list of approved departmentals. Other courses may be approved upon consideration by the departmental undergraduate committee.

### Program in Biophysics

The biophysics certificate program is designed for students with strong interests in molecular biology and physics who wish to combine these two subjects in their junior and senior independent work. The program offers a combination of courses and interdisciplinary research that meet the requirements of the physics or molecular biology departments, and entry requirements of graduate schools in both physics and molecular biology. Courses are chosen with the help of advisers in the Departments of Physics and Molecular Biology. Students are admitted to the program once they have chosen their field of concentration and consulted with the program director, who will assign them an adviser.

### Program in Global Health and Health Policy

The global health and health policy certificate program is an interdepartmental program in which undergraduates can study the determinants, consequences, and patterns of disease across societies; the role of medical technologies and interventions in health improvements; and the economic, political, and social factors that shape domestic and global public health. In addition to the core departmental courses, molecular biology concentrators should take GHP 350 by the end of junior year and GHP 351 by the end of senior year. Most upper-level MOL courses fulfill the requirements for the global health and health policy certificate.

### Program in Neuroscience

The neuroscience certificate program is designed for undergraduates with strong interests in neuroscience who wish to pursue an interdisciplinary study of the brain in their senior independent work. The program encourages the serious study of molecular, cellular, developmental and systems neuroscience as it interfaces with cognitive and behavioral research. The program offers a combination of courses and interdisciplinary research that meet the requirements of the molecular biology and psychology departments. Students in the neuroscience certificate program will be prepared to meet the entry requirements of graduate schools in neuroscience, as well as molecular biology or psychology.

### Program in Quantitative and Computational Biology

The quantitative and computational biology certificate program is designed for students with a strong interest in multidisciplinary and systems-level approaches to understanding molecular, cellular, and organismal behavior. The curriculum introduces the students to experimental and analytic techniques for acquisition of large-scale quantitative observations, and the interpretation of such data in the context of appropriate models. Strong emphasis is placed on using global genome-wide measurements to understand physiological and evolutionary processes. The required courses provide a strong background in modern methodologies in data analysis, interpretation, and modeling.
Courses

MOL 101 From DNA to Human Complexity (also STC 101)  Spring STL
This lecture and laboratory course will acquaint non-biology majors with the theory and practice of modern molecular biology, with a focus on biological topics of current public interest. Topics include: structure of DNA, RNA, proteins, genomes and an overview of state-of-the-art technologies including cloning, recombinant DNA and PCR. The course will address how recent scientific advances affect issues relevant to human biology including forensics, stem cells, molecular evolution and the genetic basis of human traits and behaviors such as obesity and aggression. Three lectures, one three-hour laboratory. B. Bassler, E. Wieschaus, H. Thieringer

MOL 110 Neuroscience and Everyday Life (See NEU 101)

MOL 211 Life on Earth: Chaos and Clockwork of Biological Design (See EEB 211)

MOL 214 Introduction to Cellular and Molecular Biology (also EEB 214)  Fall/Spring STL
Important concepts and elements of molecular biology, biochemistry, genetics, and cell biology, are examined in an experimental context. This course fulfills the requirement for students majoring in the biological sciences and satisfies the biology requirement for entrance into medical school. Two 90-minute lectures, one three-hour laboratory. Staff

MOL 215 Quantitative Principles in Cell and Molecular Biology (also EEB 215 / CBE 215)  Fall STL
Central concepts and experiments in cellular, molecular, and developmental biology with an emphasis on underlying physical and engineering principles. Topics include the genetic code; energetics and cellular organization; communication, feeding, and signaling between cells; feedback loops and cellular organization; problems and solutions in development; the organization of large cellular systems, such as the nervous and immune systems. Satisfies the biology requirement for entrance into medical school. Prerequisites: AP biology, physics, and calculus. Three lectures, one three-hour laboratory. A. Korenykh, J. Toettcher, P. Felton

MOL 231 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 231)

MOL 232 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 232)

MOL 233 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 233)

MOL 234 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 234)

MOL 235 An Integrated, Quantitative Approach to Biochemistry and Neuroscience (See ISC 235)

MOL 236 An integrated, Quantitative Approach to Genetics and Genomics (See ISC 236)

MOL 301 Experimental Project Laboratory in Quantitative and Computational Biology (See QCB 301)

MOL 327 Immune Systems: From Molecules to Populations (See EEB 327)
MOL 330 Molecular Evolution (See EEB 320)

MOL 340 Molecular and Cellular Immunology Fall STN
A broad survey of the field of immunology and the mammalian immune system. The cellular and molecular basis of innate and acquired immunity will be discussed in detail. The course will provide frequent exemplars drawn from human biology in health and disease. A. Ploss

MOL 342 Genetics Spring STN
Basic principles of genetics illustrated with examples from prokaryote and eukaryote organisms with emphasis on classic genetic techniques. The evolving conception of the gene and genome will be the primary focus of the course. Selected advanced topics will include Drosophila developmental genetics, yeast cell biology, and human disease. Two 90-minute lectures, one class. Prerequisite: MOL 214/215, or permission of instructor. M. Abou Donia, G. Schupbach, M. Levine

MOL 345 Biochemistry (also CHM 345) Fall/Spring STN
Fundamental concepts of biomolecular structure and function will be discussed, with an emphasis on principles of thermodynamics, binding and catalysis. A major portion of the course will focus on metabolism and its logic and regulation. Prerequisites: MOL 214/215 and either CHM 304/304B or ISC 335. CHM 304/304B may be taken concurrently with MOL 345. Staff

MOL 348 Cell and Developmental Biology Spring STN
The mechanisms that underlie development of multicellular organisms, from C. elegans to humans, will be examined using biochemical, genetic and cell biological approaches. The course will investigate the roles that gene regulation, cell-cell communication, cell adhesion, cell motility, cell death, signal transduction and intracellular trafficking play in the commitment, differentiation and assembly of cells into specialized tissues. Two 90-minute lectures, one two-hour class. Prerequisite: MOL 214/215. R. Burdine, D. Devenport

MOL 350 Laboratory in Molecular Biology Fall STL
The major objective of the course is to introduce students to a variety of tools required to perform independent research in the field of molecular biology. While conducting original research, students will employ a number of techniques that are used by molecular biologists, molecular geneticists, and biochemists. Students will gain an understanding of how, when, and why certain techniques and skills are used in a research setting. In addition, students will learn to write a research report modeled on the scientific literature. One lecture, two three-hour laboratories. Prerequisite: MOL 214/215. B. Patterson, L. Wright

MOL 355 Introduction to Statistics for Biology (See EEB 355)

MOL 408 Cellular and Systems Neuroscience (See NEU 408)

MOL 410 Introduction to Biological Dynamics Not offered this year STN
Designed for students in the biological sciences, this course focuses on the application of mathematical methods to biological problems. Intended to provide a basic grounding in mathematical modeling and data analysis for students who might not have pursued further study in mathematics. Topics include differential equations, linear algebra,
difference equations, and probability. Each topic will have a lecture component and computer laboratory component. Students will work extensively with the computing package MATLAB. No previous computing experience necessary. Two 90-minute lectures, one laboratory. N.

_Wingreen, T. Gregor_

**MOL 414 Genetics of Human Populations (See EEB 414)**

**MOL 425 Infection: Biology, Burden, Policy (also WWS 355 ) Spring STN**
This course will examine fundamental determinants of human microbe interaction at the biological and ecological levels. The focus will be on major global infectious diseases, their burden of illness and policy challenges for adequate prevention and control. Each infectious agent will be discussed in terms of its biology, mechanisms of pathogenesis, and epidemiology, as well as strategies for its control. Specific emphasis will be placed on the public health aspects of each disease. Prerequisite: MOL 101/214/215, or permission of instructor. Two 90-minute lectures. 

_A. Mahmoud, T. Shenk_

**MOL 433 Biotechnology (also CBE 434 ) Fall STN**
This course will consider the principles, development, outcomes and future directions of therapeutic application of biotechnology, with particular emphasis on the interplay between basic research and clinical experience. Topics to be discussed include production of hormones and other therapeutic proteins, gene therapy, oncolytic viruses, and stem cells. Reading will be from the primary literature. Prerequisite: MOL 214/215. 

_J. Flint_

**MOL 435 Pathogenesis and Bacterial Diversity Not offered this year**
An examination of current topics exploring the microbial world with emphasis on signal transduction, and the molecular basis for bacterial diversity and their roles in bacterial pathogenesis. Topics will include the regulation of cell division and sporulation, quorum sensing, mechanisms of microbial differentiation, evolution of communicable diseases, molecular mechanisms of pathogenesis, and identification of virulence factor and immunization. Two lectures, one precept. Prerequisites: MOL214/215, or permission of instructor. 

_Staff_

**MOL 437 Computational Neuroscience (See NEU 437)**

**MOL 438 Biomolecular Engineering (See CBE 438)**

**MOL 440 Genome Integrity and Human Disease Fall STN**
This course deals with the basic science that led to the molecular understanding of human diseases associated with defects in genome maintenance, such as aging and cancer. The first two-thirds of each class is a group discussion of an assigned paper. The last third is a lecture-type introduction to the material for the next class. Topics include telomeres, trinucleotide repeats, fragile sites, transcriptional sources of genome instability, and massive genome rearrangements. Two 90-minute seminars. 

_V. Zakian_

**MOL 447 Neuroimmunology: Immune Molecules in Normal Brain Function and Neuropathology (also NEU 447 ) Spring STN**
In this course, we will explore the diverse and complex interactions between the brain and the immune system from the perspective of current, cutting-edge research papers. In particular, we will focus on the molecular mechanisms of these interactions and their role in brain development and function as well as their potential contributions to specific neurological disorders, including autism. In the process, students will learn to read, critically evaluate, and explain in presentations the content of articles from the primary literature. Prerequisites: MOL 214/215. 

_L. Boulanger_
MOL 450 Stem Cells and Cell Fate Decision Processes in the Genomic Era  Not offered this year  Focuses on the current state of stem cell research and the future directions for this field. Stem cell research has great promise for the future of regenerative medicine. Very little is known about the molecular biology that underlies stem cell fate determination. The completion of the human and mouse genome sequences, together with novel technologies to observe global gene expression, offer unique opportunities to unravel stem cell regulatory mechanisms. Explores parallels to other, more mature biological systems. Two lectures, one preceptorial. Prerequisite: 342 and 348, or instructor's permission. Staff

MOL 455 Introduction to Genomics and Computational Molecular Biology (See QCB 455)

MOL 459 Viruses: Strategy and Tactics  Fall STN
Viruses are unique parasites of living cells and may be the most abundant, highest evolved life forms on the planet. The general strategies encoded by all known viral genomes are discussed using selected viruses as examples. The course covers the molecular biology (the tactics) inherent in these strategies. It also introduces the biology of engagement of viruses with host defenses, what happens when viral infection leads to disease, vaccines and antiviral drugs, and the evolution of infectious agents and emergence of new viruses. Three lectures, one two-hour preceptorial. Prerequisite: MOL 214/215 or permission of instructor. L. Enquist

MOL 460 Diseases in Children: Causes, Costs, and Choices (also STC 460 )  Fall
Within a broader context of historical, social, and ethical concerns, a survey of normal childhood development and selected disorders from the perspectives of the physician and the scientist. Emphasis on the complex relationship between genetic and acquired causes of disease, medical practice, social conditions, and cultural values. The course features visits from children with some of the conditions discussed, site visits, and readings from the original medical and scientific literature. Prerequisite: MOL 214/215. Two 90-minute classes. D. Notterman

MOL 470 Advanced Topics in Genetic Analysis  Not offered this year STN
The application of current tools of human genetics and genomic analysis including SNPs, copy number variants, HapMaps, high throughput DNA sequencing and DNA microarrays to perform genome-wide association studies of complex traits with an emphasis on neurological diseases including autism and schizophrenia. Covers recent evolution within the human species and genetic divergence of human populations in response to selective forces. Extensive use will be made of online genome databases as interactive tools for genome analysis. One three-hour seminar. Prerequisite: MOL 342. Staff

MOL 981 Junior Independent Work  Fall
No Description Available Staff
Department of Music

Chair
Wendy Heller

Departmental Representative
Donnacha M. Dennehy (fall)
Jamie Reuland (spring)

Director of Graduate Studies
V. Kofi Agawu (Musicology)
Dmitri Tymoczko (Composition)

Professor
V. Kofi Agawu
Wendy Heller
Steven Mackey
Simon A. Morrison
Daniel L. Trueman
Dmitri Tymoczko

Associate Professor
Barbara A. White

Assistant Professor
Rob C. Wegman

Assistant Professor
Donnacha M. Dennehy
Jamie Reuland
Juri Seo
Gavin Steingo

Senior Lecturer
Gabriel Crouch, University Glee Club, Chamber Choir
Rudresh Mahanthappa, University Jazz Ensembles
Michael J. Pratt, University Orchestra, University Opera Theater

Information and Departmental Plan of Study

The Department of Music encourages students to explore music according to their individual needs, interests, and aspirations. Students may pursue work in composition, music history, theory, analysis and interpretation, non-Western music, music technology, performance, and improvisation. Courses offered through the department cover this wide range of activities. Many courses are geared not only to majors but also to a variety of students involved with music and music making.

Advanced Placement

The Department of Music does not grant advanced placement exam credit. Freshmen who wish to enroll in a course where "any music course" is listed as a prerequisite must obtain the permission of the departmental representative or the course instructor.

Prerequisites

Students are expected to attain a certain competence in music theory before entering the department. This general prerequisite may be satisfied by the completion of 105, 106 or of 205, 206. Because certain upperlevel courses have as a prerequisite a year of music theory, students who are considering majoring in music are advised to take 105, 106 in their freshman year.
Early Concentration

Qualified students who have completed the departmental prerequisites early may be allowed to begin departmental concentration in the sophomore year.

Program of Study

Students majoring in music design their program in close consultation with the departmental representative. In addition to the two prerequisite courses (105, 106 or 205, 206), music majors are required to take a minimum of nine additional courses.

A second year of theory, 205, 206, is required. (In cases where 205, 206 has already been taken as a prerequisite, majors are expected to take two additional electives.) Also required are three courses chosen from those listed below under Group I (Western music history sequence), one course from Group II (non-Western and non-canonical music), and three additional electives at the 300 level or higher (with a strong recommendation that one of these be another theory course). Music majors in the performance program may use 213, 214, or 215 as a departmental course.

Group I (Western music history): 230, 232, 234, 236, 238, 240, 242

Group II (non-Western and noncanonical music): 250, 251, 254, 255, 257, 258, 259, 260, 262, 264, 265

Languages

Students planning graduate study in music should achieve reading and speaking proficiency in at least one foreign language. German, French, and Italian are most germane to the study of Western music. Some experience with composition software may also be of use.

Independent Work

Junior Independent Work. Juniors participate in a junior seminar their first semester. This weekly seminar is led by the departmental representative. Students in the seminar are responsible for various writing assignments, including one substantial paper. In the second semester, students either (1) write a research paper that allows them to explore the theoretical, historical, and analytical literature on music as well as develop their own ideas; or (2) write a substantial musical composition.

Senior Independent Work. The senior thesis may range from an extended essay on a musicology topic to a project in composition. The specific topic or project of the thesis is agreed upon in discussions with a faculty adviser.

Senior Departmental Examination

Departmental examinations are held after the submission of senior theses. The examination is broad in scope and covers a wide range of musical knowledge.
Study Abroad

Beginning in 2007, Princeton began a unique collaboration with the Royal College of Music in London, in which students have the opportunity to participate in a five-year double-degree program (A.B. and M.M.). Students spend the fall semester of the junior year in London. Interested current and prospective music majors should email the director of the Certificate Program in Musical Performance for further details.

Musicianship. Some training in musicianship is a component in the undergraduate theory courses, but it is expected that students will also work on aural and practical skills on their own. At least a minimal competence at the keyboard is expected of all music concentrators as well.

Other Academic Preparation: Students planning graduate study in musicology or theory should achieve reading and speaking proficiency in at least one foreign language, depending upon their areas of interest. Students with interests in composition may want preparation in engineering and computer science. Majors should discuss this with the departmental representative.

Instrumental and Vocal Lessons. The Department of Music has highly qualified professionals on the performance faculty who provide co-curricular instruction for a fee that is billed directly to the student's University account. Music majors and students in the Certificate Program in Music Performance also have the option of receiving academic credit for lessons by registering for Music 298-299. For details, see the Program in Music Performance. For further information, please contact Gregory Smith.

Performance for Departmental Concentrators. Serious students of music, whatever their particular interests or eventual orientation, need to have at least some experience in performing music. Music concentrators are expected to be pursuing some performance study by taking vocal or instrumental lessons. It is recommended that prospective concentrators without at least minimal keyboard skills study piano. Concentrators are also urged to participate in the ensembles conducted by department staff.

Technical, Electroacoustic, and Computer Facilities. The music department is equipped with complete facilities for recording, editing, creating, and processing sound. There are three studios: a central studio equipped with an SSL Nucleus control surface, a Macintosh computer, Pro Tools, Logic and Ableton Live software with a large supply of plug-ins, Max/MSP, most standard software packages, and surround-sound capabilities; two other studios have similar setups, with specialized video-editing equipment, and other specialized software. There is also a room dedicated to hardware construction with soldering stations and electronic components.

Courses

MUS 103 Introduction to Music LA

A listener's introduction to western musical styles from the middle ages to the present. The course is designed for students with no previous musical background and is taught essentially without musical notation. Emphasis is on guided analytic listening to selected works of Bach, Haydn, Mozart, and Beethoven. Two lectures, one class. S. Morrison, W. Heller, J. Reuland
MUS 104 When Music Is Made LA
An introduction to the fundamental materials of a variety of musics, including Western concert music, jazz, and popular music. Course activities center around interrelated theoretical, compositional, and analytical projects that serve to explore issues of music theory, style, and creativity. Two lectures, two preceptorials. D. Dennehy

MUS 105 Music Theory through Performance and Composition Fall LA
An introduction to the procedures, structures, and aesthetics of tonal music. Composing, singing, playing, analysis of music such as 18th-century chorale, and 18th- and 19th-century piano music. Emphasis on fluency in handling tonal materials as a means of achieving a variety of formal and expressive ends. Two lectures, two classes, one session in practical musicianship. D. Tymoczko, B. White

MUS 106 Music Theory through Performance and Composition Spring LA
An introduction to the procedures, structures, and aesthetics of tonal music. Composing, singing, playing, analysis of music such as 18th-century chorale, and 18th- and 19th-century piano music. Emphasis on fluency in handling tonal materials as a means of achieving a variety of formal and expressive ends. Two lectures, two classes, one session in practical musicianship. Prerequisite: ability to read music. D. Tymoczko, B. White

MUS 205 Species Counterpoint Fall LA
An introduction to the principles of voice leading and linear construction through a series of systematic compositional exercises. Two lectures, two classes. Prerequisite: 106 or equivalent. S. Mackey, D. Trueman, J. Seo

MUS 206 Tonal Syntax Spring LA
An introduction to the syntactic structure of the music of the 18th and 19th centuries through exercises in analysis and composition. Two lectures, two classes. Prerequisite: 205 or equivalent. S. Mackey, D. Trueman, J. Seo

MUS 210 Beginning Workshop in Musical Composition LA
A continuous cycle of creation, discussion, and response based on the creative musical activity of the students. Varieties of kind and style--notated composition, multimedia music, multitracking, and improvisation--are encouraged. Prerequisite: instructor's permission. Two 90-minute classes. S. Mackey, J. Seo

MUS 213 Projects in Instrumental Performance LA
Guides students in extended projects in performance. Prerequisite: instructor's permission. Staff

MUS 214 Projects in Vocal Performance LA
Guides students in extended projects in performance. Prerequisite: instructor's permission. Staff

MUS 215 Projects in Jazz Performance Fall LA
A performance course that focuses on the development of style, concept, and repertoire in the jazz idiom. Students are coached by faculty in extended projects in performance. One three-hour class. Staff
MUS 220 The Opera LA
An introduction to opera. Lectures deal with works by major composers, conventions of libretto poetry, singers and voice types, musical forms and dramatic pacing, and opera staging. Classes are devoted to close study of two works and the plays on which they were based. Two lectures, one class. Prerequisite: any music course, or some musical background, or instructor's permission. Open to freshmen. W. Heller

MUS 221 Choral Music (also REL 221) LA
A survey of vocal literature (excluding opera) from the early Middle Ages to the present. Relations between text and music are stressed. The classes are devoted to a close study of two or three works. Two lectures, one class. Prerequisite: instructor's permission. Staff

MUS 225 Instrumental Music: The Symphony from Haydn to Stravinsky LA
A study of the development of the symphony from its origins in the mid-18th century through the first half of the 20th. Representative works will be chosen for detailed study in the class meetings. Two lectures, one class. Prerequisite: any music course, some musical background, or instructor's permission. S. Burnham, W. Heller

MUS 230 Music in the Middle Ages (also MED 230) Fall LA
Major developments of Western music up to about 1400, including some of the following: the origin and growth of chant, its liturgical context and musical properties; medieval secular song; early polyphony and Parisian organum; the French *ars nova* and Machaut; the Italian *trecento*; English medieval music. Prerequisite: a year of theory or instructor's permission. R. Wegman

MUS 232 Music in the Renaissance LA
Introduction to the history and current scholarship of European music in the period 1400-1600. The principal thread is compositional history; in addition, the course includes extensive coverage of these topics: aesthetics, orality/literacy, improvisation, gender and sexuality. R. Wegman

MUS 234 Music of the Baroque LA
An introductory survey of style developments, aesthetic trends affecting music, and principal vocal and instrumental genres (opera, cantata, concerto, sonata, and suite) of the period 1600-1750. Major figures to be considered include Monteverdi, Schütz, Lully, Corelli, Vivaldi, Handel, and J. S. Bach. Two lectures, one preceptorial. Prerequisite: any music course or instructor's permission. W. Heller

MUS 236 Music of the Classical Period LA
This course provides a comprehensive introduction to the music of the Viennese Classical period. In addition to becoming familiar with some 20 musical works by Haydn, Mozart, and Beethoven, students will engage the cultural context of this music, including historical, aesthetic, and biographical issues. Includes units on the primary instrumental genres of the Classical style and concludes with a series of indepth analyses of large-scale works by each composer. Two lectures, one class. Staff

MUS 240 Musical Modernism 1890-1945 LA
An introduction to modern music, beginning with its origins in late Romanticism, up to World War II. Composers considered include Mahler, Stravinsky, Debussy, Ravel, and Berg. Topics range from urban centers for modern music (Paris and Vienna), the relationship of musical modernism to contemporary literature and visual arts, music
and politics, to the impact of recording technology and cinema on musical arts. Prerequisite: any music course, some classical music background, or instructor's permission. Two lectures, one preceptorial. S. Morrison

MUS 242 Music since 1945 LA
European and American music since World War II. Study of many recent approaches to music and their cultural, social, and philosophical bases. Topics include: postwar European avant-garde, American extensions of serialism, technological developments, influences of popular and folk cultures, American avant-garde. Prerequisite: any music course, some musical background, or instructor's permission. Two lectures, one preceptorial. D. Dennehy

MUS 251 Music and Film LA
An examination of the effect of different compositional practices and different sound technologies on the film viewer. The course will focus on three parameters of film music: music that has a visual point of origin on the screen (diegetic music), music that does not have a visual point of origin on the screen (nondiegetic music, also called background scoring), and music that floats between these two realms. Prerequisite: 103, or 105, or permission of instructor. One three-hour seminar. S. Morrison

MUS 258 Music of Africa (also AFS 258) LA
Introduction to the vocal and instrumental music of Africa south of the Sahara. Topics include the place of music in society, the influence of language on musical composition, principles of rhythmic organization, urban popular music, "art" music as a response to colonialism, and the impact of African music on the earliest forms of African American music. Two 90-minute lectures. V. Agawu

MUS 262 Introduction to the Evolution of Jazz Styles (also AAS 262) LA
An introduction survey examining the historical development of jazz from its African origins through the present. The course will place emphasis on the acquisition of listening skills and explore related musical and social issues. Staff

MUS 264 Urban Blues and the Golden Age of Rock LA
Examines post-World War II blues, rock music mostly of the late sixties and early seventies, and the connections between them. Explores wider musical and extramusical connections. Two lectures, one class. R. Wegman

MUS 308 Contemporary Music through Composition and Performance LA
An introduction to a variety of 20th-century approaches to composition. Emphasis on understanding different techniques, syntaxes, and musical languages through exercises in compositional emulations and in performance projects of student and studied works, using available performance skills of participants. Prerequisite: 206 or instructor's permission. One three-hour seminar, one preceptorial. S. Mackey, V. Agawu

MUS 309 Topics in Tonal Analysis LA
The course will deal closely with a small number of works from the tonal repertoire and will serve as a critical introduction to several pertinent and influential analytical methodologies, including motivic, formal, semiotic, and voice-leading analysis. The focus will be on the musical and aesthetic values that each method either enhances or attenuates. Prerequisite: 206 or instructor's permission. One three-hour seminar. V. Agawu, D. Trueman
MUS 310 Advanced Workshop in Musical Composition LA
An opportunity for students who have developed sufficient compositional skills to work on more extended and advanced projects. Three hours per week. S. Mackey, D. Dennehy

MUS 311 Jazz Theory through Improvisation and Composition I LA
An exploration of the melodic, harmonic, and rhythmic principles of the bebop paradigm. The course includes analysis of representative works by various jazz masters and will place a strong emphasis on student projects in improvisation and composition. Prerequisites: 105 or permission of instructor. Two 90-minute classes. Staff

MUS 314 Computer and Electronic Music through Programming, Performance, and Composition (also COS 314) QR
An introduction to the fundamentals of computer and electronic music in the context of the Princeton Laptop Orchestra (PLOrk). The music and sound programming language ChucK, developed here at Princeton, will be used in conjunction with Max/MSP, another digital audio language, to study procedural programming, digital signal processing and synthesis, networking, and human-computer interfacing. D. Trueman, J. Snyder

MUS 315 Transforming Reality by Computer (See COS 325)

MUS 316 Computer and Electronic Music Composition LA
Compositional projects involving computers and synthesizers. Some work may involve interactions between live and electronic sounds. Two 90-minute classes. Prerequisite: 314 or permission of instructor. D. Trueman, J. Snyder

MUS 325 Special Topics in Contemporary Practice (See DAN 304)

MUS 328 Special Topics in Performance Practice (See THR 330)

MUS 333 Bach and Handel LA
The contrasting careers and oeuvres of the two greatest representatives of the late baroque in music will be considered both individually and comparatively. Prerequisite: a year of theory or instructor's permission. W. Heller

MUS 339 Russian Music (also SLA 311) LA
A detailed survey of Russian national and international composers. Topics of discussion and analysis will include magic opera, realism, orientalism, the relationship between composers and poets of the Russian Symbolist era, the World of Art movement and the Ballets Russes, Soviet film music, Soviet arts doctrine, and musical aesthetics (especially as they pertain to authorship and identity). Prerequisites: 105 or permission of instructor. Two 90-minute classes. S. Morrison

MUS 430 Topics in History, Analysis, and Interpretation Fall LA
Topics chosen from, but not limited to: a group of works by a single composer (Leonin's organa,
Monteverdi's madrigals, Brahms's symphonies); a certain genre (19th-century choral works, Hindustani *Khayal*, contemporary rock, late 16th-century madrigal); a specific theoretical or historical problem (atonal theory, composers' sketches and musical analysis, the origins of opera). One three-hour seminar. *Staff*

**MUS 431 Topics in History, Analysis, and Interpretation**  
Spring LA  
Topics chosen from, but not limited to: a group of works by a single composer (Leonin's organa, Monteverdi madrigals, Brahms's symphonies); a certain genre (19th-century choral works, Hindustani *Khayal*, contemporary rock, late 16th-century madrigal); a specific theoretical or historical problem (atonal theory, composers' sketches and musical analysis, the origins of opera). One three-hour seminar. *Staff*
Program in Music Theater

Director
Stacy E. Wolf

Executive Committee
Jane F. Cox, Lewis Center for the Arts, Theater
Wendy Heller, Music
Michael J. Pratt, Music
Stacy E. Wolf, Lewis Center for the Arts, Theater
Tamsen O. Wolff, English

Associated Faculty
Michael W. Cadden, Lewis Center for the Arts, Theater
Gabriel Crouch, Music
Brian E. Herrera, Lewis Center for the Arts, Theater
Stanley N. Katz, Woodrow Wilson School
Rebecca J. Lazier, Lewis Center for the Arts, Dance
Steven Mackey, Music
Simon A. Morrison, Music
Paul B. Muldoon, Lewis Center for the Arts, Creative Writing

From opera to Broadway musicals to experimental music theater, the many hybrids of singing, acting, and movement are among the most historically significant, socially relevant, and artistically adventurous forms of performance. With a liberal arts education as its base, Princeton’s Certificate Program in Music Theater encourages students to explore music theater as an intensely collaborative art form, as a key component of world cultures, and as an entertainment genre that shapes and is shaped by history, economics, politics, and technology.

The Program in Music Theater encompasses Princeton’s curricular tripartite of creation, performance, and study. Students in the Program take courses in Music, Theater, and Dance, as well as related courses in other departments, taught by faculty across the university who compose, write, create, perform, and research music theater’s various forms that combine music, dance, text, and design. Additional classes are taught by guest artists. Students can create new music theater work, participate in music theater production, and/or produce new scholarship in music theater history, theory, and criticism.

Admission to the Program

The Program in Music Theater is open to juniors and seniors who are committed to music theater practice and/or scholarship. Students may begin taking courses that count toward certificate requirements in their first year at Princeton.

Program of Study and Requirements

To qualify for a program certificate, students are required to complete:

1) Five related courses
   - One course in theater
   - One course in music
   - One course in dance
   - Two courses, either academic or practice-based, the focus specifically on a form of music theater, including opera, American musical theater, and experimental music theater
2) Senior independent work

This work might take the form of creating a music theater piece: composing the music and/or writing the lyrics and/or writing the book. It might be the direction of a production, the performance of a major role, or the design or dramaturgy of a production, under the supervision of faculty and professional staff, independently, or in conjunction with another campus-producing organization. This work might be an independent scholarly paper or another music theater-oriented project.

If the student's department permits, the student might choose to complete one part of the departmental independent work (senior thesis) on a topic approved by the Program in Music Theater faculty dealing with some facet of music theater in relation to that department's subject matter. This independent work could take the form of a textual, cultural, or theoretical study; or it could be a combination of research and practical work supervised by the program faculty and the student's departmental adviser.

3) Tech hours requirement for the Program in Theater certificate. These are decided on a case by case basis depending on the Program in Theater's production needs. Students can work in the costume or scene shop, help to build a set or hang lights or locate props, stage manage, run a light or sound board, work on the run crew, or many other jobs. As a benchmark, serving as the stage manager on one production typically fulfills the Program in Theater's tech hours.

Program in Music Theater courses (We anticipate that at least five of these courses will be taught each year)

ATL 494/MUS 301: Sounding Boundaries: Interdisciplinary Alchemy in Music Theater; Making Comic Opera
(Note: Various other Atelier courses focus on music theater projects)
DAN 321: Special Topics in Dance History: Choreographers on Broadway
ENG 376 / THR 376: Curious Aesthetics: 20th Century American Musical Theatre
ENG 318/THR 310/MUS 338: The Musical Theatre of Stephen Sondheim
GSS 365/THR 365/ENG 365/AMS 365: Isn’t It Romantic? The Broadway Musical from Rodgers and Hammerstein to Sondheim
MUS 214: Projects in Vocal Performance (opera or music theatre topics)
MUS 220: The Opera
MUS 223: The Ballet
MUS 332: Monteverdi: Madrigal and Opera 1575-1650
MUS 335: Mozart’s Operas
MUS 337/GER 302: Wagner
MUS 513: Topics in 19th and Early 20th-Century Music—Modernism in Music and Dance
THR 366/MUS 366: Musical Theater and American Culture
THR 335/MUS 303: The Development of the Multi-Skilled Performer
THR 334: The Nature of Theatrical Reinvention
THR 341: Acting and Directing for Musical Theater
Program in Musical Performance

Director
Michael J. Pratt

Associate Director
Gabriel Crouch (Vocal Performance)
Rudresh K. Mahanthappa (Jazz Performance)

Executive Committee
Simon A. Morrison, Music
Michael J. Pratt, Music
Daniel L. Trueman, Music
Barbara A. White, Music
Stacy E. Wolf, Lewis Center for the Arts, Theater

The Program in Musical Performance provides an opportunity for students to develop their performing skills in the context of regular liberal arts study. One of the goals of the program is to enhance the study of performance through the study of theory, composition, and music history—and vice-versa. The program can provide a foundation upon which a student may build to go on to further professional performance training at the graduate level.

Admission to the Program

The two-year Program is open to rising juniors who can demonstrate in an audition a high level of proficiency in a performance medium such as an orchestral instrument, piano, electronic media, voice, or jazz. MUS 105-106 is a requirement for the certificate. Under special circumstances, a student may demonstrate equivalent knowledge through an examination by the course instructor. Students are urged to fulfill this requirement as early as possible, preferably in the freshman or sophomore year. Students wishing to wait until the senior year must obtain special permission from one of the directors.

Program of Study

Students are required to take two semesters of a department performance course. These include MUS 213 Projects in Instrumental Performance (chamber music), MUS 214 Projects in Vocal Performance (lieder or opera); MUS 215 Projects in Jazz Performance; MUS 216 Techniques of Conducting; MUS 218 Making Tunes; MUS 314 Computer and Electronic Music through Programming, Performance, and Composition; or MUS 316 Computer and Electronic Music Composition (electronic media performance). The department also offers MUS 298 and MUS 299, which consists of private studio study with department performance faculty. Both semesters, including a year-end jury, must be completed for credit. One completion of this sequence is required for program students, and it may count as one of the departmental performance courses if it proves impossible to enroll in two of the courses listed above. Other courses may also qualify to meet this requirement with the permission of one of the directors of the Program in Musical Performance. Students should consult with the program director in each area—instrumental, vocal, or jazz—for specifics questions regarding performance courses. Students must also complete at least two of the music courses required for the music major. Please look under the Department of Music for a list of these courses.

Independent Project. In the senior year each student will undertake a major performance project, which will be evaluated by members of the performance faculty. This may be in the form of a recital or other project relevant to a student's interests and needs. Where possible, the project will be coordinated with independent work in the student's major department.

Instrumental and Vocal Lessons. The Department of Music has highly qualified professionals on the performance faculty who provide co-curricular studio instruction subsidized by the department for students in the certificate
program for musical performance. Students are required to take vocal or instrumental lessons, with at least one year devoted to MUS 298-299.

**Participation in Music Department Ensembles.** Students in the program are required to participate in a music department performance ensemble (orchestra, glee club, jazz ensembles, or in the case of pianists, accompanying within the department) appropriate to their discipline.

**Certificate of Proficiency**

Students who fulfill the requirements of the program will receive a certificate of proficiency in musical performance upon graduation.
Department of Near Eastern Studies

Chair
Muhammad Q. Zaman

Assistant Professor
Jonathan M. Gribetz, also Judaic Studies
Lara Harb
Eve Krakowski, also Judaic Studies
Satyel K. Larson
M'hamed Oualdi, also History Daniel J. Sheffield

Departmental Representative
Jonathan M. Gribetz

Senior Lecturer
Nancy Coffin

Director of Graduate Studies
Lara Harb

Lecturer
Gregory J. Bell
Tarek Elsayed
Nilüfer Hatemi
Thomas Hefter
Amineh Mahallati
Philip Zhakevich

Professor
Michael A. Cook
M. Şükrü Hanoğlu
Bernard A. Haykel
Hossein Modarressi
Marina Rustow, also History
Muhammad Q. Zaman, also Religion

Associate Professor
Michael A. Reynolds
Cyrus Schayegh
Max D. Weiss, also History

Associated Faculty
Molly Greene, History, Hellenic Studies
Amaney A. Jamal, Politics
Michael F. Laffan, History
Lital Levy, Comparative Literature
Shaun E. Marmon, Religion

Information and Departmental Plan of Study

The Department of Near Eastern Studies offers a liberal arts major designed to give students competence in a Near Eastern language and a broad knowledge of the literatures, civilizations, politics, and history of the ancient, medieval, and modern Near East (comprising Afghanistan, the Arab countries, Central Asia, Iran, Israel, Muslim Africa, South Asia, and Turkey). Accordingly, a plan of study is built around departmental and cognate courses in history, literature, religion, law, anthropology, politics, economics, and public policy, combined with the study of one or more Near Eastern languages (Arabic, Hebrew, Persian, or Turkish), determined by the student's interest. In addition to serving as the focal point of a broad liberal arts education, the Near Eastern studies major can be the basis for graduate or professional study. The department's many small classes and seminars allow extensive student/teacher interaction and equip students to take up careers in business, finance, economics, international affairs, government, diplomacy, journalism and public policy.

For nonconcentrators the Department of Near Eastern Studies offers a range of courses that are relevant to the study of history, politics, religion, comparative literature, linguistics, and anthropology. Most undergraduate courses require no knowledge of a foreign language, and the department's survey courses present comprehensive portraits of past and present Near Eastern civilizations.
Departmental Courses and Programs. Departmental concentrators achieve a broad understanding of the varieties of regions, cultures, and religions of the Near East in the more distant past as well as in the modern period, and gain the tools of the multiple disciplines employed by scholars of Near Eastern Studies. The department’s curricular guidelines help ensure that students reach these objectives while also giving them significant flexibility to forge their own educational paths in the department.

For the Classes of 2018 and earlier: Students are strongly encouraged to fulfill the requirements below; please consult the 2015-2016 Undergraduate Announcement for the former requirements. Classes of 2019 and beyond: Students take eight courses in Near Eastern Studies; up to three of these courses may be from cognate departments, upon the approval of the Department Representative. All students are required to take NES 300 (Seminar in Research Methods). Students who plan to be abroad when the course is offered are encouraged to take the course before they leave campus. Juniors who are abroad when the course is offered may take the course in the Senior year. The remaining seven courses must satisfy the following requirements:

1. **Historical Periods:** Students are required to take at least one course that focuses on the pre-modern Near East and one course that focuses on the modern Near East.

2. **Regions:** Students are required to take at least one course on two of the following six sub-regions:
   a. Egypt, North Africa, and Andalusia
   b. The Levant, Iraq, and the Arabian Peninsula
   c. Ottoman Empire/Turkey
   d. Iran
   e. Muslim South and Central Asia
   f. Diasporic communities

3. **Disciplines:** Students are required to take at least one course in two of the following four disciplines:
   a. history
   b. literature
   c. social sciences
   d. religion

A single course may satisfy more than one requirement (e.g., a course focusing on 20th century Turkish literature may count as modern, Ottoman Empire/Turkey, and literature.) Students who wish to undertake a plan of study that
does not meet these guidelines must apply for a waiver from the Undergraduate Committee. Waivers will be granted only in exceptional cases.

Advanced Placement

Advanced placement is available in all of the languages offered by the department. Students seeking advanced placement in Arabic, Persian, or Turkish should consult the departmental representative to arrange for testing with the appropriate language instructor. A student with a Hebrew Subject Test score of 760 or a high score on the departmental Hebrew placement examination given during freshman orientation week will be considered to have satisfied the A.B. foreign language requirement and to be eligible for placement in a 300-level course.

Prerequisites

A student who has completed at least one course in the department is eligible to concentrate in Near Eastern studies. This course may be a language class or a course or seminar offered in any of the disciplines covered by the department.

Early Concentration

Students who meet the prerequisite for entrance into the department may be admitted and begin their program of concentration in the second term of sophomore year.

Language Requirements

The departmental language requirement is four terms (i.e., through 107 level) of Arabic, Hebrew, Persian, or Turkish. Students are advised to begin their language training as early as possible. Students are encouraged, albeit not required, to continue language study at the advanced level and to utilize their chosen Near Eastern language for senior thesis research. Language courses beyond the second year count as departmentals, as does elementary and intermediate study of a second Near Eastern language. The necessary language training for the A.B. degree can be acquired through a combination of language study at Princeton, intensive summer language study, and year abroad programs. The department will work out with each undergraduate concentrator a language training schedule appropriate to his or her planned course of study.

Independent Work

Juniors submit a proposal (including an outline and an annotated bibliography) for their Junior Independent Work in the fall semester and a completed Junior Paper in the spring semester. The choice of Junior Paper and Senior Thesis topics must be approved by the student's adviser.

Senior Departmental Examination

The comprehensive examination in the department consists of an oral examination based on the senior thesis and related topics.
Study Abroad

The department encourages students to consider a semester or year abroad for language and area study in the Middle East. The department also makes every effort to facilitate student participation in any of a number of excellent intensive summer language study programs in the U.S. and the Middle East. The Program in Near Eastern Studies offers support for students who wish to take advantage of such study opportunities.

Certificate in Language and Culture

The Department of Near Eastern Studies offers students the opportunity to earn a certificate in one of the area's languages and cultures while concentrating in another department.

Certificate Requirements. The certificate is open to undergraduates in all departments. Students should consult the departmental representative by the end of the sophomore year to plan a program of study. Ordinarily, students concentrating in language and literature departments, including comparative literature, will be eligible for the certificate in language and culture provided that: (a) the linguistic base for the language and culture certificate is different from the linguistic base of the concentration; and (b) the work required for the language and culture certificate does not duplicate the requirements of the major. Students pursuing area studies certificates may earn the certificate in language and culture provided that: (a) the courses they elect to satisfy the requirements of the area studies program are different from those they elect to satisfy the requirements of the language and culture certificate program; and (b) they submit a piece of independent work in addition to the independent work that satisfies the requirements of the area studies program and the home department. The requirements for work done in the Department of Near Eastern Studies are:

1. Studying one of the languages taught in the department--Arabic, Hebrew, Persian, Turkish--beyond the level required for completion of the University language requirement

2. Completing at least three departmental courses at the 300 level or higher in language, literature, or culture that involve extensive use of the designated language

3. Completing a piece of independent work that makes substantive use of a Near Eastern language. Most often this is a substantial research paper (approximately 7,000 words) written under the supervision of a member of the department.

In addition to 300- and 400-level language courses, any graduate courses open to qualified undergraduates, such as those listed below, may be used to satisfy the departmental requirements above:

In Arabic:
NES 529 (Readings in Modern Arabic Literature) NES 531/532 (Readings in Classical Arabic Literature)

In Hebrew:
NES 508 (Readings in Medieval Hebrew Literature)
NES 509 (Readings in Modern Hebrew Literature) NES 523 (Readings in Judeo-Arabic)
In Persian:
NES 539/540 (Studies in Persian Literature)

In Turkish:
NES 504 (Introduction to Ottoman Turkish)

Finally, a course in which the student arranges with the instructor to do substantial reading in his or her designated language may also count toward the certificate in language and culture. This includes all the literature in translation courses. This must be arranged on a case-by-case basis with the instructor involved.

Any questions regarding the certificate in language and culture should be addressed to the departmental representative in Jones Hall.

Courses

ARA 101 Elementary Arabic I      Fall
Students in this course will develop their skills in speaking, hearing, reading, and writing Modern Standard Arabic, the form of the Arabic language shared by all Arab countries. The course covers phonics, the alphabet and numerals, as well as noun-adjective agreement and how to form sentences using past and present tense verbs. Also covered: greetings and courtesy phrases in spoken Arabic. Five classes, one hour of drill. No credit is given for ARA 101 unless followed by ARA 102. Staff

ARA 102 Elementary Arabic II     Spring
Continuation of 101. Students will expand their language skills through conversational and grammatical exercises based on the audio-visual approach. Students will be able to speak and write simply and accurately about topics such as daily activities, studies, family members, and hopes and plans for the future. Five classes, one hour of drill. Staff

ARA 105 Intermediate Arabic I     Fall
Building upon the skills gained in 101 and 102, this course offers further practice in speaking and listening and increases proficiency in reading and writing. Topics to be covered include use of dual and feminine plural forms; conditional sentences; use of superlatives and comparatives; and the study of case markings in formal written Arabic. Five classes, one hour of drill. Staff

ARA 107 Intermediate Arabic II    Spring
Continuation of 105. Students will expand their reading, writing, speaking, and oral comprehension skills through oral and written exercises involving more sophisticated texts derived from authentic newspaper and journal sources. Five classes, one hour of drill. Staff

ARA 111 Colloquial Arabic I      Not offered this year
An introduction to a specific spoken dialect of the Arabic language. This course currently focuses on the Arabic dialects used in the Levant, especially Palestinian and Lebanese dialects. The material of the course is designed to

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promote functional usage of the language stressing vocabulary and grammar in conversation of everyday life. Four classes. *N. Coffin*

**ARA 113 Colloquial Arabic II**  
Not offered this year  
A continuation of ARA 111. Focusing on Arabic dialects used in the Levant, especially Palestinian and Lebanese dialects, the material of the course further develops functional usage of the language stressing vocabulary and grammar in conversation of everyday life. *N. Coffin*

**ARA 301 Advanced Arabic I**  
Fall  
Reading and accurate translation of numerous selections from modern Arabic works as well as reading for general understanding of simple prose, mostly from newspapers and magazines. Review of morphology, introduction to the systematic study of syntax. Speaking about the readings and about other assigned topics. English to Arabic translation. Emphasis on building vocabulary. Two 90-minute classes, two periods of drill. *Staff*

**ARA 302 Advanced Arabic II**  
Spring  
Continuation of 301. Class reading of more sophisticated discursive prose and short stories. Class discussion in Arabic of assigned texts not translated in class. Emphasis on the systematic study of syntax. Increased emphasis on speaking about a variety of topics. Arabic composition. Two 90-minute classes, two periods of drill. *Staff*

**ARA 401 Advanced Arabic Skills Workshop**  
Fall LA  
This course develops to a more advanced and natural level the linguistic skills of listening, speaking, and reading through the reading and class discussion of lengthy texts, primarily literary ones. Term papers written in Arabic provide the opportunity to improve composition, and aural comprehension is honed through the use of tapes of Arabic broadcasts, and through viewing films from various parts of the Arab world. Prerequisite: 302 or instructor's permission. Two 90-minute classes. *Staff*

**ARA 403 Topics in Arabic Language and Culture**  
Fall  
This course is designed as an advanced, fourth-year course in Arabic language and culture which may be repeated up to two times, provided the topic is different each time. The course is intended to appeal to students who prefer to study in an Arabic immersion environment, and all aspects of the course will be conducted in Arabic. *T. Elsayed*

**ARA 404 Topics in Arabic Language and Culture**  
Spring LA  
Introduces the conventions of major genres of history, belles-lettres and religious thought of the Abbasid era (750-1258 CE). Primary emphasis on reading comprehension and developing confidence in approaching classical sources. Conducted in Arabic, apart from translation exercises, and will also develop skills in writing, through projects, and speaking, through discussions and presentations. Course is divided into one or two-week units, focusing on excerpts from major texts. Students to complete major reading/writing project on a text of choosing. *T. Hefter*

**HEB 101 Elementary Hebrew I**  
Fall  
Introductory course develops skills of reading, speaking, comprehension, and writing through various techniques, with an emphasis on a solid grammatical basis and awareness of idiomatic usage of the language. Teaching materials include ones developed in Israel. Five classes. No credit is given for HEB 101 unless followed by HEB 102. *Staff*
HEB 102 Elementary Hebrew II      Spring
A continuation of 101, with emphasis on the development of all skills. The course will expose students to contemporary Israeli culture by using authentic material such as films, TV series, newspaper articles, and Web-based material. Class activities include role-playing, drills, group discussion, and oral presentations.

Five classes.  Staff

HEB 105 Intermediate Hebrew I      Fall
Expansion of reading, oral, aural, and written skills, as well as coverage of more advanced grammar. Students will be gradually introduced to contemporary Israeli prose and poetry. Maximum participation by students is encouraged through discussion of readings and films. Five classes.  Staff

HEB 107 Intermediate Hebrew II     Spring
A continuation of 105, covering remainder of grammar. Further explores contemporary Israeli prose, poetry, and more complex essays from textbooks and photocopied material. Five classes.  Staff

HEB 301 Advanced Hebrew Language and Style I  Not offered this year LA
For advanced students, this course seeks to improve further the active command of written and spoken Hebrew through work with a variety of literary texts, styles, and artistic expressions, including film. Topics are selected to explore fundamental issues of Israeli culture and society. Prerequisite: 107 or instructor's permission. Two 90-minute classes.  Staff

HEB 302 Advanced Hebrew Language and Style II     Spring LA
Continuation of 301. Growing emphasis on individual and small group work. Students prepare final project of their choosing in consultation with instructor. Prerequisite: 301 or instructor's permission. Two 90-minute classes.  Staff

NES 201 Introduction to the Middle East (also HIS 223)  Fall HA
An overview of the history of the Middle East from the rise of Islam to the present day with a focus on the "core" of the Middle East, i.e., the region defined by present-day Turkey and Egypt to the west, Iran to the east, and Arabia to the south. Issues raised include difficulties in the study of foreign cultures, religion and society, the interplay between local and global processes, identity formation, and the Middle East in the broader world. One lecture, two classes.  C. Schayegh

NES 202 Contemporary Arabic Literature in Translation  Not offered this year LA
A survey of the literature of the modern Arab world, starting with the late 19th century and continuing up to within the last five years. Narrative (novel and short story), theater, poetry, as well as (briefly) folk literature will be treated. Works are assigned in English translation, but students who are able to read them in Arabic are welcome to do so. Two lectures, one preceptorial. Offered in alternate years.  N. Coffin

NES 205 The Art and Archaeology of the Ancient Near East and Egypt (See ART 200)

NES 214 Masterworks of Hebrew Literature in Translation (also JDS 214)  Not offered this year LA
An introduction to modern Hebrew literature, represented by selected translations from major works of the last hundred years, in prose (Agnon, Almog, Izhar, Kahana-Carmon, Mendele, Oz, and Yehoshua) and in poetry (Alterman, Amichai, Bialik, Rabikovitch, Zach, and others). Two 90-minute classes.  Staff
NES 220 Jews, Muslims, and Christians in the Middle Ages (also HIS 220 / JDS 220 / MED 220 ) Not offered this year HA
An introduction to the history and culture of the Jews in the Middle Ages (under Islam and Christendom) covering, comparatively, such topics as the interrelationship between Judaism and the other two religions, interreligious polemics, political (legal) status, economic role, communal self-government, family life, and cultural developments. Two 90-minute classes. Staff

NES 230 Early Islamic Art and Architecture (See ART 230)

NES 232 The Arts of the Islamic World (See ART 232)

NES 235 In the Shadow of Swords: Martyrdom and Holy War in Islam (See REL 235)

NES 236 Introduction to Islam (See REL 236)

NES 240 Muslims and the Qur'an (also REL 240 ) Fall EM
A broad-ranging introduction to pre-modern, modern, and contemporary Islam in light of how Muslims have approached their foundational religious text, the Qur'an. Topics include: Muhammad and the emergence of Islam; theology, law and ethics; war and peace; mysticism; women and gender; and modern debates on Islamic reform. This course examines the varied contexts in which Muslims have interpreted their sacred text, their agreements and disagreements on what it means, and more broadly, their often competing understandings of Islam and of what it is to be a Muslim. Three classes. M. Zaman

NES 245 The Islamic World from its Emergence to the Beginnings of Westernization (also HIS 245 / MED 245 ) Not offered this year HA
Begins with the formation of the traditional Islamic world in the seventh century and ends with the first signs of its transformation under Western impact in the 18th century. The core of the course is the history of state formation in the Middle East, but other regions and themes make significant appearances. The course can stand on its own or serve as background to the study of the modern Islamic world. Two 90minute classes. M. Cook

NES 265 Political and Economic Development of the Middle East (also POL 268 ) Not offered this year SA
Provides a framework for understanding the political and economic issues that both challenge and encourage development in the Middle East and Northern Africa. Students will think creatively about the issues raised by designing a development project aimed at tackling a specific problem in a Middle Eastern country. Two lectures, one preceptorial. Staff

NES 268 Political Islam (also POL 376 ) Not offered this year HA
For decades scholars predicted that as nations modernized, religion and its corresponding institutions would become increasingly irrelevant. No phenomenon has discredited the secularization thesis more than the powerful resurgence of Islamist movements that began in the 1970s. Given the rapid social and economic development experienced by most Muslim countries, why has political Islam emerged as the most potent force of political opposition in all of these countries? To address this question, the course examines the origins and discourse of political Islam and the goals and organization of Islamist groups. Two lectures, one preceptorial. Staff
NES 269 The Politics of Modern Islam (also POL 353) Not offered this year HA
An examination of the political dimensions of Islam, involving a study of the nature of Islamic political theory, the relationship between the religious and political establishments, the characteristics of an Islamic state, the radicalization of Sunni and Shi'i thought, and the compatibility of Islam and the nation-state, democracy, and constitutionalism, among other topics. Students will be introduced to the complex and polemical phenomenon of political Islam, using examples drawn mainly, though not exclusively, from cases and writings from the Middle East. Two lectures, one preceptorial. B. Haykel

NES 305 Modern Worlds of Islam (See HIS 336)

NES 315 War and Politics in the Modern Middle East Not offered this year SA
Drawing on case studies of Middle Eastern wars, this course examines the changing nature of warfare from the second half of the 20th century through the present day. It begins with Clausewitz's theory of war and examples of conventional state warfare in the Middle East, then moves on to cases of insurgency and so-called fourth generation warfare and uses them to test Clausewitz's ideas and less state-centric alternatives. Two 90-minute classes. M. Reynolds

NES 322 Politics of the Middle East (See POL 364)

NES 334 Modern Islamic Political Thought (also REL 334) Not offered this year EM
An examination of major facets of Islamic political thought from the late 19th century to the present in a broadly comparative framework and against the backdrop of medieval Islamic thought. Topics include: the "fragmentation" of religious authority and its consequences for Muslim politics; conceptions of the shari'a and of the Islamic state; and Islamist discourses on gender, violence, and relations with non-Muslims. One three-hour seminar. M. Zaman

NES 336 Pilgrimage, Travel, and Sacred Space: Muslims, Christians, and Jews in the Land of Islam (See REL 336)

NES 337 The Making of the Modern Middle East (also HIS 334) Not offered this year HA
An introduction to the political, social and cultural history of the Arabic-speaking Middle East, in addition to Iran, Israel, and Turkey from the late 19th century until the turn of the 21st century. Topics covered include: the end of the Ottoman and Qatar Empires; the integration of the Middle East into the world economy; the establishment of the Middle East state system; the development of political institutions, ideologies and religious revivalist movements; nationalism; women's movements; gender; the spread of political Islam; as well as literature, film and other forms of media. Two lectures, one preceptorial. M. Weiss

NES 338 The Arab-Israeli Conflict (also JDS 338/HIS 349) Spring HA
The history of the Arab-Israeli conflict up to 1967. Due to its contentious theme, it stresses historiographic problems and primary sources; also, it looks at Israeli and Palestinian societies as much as at the conflict between them. Questions include the ideological vs. practical roots of, and religious/secular elements in, Zionism and Palestinian nationalism; politico-economic links between the two societies; breaks in their social and/or ethnic composition; the effects of collective traumas and warfare on socio-political structures and gender; and the role of foreign powers and regional states. Two lectures, one preceptorial. J. Gribetz
NES 339 Introduction to Islamic Theology (also REL 339)  Fall HA
A general survey of the main principles of Islamic doctrine. Focuses on the Muslim theological discourse on the concepts of God and God's attributes, man and nature, the world to come, revelation and prophethood, diversity of religions, and the possibility and actuality of miracles. One three-hour seminar.
H. Modarressi

NES 340 Islam in India and Pakistan (See REL 338)

NES 343 Southeast Asia's Global History (See HIS 342)

NES 345 Introduction to Islamic Law  Spring SA
A survey of the history of Islamic law, its developments, and the attempts of the Muslim jurists to come to terms with the challenges of modern time. The course will focus on the issues of constitutional, public, international, and personal laws that have the greatest relevance to the modern era. One three-hour seminar. H. Modarressi

NES 347 Islamic Family Law  Not offered this year SA
Examines the outlines of Islamic family law in gender issues, sexual ethics, family structure, family planning, marriage and divorce, parenthood, and child guardianship and custody. Provides a general survey of the Islamic legal system: its history and developments, structure and spirit, and the attempts of the Muslim jurists to adapt law to changing times. One three-hour seminar. H. Modarressi

NES 348 Islamic Ritual Laws  Not offered this year SA
Examines the outlines of Islamic ritual law. Starting with a general survey of pre-modern Islamic legal discourse, the course focuses on such issues as Islamic festivals, religious birth and death rituals, the concepts of worship and sacrifice, and various Islamic acts of devotion in matters such as prayer, fasting, almsgiving, and annual pilgrimage to Mecca. One three-hour seminar. H. Modarressi

NES 356 Moses and Jesus in the Islamic Tradition (See REL 335)

NES 358 Modern Turkey  Not offered this year HA
An examination of changes currently affecting the Republic of Turkey, including internal and external problems precipitated by factors such as rapid urbanization, growing ethnic conscience, and regional instability. Two 90-minute classes. Staff

NES 363 Islamic Social and Political Movements (also ANT 363)  Not offered this year SA
An introduction to the vast number of Islam-inspired sociopolitical movements. An attempt is made to present the contemporary movements in the light of the Islamic tradition of rebellion and revolution. Islamic movements will be surveyed against the historical and social context in which they occurred, with emphasis on the Arab World and Iran. Questions will be raised about the ways in which these movements have been approached and interpreted. Two 90-minute classes. Staff
NES 365 Modern Iran  Not offered this year HA
A general introduction to Iran in the period from the establishment of the Qajar dynasty in the late 18th century to the present day. Particular emphasis will be given to the social and cultural development of Iran under the stimulus of its contacts with the West. Two lectures, one preceptorial. Offered in alternate years.
C. Schayegh

NES 380 Politics and Society in the Arabic Novel and Film (See COM 380)

NES 404 Special Topics in Regional Studies (See ANT 404)

NES 416 Nation, State, and Empire: The Ottoman, Romanov, and Hapsburg Experiences (also HIS 434)
Not offered this year HA
An exercise in comparative history and the application of theoretical constructs to historical events. Examines a range of theories of nationalism, state, and empire; applies them to the historical records of three multi-ethnic dynastic empires—the Ottoman, Russian, and Austro-Hungarian; explores the ways in which theories can both elucidate and obscure historical processes. Questions of the nature of empire, the rise of nationalism, and the processes of imperial collapse, among others, will be explored. One three-hour seminar. M. Reynolds

NES 419 Topics in History of Modern Syria (See HIS 419)

NES 428 Representation of Faith and Power: Islamic Architecture in Its Context (See ART 438)

NES 433 Imperialism and Reform in the Middle East and the Balkans (also HIS 433)
Fall HA
The major Near Eastern and Balkan diplomatic crises, the main developments in internal Near Eastern history, and the Eastern Question as perceived by the Great Powers. The focus will be on the possible connections between diplomatic crises and the process of modernization. One three-hour seminar. M. Hanioglu

NES 435 The Madrasa: Islam, Education, and Politics in the Modern World (also REL 435)
Not offered this year EM
Since 9/11, madrasas have often been viewed as sites of indoctrination into Islamic radicalism. This seminar seeks to examine the broad range of institutions to which the term "madrasa" refers in modern Muslim societies, as well as other related institutions of Islamic education. Addresses the transformations they have undergone since the 19th century, and how these institutions shape and are shaped by Muslim politics in varied contexts. One three-hour seminar. M. Zaman

NES 437 The Ottoman Empire, 1300-1800 (also HIS 337 / HLS 337)
Not offered this year HA
An analysis of political, economic, and social institutions with emphasis on the problems of continuity and change, the factors allowing for and limiting Ottoman expansion, and Ottoman awareness of Europe. Two 90-minute classes. Staff

NES 438 The Late Ottoman Empire  Spring HA
An examination of the Westernization movement; administrative reforms; Young Ottoman, Young Turk, and ethnic-nationalist movements; great diplomatic crises of the 19th and 20th centuries; emergence of modern Turkish republic; and the consequences of the Ottoman collapse. Two 90-minute classes. Offered in alternate years. M. Hanioglu
PER 101 Elementary Persian I  Fall
Introduction to Persian language and culture. By the end of the semester, students will have an overview of Persian grammar and will be able to read and converse in Persian at a basic level. Class activities include group discussions, skits, short stories, oral presentations, and comprehension and grammar drills. Class instruction is supplemented with other media such as movies and online Persian news media. Five classes. No credit is given for PER 101 unless followed by PER 102. A. Mahallati

PER 102 Elementary Persian II  Spring
Continuation of 101 with a greater emphasis on reading, writing, and comprehension. By the end of the semester, most instruction will be delivered in Persian, and students will be able to communicate comfortably using everyday language and read more elaborate prose. Class instruction is supplemented with other media such as movies and online Persian news media. Five classes. A. Mahallati

PER 105 Intermediate Persian I  Fall
An introduction to modern Persian prose and poetry. The course introduces advanced grammar while developing communication skills through the discussion of modern and classic novels, movies, and online Persian media (news, weblogs, etc). This class will be conducted mainly in Persian. Prerequisite: 102 or instructor's permission. Five classes. A. Mahallati

PER 107 Intermediate Persian II  Spring
Continuation of 105. Reading and discussion of selected works by major authors. This class will be conducted mainly in Persian. Five classes. A. Mahallati

PER 301 Introduction to Classical Persian Literature  Not offered this year LA
An introduction to the language of classical Persian literature. Intensive reading and discussion of texts by major poets and writers from Rudaki to Hafez. Texts will vary from year to year. Prerequisite: 107 or instructor's permission. Three classes. Staff

PER 302 Advanced Persian Reading I  Fall
Aimed at developing proficiency in reading and communication in Persian, using materials written for native speakers. Texts used include classical Persian novels, modern works, and Persian translations of classical Western works such as Le Petit Prince and Les Miserables. This class will be conducted entirely in Persian. Prerequisite: two years of Persian or instructor's permission. Two 90-minute classes. A. Mahallati

PER 303 Advanced Persian Reading II: Modern Persian Prose  Not offered this year
Continuation of 302. This course is designed to improve students' proficiency in the reading and comprehension of a variety of Persian texts. Prerequisite: two years of Persian or instructor's permission. Two 90-minute classes. A. Mahallati

TUR 101 Elementary Turkish I  Fall
A performance-oriented, multimedia introductory course in modern spoken and written Turkish. Based on authentic input, grammatical properties of the language are introduced. Language skills are developed through communicative activities in class and individualized work with interactive learning aids. Five classes; laboratory required. No credit is given for TUR 101 unless followed by TUR 102. N. Hatemi
TUR 102 Elementary Turkish II       Spring
A continuation of 101. Coverage of basic grammar. There will be a growing emphasis on Turkish culture, reading, and increasing vocabulary. Final exam includes an oral interview. Five classes; laboratory work required. Prerequisite: 101. Students who complete 102 normally place into 105. N. Hatemi

TUR 105 Intermediate Turkish I       Fall
Building on students' knowledge, this course aims to further all language skills through extensive exposure to current news, authentic multimedia sources, and close reading of graded authentic materials. Weekly modules to reinforce more complex language structures. Prerequisite: 102 or permission of the instructor. Five classes; laboratory work recommended as needed. N. Hatemi

TUR 107 Intermediate Turkish II       Spring
A continuation of 105. Emphasis on developing all language skills and cultural understanding. Review of grammar as needed. In addition to exposure to current events, students will be introduced to modern Turkish literature, with close reading of selected prose and poetry. Final exam includes an oral interview. Five classes; laboratory work recommended as needed. N. Hatemi
Program in Near Eastern Studies

Director
Cyrus Schayegh

Executive Committee
John Borneman, Anthropology
Michael A. Cook, Near Eastern Studies
M. Şükrü Hanioğlu, Near Eastern Studies
Amaney A. Jamal, Politics

The Program in Near Eastern Studies provides students in any department of the University the opportunity to study the languages, modern history, and contemporary institutions of the Near East. Its purpose is to enhance a liberal education and to offer additional training for students who plan a career in that area. For this program, the Near East is defined as the entire Arab world and the present-day states of Iran, Israel, and Turkey.

Admission to the Program

Students may enter the program through the departments of anthropology, East Asian studies, economics, history, Near Eastern studies, politics, religion, or sociology, or the Woodrow Wilson School of Public and International Affairs. Students from other departments who have an interest in Near Eastern studies may enter the program by special arrangements with the director. Students must meet the entrance requirements of the selected department in addition to those of the program.

Program of Study

The student's plan of study is guided and given coherence by the departmental adviser and the director of the program. The specific courses are described in this site for each of the cooperating departments listed above. In general, students follow the plan of study of their department; the Woodrow Wilson School student in the program selects the Near East in the modern world as a field of concentration. The requirements of the program are as follows:

Language: Students who have had no relevant language training will take at least two years of Arabic, Hebrew, Persian, or Turkish language as elective courses.

History: All students will take, as departmental courses, at least one appropriate history course in the Department of Near Eastern Studies. Students in the Department of History will take at least two such courses.

Social Sciences: All students will take at least two courses treating the Near East that are chosen from the offerings of the departments of anthropology, Near Eastern studies, politics, religion, and sociology, and the Woodrow Wilson School.

Junior independent work is divided between the student's department and the program.

The senior thesis is written on a Near Eastern subject under the supervision of a Near Eastern specialist in the appropriate department and the program.
Students take the regular senior departmental examination given by their department, except that a portion of it deals with the Near Eastern fields studied. These examinations are described in the sections of this catalog for each department.

Languages

Students are encouraged to begin the study of a Near Eastern language as early as possible in order to enable them to continue it beyond the required minimum and, if desired, to offer it to meet the language requirement for the A.B. The program also encourages qualified students to enroll in summer sessions in Near Eastern languages.

Study Abroad

For a student whose career plans make it appropriate, the program encourages an intervening year abroad devoted to intensive study of a Near Eastern language and society. This additional year would be spent at a university or other center in the Near East. Upon returning, the student would resume regular studies at Princeton as a member of the junior class. The program will nominate students on the basis of ability.

Students of demonstrated ability who are interested in the Arab world are encouraged to apply to the Center for Arabic Study Abroad, located at the American University in Cairo and governed by a group of universities of which Princeton is one. For students interested in other Near Eastern languages, appropriate arrangements will be made wherever possible.

Certificate of Proficiency

A student who completes the requirements of the program with satisfactory standing receives a certificate of proficiency in Near Eastern studies. A student who satisfactorily completes the intervening year abroad will have this fact noted on the certificate.
Program in Neuroscience

Director
Uri Hasson, Co-Director
H. Sebastian Seung, Co-Director

Executive Committee
Michael J. Berry, Molecular Biology, Princeton Neuroscience Institute
Lisa M. Boulanger, Princeton Neuroscience Institute
Carlos D. Brody, Molecular Biology, Princeton Neuroscience Institute
Timothy J. Buschman, Psychology, Princeton Neuroscience Institute
Jonathan D. Cohen, Psychology, Princeton Neuroscience Institute
Nathaniel D. Daw, Princeton Neuroscience Institute, Psychology
Lynn W. Enquist, Molecular Biology, Princeton Neuroscience Institute
Asif A. Ghazanfar, Psychology, Princeton Neuroscience Institute
Elizabeth Gould, Psychology, Princeton Neuroscience Institute
Michael S. Graziano, Psychology, Princeton Neuroscience Institute
Uri Hasson, Psychology, Princeton Neuroscience Institute
Barry L. Jacobs, Psychology, Princeton Neuroscience Institute
Sabine Kastner, Psychology, Princeton Neuroscience Institute
Carolyn McBride, Ecology and Evolutionary Biology, Princeton Neuroscience Institute
Mala Murthy, Molecular Biology, Princeton Neuroscience Institute
Yael Niv, Psychology, Princeton Neuroscience Institute
Kenneth A. Norman, Psychology, Princeton Neuroscience Institute
Jonathan W. Pillow, Psychology, Princeton Neuroscience Institute
H. Sebastian Seung, Computer Science, Princeton Neuroscience Institute
David W. Tank, Molecular Biology, Princeton Neuroscience Institute
Samuel S. H. Wang, Molecular Biology, Princeton Neuroscience Institute
Ilana B. Witten, Psychology, Princeton Neuroscience Institute

Associated Faculty
William Bialek, Physics, Lewis-Sigler Institute for Integrative Genomics
Elizabeth R. Gavis, Molecular Biology
Alan Gelperin, Molecular Biology, Princeton Neuroscience Institute
Coleen T. Murphy, Molecular Biology, Lewis-Sigler Institute for Integrative Genomics
Joshua W. Shaevitz, Physics, Lewis-Sigler Institute for Integrative Genomics
Jordan A. Taylor, Psychology
Nicholas B. Turk-Browne, Psychology

The Program in Neuroscience is offered by the Princeton Neuroscience Institute. The neuroscience certificate program is designed for undergraduates with strong interests in pursuing an interdisciplinary study of the brain. The program encourages the serious study of molecular, cellular, developmental, and systems neuroscience as it interfaces with cognitive and behavioral research. Current neuroscience research examples at Princeton include: plasticity and timing-dependent learning rules at synapses, coincidence detection and computation in dendrites, adaptation and pattern detection in neural circuits, cellular and circuit mechanisms of short-term memory, sensory-motor...
transformations in the cerebral cortex, neural stem cells in the adult brain, viral infections of the nervous system, brain-imaging studies of cognitive functions such as attention and memory in human subjects, and mathematical and computational analysis of neural network function.

The program offers a combination of courses and interdisciplinary research that meet the requirements of the molecular biology and psychology departments. Students majoring in other disciplines are also encouraged to enroll in the program. A course of study tailored to the requirements of their home department can be designed with the help of the program directors. In the past, students from a wide range of majors -- including engineering, economics, chemistry, art history, English, and music -- have successfully completed the neuroscience certificate program. Students in the neuroscience certificate program will be prepared to meet the entry requirements of graduate schools in neuroscience, as well as molecular biology or psychology. A certificate in neuroscience is awarded to students who successfully complete the program.

Admission to the Program

Students are admitted to the program by filling out an enrollment form that can be found on our website.

Program of Study

Students in the Program in Neuroscience pursue a course of study built upon their departmental concentration that consists of the curriculum listed below, plus junior and senior independent work in neuroscience. Program courses may not be taken Pass/D/Fail.

Note: Independent Work will no longer be required beginning with the Class of 2017.

Prerequisites:

One year of calculus: MAT 103 and MAT 104
One semester of statistics in any department can be substituted for a semester of calculus
Higher math can also be substituted for calculus: MAT 201, 202, 203, or 204
Advanced placement credit for math is assessed according to the standards of the Math Department

Note: The math prerequisites will no longer be required beginning with the Class of 2017.

Neuroscience Requirements:

NEU201/PSY 258 Fundamentals of Neuroscience
NEU 202/PSY 259 Introduction to Cognitive Neuroscience

In addition to these two core courses, all students are expected to take at least four neuroscience electives. Students should consult the neuroscience certificate website for the list of neuroscience electives. In recognition that neuroscience is an interdisciplinary program whose excitement lies in new and changing areas at the interface of biology, psychology, and other related disciplines, alternative programs of study may be arranged at the discretion of the program directors and the Neuroscience Curriculum Committee.
Independent Work

Junior and Senior Independent Research

Independent research topics can be laboratory or theoretical research projects. All neuroscience certificate students must have their topic approved in advance by the program directors, in consultation with faculty advisers.

Juniors: Requirements for junior independent work are determined by each student's home department.

Seniors: A senior thesis in neuroscience is an important component of the neuroscience certificate program and is supervised by a faculty member affiliated with the Princeton Neuroscience Institute. For students concentrating in departments that make it impossible to do senior thesis research that fulfills both departmental and certificate program expectations, an additional research report will be required. This report must be co-advised by a faculty member affiliated with the Princeton Neuroscience Institute.

Note: Beginning with the Class of 2017 Independent Work is no longer be required.

Certificate of Proficiency

Students who fulfill all the requirements of the program will receive a certificate in neuroscience upon graduation.

Courses

NEU 101 Neuroscience and Everyday Life (also MOL 110 / STC 102) Not offered this year STL
Acquaints non-science majors with classical and modern neuroscience. Lectures will give an overview at levels ranging from molecular signaling to cognitive science with a focus on the neuroscience of everyday life, from the general (love, memory, and personality) to the particular (jet lag, autism, and weight loss). The laboratory will offer hands-on experience in recording signals from single neurons, examining neural structures, and analysis of whole-brain functional brain imaging data. Two 90-minute lectures, one laboratory. S. Wang, A. Gelperin

NEU 201 Fundamentals of Neuroscience (also PSY 258) Fall STN
This is a survey course in neurobiology which takes a mechanistic and reductionist perspective to cover important topics in the field, including the physiological basis of neural excitability, sensory and motor processing, learning and memory, and neuropsychiatric diseases. I. Witten

NEU 202A Introduction to Cognitive Neuroscience (also PSY 259A) Spring EC
An introduction to cognitive brain functions, including higher perceptual functions, attention and selective perception, systems for short- and long-term memory, language, cerebral lateralization, motor control, executive functions of the frontal lobe, cognitive development and plasticity, and the problem of consciousness. Major neuropsychological syndromes (e.g., agnosia, amnesia) will be discussed. Prerequisite: 258 or instructor's permission. Two 90-minute lectures, one preceptorial. M. Botvinick

NEU 202B Introduction to Cognitive Neuroscience (also PSY 259B) Spring STL
An introduction to cognitive brain functions, including higher perceptual functions, attention and selective perception, systems for short- and long-term memory, language, cerebral lateralization, motor control, executive functions of the frontal lobe, cognitive development and plasticity, and the problem of consciousness. Major
neuropsychological syndromes (e.g., agnosia, amnesia) will be discussed. Prerequisite: 258 or instructor's permission. Two 90-minute lectures, one three-hour laboratory. M.

Botvinick

NEU 260 The Life Cycle of Behaviors (See PSY 260)

NEU 301 Cellular Neurobiology (also MOL 310) Fall STN
This course will focus on understanding how neurons and the molecules they express contribute to brain function. Topics covered will include the structure and electrical properties of neurons, cell fate decisions, synapse formation and plasticity, neuromodulation, and the function of simple neural circuits. We will also discuss molecular and genetic tools for interrogating the nervous system. Examples will be drawn from studies of sensory system development and function in animals amenable to molecular and cellular level investigation. Students will have the opportunity to read and discuss primary literature throughout the course. M. Murthy

NEU 306 Memory and Cognition (See PSY 306)

NEU 314 Mathematical Tools for Neuroscience Spring
This lecture course will cover mathematical, statistical, and computational tools necessary to analyze, model, and manipulate neural datasets. A primary goal of the course will be to introduce students to key concepts from linear algebra, dynamical systems, and probability and statistics, with an emphasis on practical implementations via programming. Lectures on each topic will focus on relevant mathematical background, derivation of basic results, and examples relevant to neuroscience. The course will include problem sets based on the MATLAB software package. J. Pillow

NEU 316 The Cognitive Neuroscience of Selective Attention (See PSY 316)

NEU 325 Sensation and Perception (See PSY 345)

NEU 330 Introduction to Connectionist Models: Bridging between Brain and Mind (also PSY 330) Not offered this year STL
A fundamental goal of cognitive neuroscience is to understand how psychological functions such as attention, memory, language, and decision making arise from computations performed by assemblies of neurons in the brain. This course will provide an introduction to the use of connectionist models (also known as neural network or parallel distributed processing models) as a tool for exploring how psychological functions are implemented in the brain, and how they go awry in patients with brain damage. Prerequisite: instructor's permission. Two 90-minute lectures, one laboratory. K. Norman

NEU 331 Introduction to Clinical Neuropsychology: Case Studies in Cognitive Neuroscience (See PSY 331)

NEU 334 Neuroscience of Motivation and Reward (See PSY 334)

NEU 336 The Diversity of Brains (See PSY 336)

NEU 337 Neuroscience of Social Cognition and Emotion (See PSY 337)
NEU 338 Animal Learning and Decision Making: Psychological, Computational and Neural Perspectives (See PSY 338)

NEU 350 Laboratory in Principles of Neuroscience Spring STL
This course is designed to introduce undergraduate students to modern methods of analysis applied to single neurons, the synaptic connections between neurons and the dynamics of networks of neurons underlying learning and decision making. The course will include mammalian cellular and system neuroanatomy and the influence of experience on the production of new neurons. Students will learn modern methods of microscopy and the application of optogenetic approaches to analysis of neuronal function. Basic neuroscience concepts will be studied using both invertebrate and mammalian CNS preparations. A.

Gelperin, D. Tank

NEU 401 History of Neuroscience (See PSY 401)

NEU 403 Neurogenetics and Evolution of Behavior (See EEB 403)

NEU 406 Primate Posterior Parietal Cortex: Organization, Functions, and Pathology (See PSY 406) NEU 407 Sleep: From Molecules to Mattress (See PSY 407)

NEU 408 Cellular and Systems Neuroscience (also MOL 408 / PSY 404 ) Not offered this year STN A survey of fundamental principles in neurobiology at the biophysical, cellular, and system levels. Lectures will address the basis of the action potential, synaptic transmission and plasticity, local circuit computation, sensory physiology, and motor control. Prerequisites: MOL 214 or MOL 215, PSY 258, PHY 103-104, and MAT 103-104, or permission of instructor. Two 90-minute lectures, one preceptorial. T. Buschman, I.

Witten

NEU 410 Depression: From Neuron to Clinic (See PSY 410)

NEU 412 Motor Control and Learning (See PSY 412)

NEU 415 Advanced Topics in Learning & Memory: Cellular and Molecular Mechanisms (See PSY 415)

NEU 417 The Neural Basis of Goal-Directed Behavior (See PSY 417)

NEU 418 Neuroethics (See PSY 418)

NEU 425 Neuroeconomics (also PSY 425 )
This seminar focuses on the recent explosion of interest in understanding the neural basis of valuation and decision making, and the resulting marriage between the formal rigor of economics and the empirical basis of psychology and neuroscience, termed "neuroeconomics". We will approach the question of how the brain makes economic decisions from multiple perspectives, drawing on theoretical, behavioral, and neural data from economics, psychology, and neurobiology. Major topics include: decision under risk and uncertainty; the role of learning in evaluating options; choice mechanisms; and multiplayer interactions and social decision making. Y. Niv
The brain is more than a mere collection of its constituent parts. In this class we aim to understand how neurons interact together in local circuits and distributed brain dynamics to perform behaviorally relevant functions. The class will be organized into modules, which are selected to cover most of the major divisions of the brain. For most modules, we will first discuss a simpler circuit/system for which detailed mechanistic models and concrete ideas about function are known. Then, we will go on to discuss more complex systems, which are related to the simpler system. M. Berry II

NEU 437 Computational Neuroscience (also MOL 437 / PSY 437 ) Not offered this year STL
Introduction to the biophysics of nerve cells and synapses, and the mathematics of neural networks. How can networks of neurons compute? How do we model and analyze data from neuroscientific experiments? Data from experiments running at Princeton will be used as examples (e.g., blowfly visual system, hippocampal slice, rodent prefrontal cortex). Each topic will have a lecture and a computer laboratory component. Prerequisite: MOL 410, or elementary knowledge of linear algebra, differential equations, probability, and basic programming ability, or permission of the instructor. Two 90 minute lectures, one laboratory. C. Brody

NEU 447 Neuroimmunology: Immune Molecules in Normal Brain Function and Neuropathology (See MOL 447)

NEU 451 Genes, Brain, and the Human Mind (See MOL 451)

NEU 480 fMRI Decoding: Reading Minds Using Brain Scans (See ELE 480)
Neuroscience - A.B., through the Princeton Neuroscience Institute

**Director**
Jonathan D. Cohen
David W. Tank

**Departmental Representative** Asif A. Ghazanfar

**Director of Graduate Studies**
Carlos D. Brody

**Executive Committee**
Michael J. Berry, also Molecular Biology
Matthew M. Botvinick, also Psychology
Lisa M. Boulanger, Princeton Neuroscience Institute
Carlos D. Brody, also Molecular Biology
Timothy J. Buschman, also Psychology
Jonathan D. Cohen, also Psychology
Nathaniel D. Daw, also Psychology
Lynn W. Enquist, also Molecular Biology
Asif A. Ghazanfar, also Psychology
Elizabeth Gould, also Psychology
Michael S. Graziano, also Psychology
Uri Hasson, also Psychology
Barry L. Jacobs, also Psychology
Sabine Kastner, also Psychology
Carolyn McBride, also Ecology and Evolutionary Biology

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Philip J. Holmes, Mechanical and Aerospace Engineering
Coleen T. Murphy, Molecular Biology, Lewis-Sigler Institute for Integrative Genomics
Joshua W. Shaevitz, Physics and Lewis-Sigler Institute for Integrative Genomics
Jordan A. Taylor, Psychology
Alexander T. Todorov, Psychology
Nicholas B. Turk-Browne, Psychology

The Princeton Neuroscience Institute offers the neuroscience concentration for undergraduates with a strong interest in pursuing an in-depth study of the brain. Neuroscience is a broad interdisciplinary field requiring rigorous preparation in basic science. Students in this discipline are expected to understand the basic principles and approaches of modern neuroscience. The concentration provides an opportunity for the serious study of molecular, cellular, developmental, and systems neuroscience as it interfaces with cognitive and behavioral research. Since modern neuroscience is relying increasingly on quantitatively sophisticated methods and theory, students are also expected to gain competency in, physics, mathematics and computation. By offering a combination of courses and interdisciplinary research, students who complete the neuroscience concentration will be highly qualified to pursue graduate work at the best neuroscience, psychology or biology graduate programs and will also have completed, in large part, the background requirements to enter medical or veterinary school.
Information and Departmental Plan of Study Prerequisites

To enter the neuroscience concentration, students must have completed NEU 201 (formerly 258), NEU 202B (formerly 259B), MAT 103 and MAT 104.

Note: Your placement into or out of these MAT courses is decided by the Department of Mathematics.

Program of Study

In addition to the prerequisites for entry into the program, concentrators must complete the following:

1. NEU 350, Laboratory in Principles of Neuroscience
2. NEU 314, Mathematical Tools for Neuroscience (beginning spring, 2016)
3. PHY 101 and PHY 102, Introductory Physics I, and Introductory Physics II
   Note: Placement into or out of these Physics courses is decided by the Department of Physics.
4. Five NEU courses that in combination draw from at least three of the following subject areas:

I. Molecular/Cellular/Disease
   MOL/NEU 447, Neuroimmunology: Immune Molecules in Normal Brain Function and Neuropathology
   MOL/NEU 451, Genes, Brains, and the Human Mind
   MOL 459, Viruses: Strategy and Tactics
   NEU 301/MOL 310, Cellular Neurobiology
   NEU/MOL 403, Neurogenetics of Behavior

II. Neural Computation
   NEU/PSY 330, Introduction to Connectionist Models: Bridging between Brain and Mind
   NEU/MOL/PSY 437, Computational Neuroscience
   PSY/NEU 338, Animal Learning and Decision Making: Psychological, Computational and Neural Perspectives

III. Systems and Circuits
   NEU/MOL 403, Neurogenetics of Behavior
   NEU 427, Systems Neuroscience
   PSY/NEU 260, The Life Cycle of Behaviors
   PSY/EES/NEU 336, The Diversity of Brains
   PSY 345/NEU 325, Sensation and Perception
   PSY/NEU 422, Dynamics in Cognition

IV. Social and Cognitive Neuroscience
   ELE/NEU/PSY 480, fMRI Decoding: Reading Minds Using Brain Scans
   MOL/NEU 451, Genes, Brains, and the Human Mind
   NEU/PSY330, Introduction to Connectionist Models: Bridging between Brain and Mind
   NEU/PSY 425, Neuroeconomics
PSY/NEU 306, Memory and Cognition
PSY/NEU 331, Introduction to Clinical Neuropsychology: Case Studies in Cognitive Neuroscience
PSY/NEU 337, Neuroscience of Social Cognition and Emotion
PSY/NEU 338, Animal Learning and Decision Making: Psychological, Computational and Neural Perspectives
PSY/NEU 407, Sleep: From Molecules to Mattress
PSY/NEU 417, The Neural Basis of Goal-Directed Behavior
PSY/NEU 516, Brain Imaging in Cognitive Neuroscience Research

5. One 200-level or higher course in cell biology from the following list:
   MOL/EEB 214, Introduction to Cellular and Molecular Biology
   MOL/EEB 215/CBE 215, Quantitative Principles in Cell and Molecular Biology
   MOL 342, Genetics
   EEB/MOL 211, Life on Earth: Chaos and Clockwork of Biological Design

6. One 200-level or higher course in behavior from the following list:
   EEB 311A/B, Animal Behavior
   EEB 323, Integrative Dynamics of Animal Behavior
   PSY 252, Social Psychology
   PSY/CGS 254, Developmental Psychology
   PSY/CGS 255, Cognitive Psychology
   PSY/NEU 338, Animal Learning and Decision Making: Psychological, Computational and Neural Perspectives
   PSY345/NEU 325, Sensation and Perception*
   *Note: Cross-listed NEU courses will not count twice in the elective total

7. One course in quantitative thinking from the following list:
   SML 201, Introduction to Statistics and Machine Learning
   COS 126/EGR 126, General Computer Science

Independent Work

Junior Independent Work. In the fall semester of the junior year students participate in tutorials, read papers from the original literature, and prepare papers on assigned topics. In the spring term students carry out a second program of independent work with a faculty adviser with whom they will eventually do their senior thesis. In some instances this may include experimental work. A paper, in the form of a grant proposal, preparatory for the senior independent work, is due in early May.

Senior Independent Work. During the senior year each student, with the guidance of a faculty adviser, undertakes a major research effort. This research project can be a laboratory or independent study that will be written and presented as a senior thesis.

Senior Departmental Examination

Students are required to present their work to two thesis readers during an oral exam. The exam usually takes about one-half hour and students should be prepared to describe the background of the thesis, defend its contents, and...
propose future directions. The grade for the oral defense will be the average of the two from the faculty members. A grading rubric will be used by the examination committee.

**Study Abroad**

Students interested in study abroad should consult with the departmental representative as early as possible, preferably during their first year.

**Integrated Science Sequence**

The first year ISC sequence (ISC 231, 232, 233, 234) offers an alternative to the combination of MOL 214 or 215 (biology elective), COS 126 (quantitative thinking elective), and PHY 101-102 (required courses).

**Courses**

**NEU 101 Neuroscience and Everyday Life (also MOL 110 / STC 102)** Not offered this year STL
Acquaints non-science majors with classical and modern neuroscience. Lectures will give an overview at levels ranging from molecular signaling to cognitive science with a focus on the neuroscience of everyday life, from the general (love, memory, and personality) to the particular (jet lag, autism, and weight loss). The laboratory will offer hands-on experience in recording signals from single neurons, examining neural structures, and analysis of whole-brain functional brain imaging data. Two 90-minute lectures, one laboratory. *S. Wang, A. Gelperin*

**NEU 201 Fundamentals of Neuroscience (also PSY 258)** Fall STN
This is a survey course in neurobiology which takes a mechanistic and reductionist perspective to cover important topics in the field, including the physiological basis of neural excitability, sensory and motor processing, learning and memory, and neuropsychiatric diseases. *I. Witten*

**NEU 202A Introduction to Cognitive Neuroscience (also PSY 259A)** Spring EC
An introduction to cognitive brain functions, including higher perceptual functions, attention and selective perception, systems for short- and long-term memory, language, cerebral lateralization, motor control, executive functions of the frontal lobe, cognitive development and plasticity, and the problem of consciousness. Major neuropsychological syndromes (e.g., agnosia, amnesia) will be discussed. Prerequisite: 258 or instructor's permission. Two 90-minute lectures, one preceptorial. *M. Botvinick*

**NEU 202B Introduction to Cognitive Neuroscience (also PSY 259B)** Spring STL
An introduction to cognitive brain functions, including higher perceptual functions, attention and selective perception, systems for short- and long-term memory, language, cerebral lateralization, motor control, executive functions of the frontal lobe, cognitive development and plasticity, and the problem of consciousness. Major neuropsychological syndromes (e.g., agnosia, amnesia) will be discussed. Prerequisite: 258 or instructor's permission. Two 90-minute lectures, one three-hour laboratory. *M. Botvinick*

**NEU 306 Memory and Cognition (See PSY 306)**

**NEU 330 Introduction to Connectionist Models: Bridging between Brain and Mind (also PSY 330)** Not offered this year STL
A fundamental goal of cognitive neuroscience is to understand how psychological functions such as attention, memory, language, and decision making arise from computations performed by assemblies of neurons in the brain. This course will provide an introduction to the use of connectionist models (also known as neural network or parallel distributed processing models) as a tool for exploring how psychological functions are implemented in the brain, and how they go awry in patients with brain damage. Prerequisite: instructor's permission. Two 90-minute lectures, one laboratory. K. Norman

**NEU 336 The Diversity of Brains (See PSY 336)**

**NEU 408 Cellular and Systems Neuroscience (also MOL 408 / PSY 404 )** Not offered this year STN
A survey of fundamental principles in neurobiology at the biophysical, cellular, and system levels. Lectures will address the basis of the action potential, synaptic transmission and plasticity, local circuit computation, sensory physiology, and motor control. Prerequisites: MOL 214 or MOL 215, PSY 258, PHY 103-104, and MAT 103-104, or permission of instructor. Two 90-minute lectures, one preceptorial.

*T. Buschman, I. Witten*

**NEU 410 Depression: From Neuron to Clinic (See PSY 410)**

**NEU 437 Computational Neuroscience (also MOL 437 / PSY 437 )** Not offered this year STL
Introduction to the biophysics of nerve cells and synapses, and the mathematics of neural networks. How can networks of neurons compute? How do we model and analyze data from neuroscientific experiments? Data from experiments running at Princeton will be used as examples (e.g., blowfly visual system, hippocampal slice, rodent prefrontal cortex). Each topic will have a lecture and a computer laboratory component. Prerequisite: MOL 410, or elementary knowledge of linear algebra, differential equations, probability, and basic programming ability, or permission of the instructor. Two 90 minute lectures, one laboratory. *C. Brody*

**NEU 447 Neuroimmunology: Immune Molecules in Normal Brain Function and Neuropathology (See MOL 447)**
Information and Departmental Plan of Study

Operations research and financial engineering may be considered as the modern form of a liberal education: modern because it is based on science, mathematics, computing and technology, and liberal in the sense that it provides for broad intellectual development and can lead to many different types of careers. By choosing judiciously from courses in engineering, science, mathematics, economics, public policy, and liberal arts, each student may design a program adapted to his or her particular interests.

All students start from a common academic core consisting of statistics, probability and stochastic processes, and optimization. Related courses focus on developing computer skills and exposing students to applications in areas such as finance, operations, transportation, and logistics. Students augment the core program with a coherent sequence of departmental electives. Students may also design specialized programs in areas such as medicine and neuroscience, which must be reviewed and approved by their academic adviser and the departmental representative. Students often draw on courses from economics, computer science, applied mathematics, civil and environmental engineering, mechanical engineering, chemistry, molecular biology, psychology, and the Woodrow Wilson School of Public and International Affairs. Requirements for study in the department follow the general requirements for the School of Engineering and Applied Science and the University.
Program of Study

The student's program is planned in consultation with the departmental representative and the student's adviser and requires a year-long thesis or a one-semester senior project. With departmental approval, the exceptional student who wishes to go beyond the science and engineering requirements may select other courses to replace some of the required courses in order to add emphasis in another field of engineering or science or to choose more courses in the area of study. Suggested plans of study and areas of concentration are available from the departmental representative.

In addition to the engineering school requirements, there are three components to the curriculum:

1. The core requirements (six courses). These form the intellectual foundation of the field and cover statistics, probability, stochastic processes, and optimization, along with more advanced courses in mathematical modeling.

2. Departmental electives (eight or nine courses). These are courses that either extend and broaden the core, or expose the student to a significant problem area or application closely related to the core program.

3. Senior independent research. A full-year thesis (or a one semester project) involving an application of the techniques in the program applied to a topic that the student chooses in consultation with a faculty adviser.

Core requirements (six courses):

ORF 245 Fundamentals of Engineering Statistics
ORF 307 Optimization
ORF 309 Probability and Stochastic Systems
ORF 335 Introduction to Financial Mathematics
ORF 405 Regression and Applied Time Series
ORF 411 Operations and Information Engineering

Departmental electives (eight or nine courses, if a one-semester project is selected but not usually recommended): The departmental electives represent courses that further develop a student's skills in mathematical modeling either by a more in-depth investigation of core disciplines, applying these skills in specific areas of application, or by learning about closely related technologies. Students must choose eight or nine courses, as appropriate, with the following constraints:

1. There must be at least one 300-level math course from the following:

MAE 305 / MAT 391 Mathematics in Engineering I or MAT 427 Ordinary Differential Equations (Both may not be taken because their contents are too similar.)
MAE 306 / MAT 392 Mathematics in Engineering II
MAT 320 Introduction to Real Analysis
MAT 322 Introduction to Differential Equations
MAT 306 Introduction to Graph Theory
MAT 377 Combinatorial Mathematics
MAT 378 Theory of Games
MAT 385 Probability Theory
MAT 427 Ordinary Differential Equations
MAT 486 Random Process

2. There must be at least two courses from the Department of Operations Research and Financial Engineering (ORF).

3. There can be no more than three courses from any one department (excluding ORF).

A list of all other departmental electives may be found in the departmental undergraduate academic guide; see the department website.

Students in the department often participate in the following certificate programs and laboratories:

Certificate in Finance. The department cooperates with the Bendheim Center for Finance, which offers a certificate program in finance.

Certificate Program in Engineering and Management Systems. The department sponsors a certificate program for students majoring in other departments who complete a significant part of the core of the undergraduate program.

Certificate in Applied and Computational Mathematics. Students seeking a strong mathematical foundation can combine courses from the department with supporting courses which develop more fundamental mathematical skills.

The department maintains several research laboratories which may be used as part of undergraduate research projects. Princeton Autonomous Vehicle Engineering (PAVE). This extracurricular undergraduate activity focuses on the implementation of advanced sensing and control technologies for optimal autonomous decision making in vehicles. The current objective is the development of an autonomous vehicle that can pass the New Jersey State Driving Test.

Computational and Stochastic Transportation and Logistics Engineering Laboratory. The CASTLE Laboratory works on problems in dynamic resource management with ongoing projects in chemical distribution, railroads, trucking, and the airlift mobility command. Through this lab, students gain access to data and specialized tools to aid them in their research into transportation and logistics.

Princeton Laboratory for Energy Systems Analysis. PENSA is the home of the SAP Initiative for Energy Systems Research at Princeton University. Our goal is to bring advanced analytical thinking to the development of new energy technologies, the rigorous study of energy policy, and the efficient management of energy resources.

Financial Engineering Laboratory. This facility provides students with access to specialized software packages and to financial data and news services. Research in the laboratory is concerned with the analysis of the various forms of financial risk and the development of new financial instruments intended to control the risk exposure of insurance and reinsurance companies.
Courses

ORF 105 The Science and Technology of Decision Making (also EGR 106)  Not offered this year
QR
An individual makes decisions every day. In addition, other people are making decisions that have an impact on the individual. In this course we will consider both how these decisions are made and how they should be made. In particular, we will focus on the use of advanced computing and information technology in the decision-making process. Staff

ORF 245 Fundamentals of Statistics (also EGR 245)  Fall/Spring QR
A first introduction to probability and statistics. This course will provide the foundations of rigorous statistical analysis including estimation, confidence intervals, hypothesis testing and regression and classification. Applicability and limitations of these methods will be illustrated using a variety of realworld data sets. Prerequisite MAT 201 Equivalent or concurrent. Three lectures, one preceptorial. J. Fan, S. Kpotufe

ORF 307 Optimization (also EGR 307)  Spring
Many real-world problems involve maximizing a linear function subject to linear inequality constraints. Such problems are called Linear Programming (LP) problems. Examples include min-cost network flows, portfolio optimization, options pricing, assignment problems and two-person zero-sum games to name but a few. The theory of linear programming will be developed with a special emphasis on duality theory, which is used to derive algorithms for solving LP problems. These algorithms will be illustrated on realworld examples such as those mentioned. Two 90 minute lectures, one preceptorial. Prerequisite MAT 202. R. Vanderbei

ORF 309 Probability and Stochastic Systems (also EGR 309 / MAT 380)  Fall/Spring
An introduction to probability and its applications. Random variables, expectation, and independence. Poisson processes, Markov chains, Markov processes, and Brownian motion. Stochastic models of queues, communication systems, random signals, and reliability. Prerequisite: MAT 201, 203, 217, or instructor's permission. R. van Handel, M. Shkolnikov

ORF 311 Optimization Under Uncertainty  Spring
A survey of quantitative approaches for making optimal decisions involving uncertainty and complexity including decision trees, Monte Carlo simulation, and stochastic programming. Forecasting and planning systems are integrated with a focus on financial applications. Prerequisites: ORF 307 or MAT 305, and 309. Two 90-minute classes, one preceptorial. J. Mulvey

ORF 322 Human-Machine Interaction (See PSY 322)

ORF 335 Introduction to Financial Mathematics (also ECO 364)  Spring QR
This course introduces the basics of quantitative finance, particularly the use of stochastic models to value and hedge risks from options, futures and other derivative securities. The models studied include binomial trees in discrete time, and the Black-Scholes theory is introduced in continuous-time models. Computational methods are introduced in Matlab. The second half of the class looks at modern topics such as credit risk, stochastic volatility, portfolio optimization, as well as lessons from the financial crisis. Prerequisites: ORF 309, ECO 100, and MAT 104. R. Sircar Staff
ORF 374 Special Topics in Operations Research and Financial Engineering  Not offered this year A course covering special topics in operations research or financial engineering. Subjects may vary from year to year. J. Mulvey

ORF 375 Independent Research Project  Fall
Independent research or investigation resulting in a substantial formal report in the student's area of interest under the supervision of a faculty member. Open to sophomores and juniors. A. Kornhauser

ORF 376 Independent Research Project  Spring
Independent research or investigation resulting in a substantial formal report in the student's area of interest under the supervision of a faculty member. Open to sophomores and juniors. A. Kornhauser

ORF 401 Electronic Commerce  Spring
Electronic commerce, traditionally the buying and selling of goods using electronic technologies, extends to essentially all facets of human interaction when extended to services, particularly information. The course focuses on both the software and the hardware aspects of traditional aspects as well as the broader aspects of the creation, dissemination and human consumption electronic services. Covered will be the physical, financial and social aspects of these technologies. Two 90-minute lectures, one 50-minute preceptorial. A. Kornhauser

ORF 405 Regression and Applied Time Series  Fall

ORF 406 Statistical Design of Experiments  Not offered this year
Major methods of statistics as applied to the engineering and physical sciences. The central theme is the construction of empirical models, the design of experiments for elucidating models, and the applications of models for forecasting and decision making under uncertainty. Three lectures. Prerequisite: 245 or equivalent. Staff

ORF 407 Fundamentals of Queueing Theory  Spring QR
An introduction to the fundamental results of queuing theory. Topics covered include: the classical traffic, offered load, loss, and delay models for communication systems. The theory of Markov chains, Poisson processes, and renewal theory are discussed through concrete examples and motivations. Fundamental queuing results such as the Erlang blocking and delay formulae, Jackson networks, Little's law and Lindley's equation are presented. Applications are drawn from classical problems in voice and data network performance, to modern issues in healthcare operations. Prerequisite: ORF 309 or equivalent. Two 90-minute lectures. W. Massey

ORF 409 Introduction to Monte Carlo Simulation  Fall
Introduction to the uses of simulation and computation in the analysis of stochastic models and interpreting real phenomena. Topics include generating discrete and continuous random variables, the statistical analysis of simulated data, variance reduction techniques, statistical validation techniques, stochastic ordering, nonstationary Markov chains, and Markov chain Monte Carlo methods. Applications are drawn from problems in finance, insurance, manufacturing, and communication networks. Students will be encouraged to program in Python. Precept offered to help students with the language. Prerequisite: ORF 309. Two 90-minute lectures. W. Massey
ORF 411 Operations and Information Engineering   Fall
The management of complex systems through the control of physical, financial and informational resources. The course focuses on developing mathematical models for resource allocation, with an emphasis on capturing the role of information in decisions. The course seeks to integrate skills in statistics, stochastics and optimization using applications drawn from problems in dynamic resource management which tests modeling skills and teamwork. Prerequisites: ORF 245, ORF 307 and ORF 309, or equivalents. Two 90 minute lectures, preceptorial. W. Powell

ORF 417 Dynamic Programming   Not offered this year
An introduction to stochastic dynamic programming and stochastic control. The course deals with discrete and continuous-state dynamic programs, finite and infinite horizons, stationary and nonstationary data. Applications drawn from inventory management, sequential games, stochastic shortest path, dynamic resource allocation problems. Solution algorithms include classical policy and value iteration for smaller problems and stochastic approximation methods for large-scale applications. Prerequisites: 307 and 309.
Staff

ORF 418 Optimal Learning   Spring QR
Addresses the problem of collecting information used to estimate statistics or fit a model which is then used to make decisions. Of particular interest are sequential problems where decisions adapt to information as it is learned. The course introduces students to a wide range of applications, demonstrates how to express the problem formally, and describes a variety of practical solution strategies. Prerequisite: ORF 245, ORF 309. Two 90-minute lectures, one preceptorial. W. Powell

ORF 435 Financial Risk Management   Fall
This course covers the basic concepts of modeling, measuring and managing different types of financial risks. Topics include portfolio optimization (mean-variance approach and expected utility), interest rate risk, pricing and hedging in complete and incomplete markets, indifference pricing, risk measures, systemic risk. Prerequisites: ORF 245, ORF 335 or ECO 465 (concurrent enrollment is acceptable) or instructor's permission. Two 90-minute lectures, one preceptorial. J. Mulvey

ORF 455 Energy and Commodities Markets   Fall
This course is an introduction to commodities markets (energy, metals, agricultural products) and issues related to renewable energy sources such as solar and wind power, and carbon emissions. Energy and other commodities represent an increasingly important asset class, in addition to significantly impacting the economy and policy decisions. Emphasis will be on the application of Financial Mathematics to a variety of different products and markets. Topics include: energy prices (including oil and electricity); cap and trade markets; storable vs non-storable commodities; financialization of commodities markets; applications of game theory. R. Carmona

ORF 467 Transportation Systems Analysis   Fall
Studied is the transportation sector of the economy from a technology and policy planning perspective. The focus is on the methodologies and analytical tools that underpin policy formulation, capital and operations planning, and real-time operational decision making within the transportation industry. Case studies of innovative concepts such as dynamic "value pricing", real-time fleet management and control, GPS-based route guidance systems, automated transit networks and the emergence of Smart Driving / Autonomous Cars. Two 90-minute lectures, one preceptorial. A. Kornhauser
ORF 473 Special Topics in Operations Research and Financial Engineering  Not offered this year  A course covering one or more advanced topics in operations research and financial engineering. Subjects may vary from year to year. Staff

ORF 474 Special Topics in Operations Research and Financial Engineering  Not offered this year  A course covering one or more advanced topics in operations research and financial engineering. Subjects may vary from year to year. Staff

ORF 478 Senior Thesis  Spring
A formal report on research involving analysis, synthesis, and design, directed toward improved understanding and resolution of a significant problem. The research is conducted under the supervision of a faculty member, and the thesis is defended by the student at a public examination before a faculty committee. The senior thesis is equivalent to a year-long study and is recorded as a double course in the Spring. A. Kornhauser

ORF 479 Senior Project  Spring
A one-semester project that fulfills the departmental independent work requirement for concentrators. Topics are chosen by students in consultation with members of the faculty. A written report is required at the end of the term. A. Kornhauser
Information and Departmental Plan of Study Prerequisites

Any course in the philosophy department may serve as prerequisite for concentration. A student who has not satisfied this prerequisite and who, at the end of sophomore year, desires to enter the department must apply to the departmental representative.

Early Concentration

Early concentration is open to spring semester sophomores who have completed the prerequisite for entering the department by the end of the fall semester of sophomore year, and allows the student to make an early start on independent work. This option is especially useful for students planning to study abroad junior year.
General Requirements

Distribution Requirement. Six of the eight courses must be so distributed that there are two in each of three of the four areas into which philosophy courses are divided; there is no such restriction on the remaining two of the eight. The four distribution areas are as follows:


3. Logic and philosophy of science: 201, 204, 312, 314, 321, 322, 323, 327, 340, 490


Interdisciplinary Options

Political Philosophy. Senior concentrators doing their theses in political philosophy have the option of substituting for the usual distribution requirement (two courses in each of three areas plus two unrestricted courses) the following: two courses from among those listed under the Department of Politics as courses in political theory; two philosophy courses in the ethics and philosophy of value area; two philosophy courses in one other philosophy distribution area; and two philosophy courses unrestricted as to distribution area.

Philosophy of Science. Senior concentrators doing their theses in philosophy of science have the option of substituting for the usual distribution requirements (two courses in each of three areas plus two unrestricted courses) the following: two upper-division (300 level or higher) courses in one relevant science (such as mathematics, computer science, physics, biology, psychology, economics); two philosophy courses in the logic and philosophy of science area; two philosophy courses in one other philosophy distribution area; and two philosophy courses unrestricted as to distribution area.

Philosophy and Linguistics. Philosophy concentrators participating in the certificate program in linguistics may follow the philosophy of science option just described, taking linguistics as their science. All courses listed under the Program in Linguistics as core, other, or related courses may be considered courses in the science of linguistics for this purpose.

Independent Work

Junior Year. During fall semester of the junior year, independent work normally involves participation in a seminar of up to five students under the supervision of an instructor from the faculty of the department. The seminar provides a transition from course work to fully independent work. A junior seminar meets weekly for an hour or biweekly for two hours to discuss readings selected by the instructor, and each student writes a final paper, normally of at least 5,000 words, on a topic in the area defined by those readings, usually chosen by the student from a list provided by the instructor. (The student's grade for fall semester independent work will be based mainly on this paper, but it is usually based partly on shorter papers and/or oral presentations in the seminar earlier in the term.) During spring semester of the junior year, independent work consists of writing a junior paper -- an essay on
a philosophical topic, normally of at least 5,000 words—under the supervision of an individual faculty adviser (different from the student's fall seminar instructor).

Senior Year. Senior year independent work consists of the following: writing the senior thesis, an essay or group of related essays on a topic or group of related topics in philosophy, normally of at least 10,000 words (and normally of at most 15,000 words); and preparation for the departmental examination (see below). The thesis is read, the examination is conducted, and both are graded by a committee of two members of the faculty, one primarily for advising the thesis, the other for coordinating the examination. A short thesis proposal is due just before fall recess and an interim thesis draft, normally of at least 5,000 words (not necessarily in final form), is due just after winter recess.

Senior Departmental Examination
The senior departmental examination is a 90-minute oral examination on the general area of philosophy to which the thesis topic belongs. The final syllabus of readings for the departmental examination (agreed upon between the student and his or her examination coordinator and thesis adviser) is due by the last week of classes.

Study Abroad
Each year some junior philosophy concentrators spend one or both semesters on foreign study, usually in Britain. The department has generally been flexible in allowing, within the limits of University regulations, departmental credit for work done abroad. If the student is planning to be away for only one semester and has a choice, the department recommends choosing spring so as not to miss the fall junior seminars here.

Preparation for Graduate Study
Students contemplating going on to graduate study in philosophy are strongly advised to do more than the minimum required of all majors: to take more than just eight philosophy courses; to do some work in all four areas of philosophy and not just three; to include in their work in the philosophy of value area some in core ethics (at least one of 202, 307, 319, 335) and in their work in the philosophy of science area some in core logic (at least one of 201, 312, 323, 340); and to include in their work in the history area some on ancient philosophy (at least one of 205, 300, 301, 335) and some on modern philosophy (at least one of 200, 302-306, 332, 333, 338). Also it is advisable to study at least to the level of the University language requirement one of the following: ancient Greek, Latin, French, or German.

Courses numbered below 300 have no prerequisite and are open to underclass students. Most courses numbered 300 and above are intended for students who have already had some philosophy; others should consult the instructor before enrolling. With some exceptions, 200-level courses are given every year. Other courses are scheduled on the principle that a student majoring in the department for a two-year period will be able to work out a well-balanced program and satisfy the department's distribution requirements with significant freedom of choice.

Courses

PHI 200 Philosophy and the Modern Mind Not offered this year EC
An introduction to modern philosophy, from the Renaissance to the present, with careful study of works by Descartes, Hume, Kant, and others. Emphasis is placed upon the complex relations of philosophy to the development of modern science, the social and political history of the West, and man's continuing attempt to achieve a satisfactory worldview. Two lectures, one preceptorial. D. Garber

PHI 201 Introductory Logic Not offered this year EC
A study of reasoning and its role in science and everyday life, with special attention to the development of a system of symbolic logic, to probabilistic reasoning, and to problems in decision theory. Two lectures, one preceptorial. H. Halvorson

PHI 202 Introduction to Moral Philosophy (also CHV 202 ) Spring EM
An introductory survey of ethical thought, covering such topics as the demands that morality makes, the justification of these demands, and our reasons for obeying them. Readings from both the historical and contemporary philosophical literature. Two lectures, one preceptorial. E. Harman, S. McGrath

PHI 203 Introduction to Metaphysics and Epistemology Fall EC
An introduction to some of the central questions of pure philosophy through their treatment by traditional and contemporary writers: questions concerning mind and matter; causation and free will; space and time; meaning, truth, and reality; knowledge, perception, belief, and thought. Two lectures, one preceptorial. G. Rosen

PHI 204 Introduction to the Philosophy of Science Not offered this year EC
An inquiry into the form and function of concepts, laws, and theories, and into the character of explanation and prediction, in the natural and the social sciences; and an examination of some philosophical problems concerning scientific method and scientific knowledge. Two lectures, one preceptorial. Staff

PHI 205 Introduction to Ancient Philosophy (also CLA 205 / HLS 208) Fall EC
Designed to introduce the student to the Greek contribution to the philosophical and scientific ideas of the Western world through study of works of Plato, Aristotle, Epicurus, and Lucretius in English translation. Topics in moral and political philosophy, as well as epistemology and metaphysics, will be included. Attention will be focused on the quality of the arguments presented by the philosophers. Two lectures, one preceptorial. S. Shogry

PHI 218 Learning Theory and Epistemology (also ELE 218 / EGR 218) Not offered this year EC
An accessible introduction for all students to recent results by logicians, computer scientists, psychologists, engineers, and statisticians concerning the nature and limits of learning. Topics include truth and underdetermination, induction, computability, language learning, pattern recognition, neural networks, and the role of simplicity in theory choice. Two lectures, one preceptorial. G. Harman, S. Kulkarni

PHI 237 The Psychology and Philosophy of Rationality (See PSY 237)

PHI 300 Plato and His Predecessors (also HLS 300) Not offered this year EC
Readings in translation from pre-Socratic philosophers and from Plato's dialogues, to provide a broad history of Greek philosophy through Plato. Topics covered will include: Socrates's method of dialectic, his conceptions of moral virtue and human knowledge; Plato's theory of knowledge, metaphysics, and moral and political philosophy. Two lectures, one preceptorial. B. Morison

PHI 301 Aristotle and His Successors (also HLS 302) Spring EC
Aristotle's most important contributions in the areas of logic, scientific method, philosophy of nature, metaphysics, psychology, ethics, and politics. Several of his major works will be read in translation. Aristotle's successors in the Greco-Roman period will be studied briefly. Two lectures, one preceptorial. B. Morison

PHI 302 British Empiricism Not offered this year EC
A critical study of the metaphysical and epistemological doctrines of Locke, Berkeley, and Hume. Two lectures, one preceptorial. D. Garber

PHI 303 Descartes, Spinoza, and Leibniz (also ECS 306) Not offered this year EC
Readings in continental philosophy of the early modern period, with intensive study of the works of Descartes, Spinoza, and Leibniz. Topics to be specially considered include: knowledge, understanding, and sense-perception; existence and necessity; the nature of the self and its relation to the physical world. Two 90-minute classes. D. Garber

PHI 304 Topics in Kant's Philosophy Not offered this year EC
Analysis of the Critique of Pure Reason, with some attention to other aspects of Kant's philosophy, such as his views on ethics, aesthetics, and teleological judgment. Two lectures, one preceptorial. D. Hogan

PHI 306 Nietzsche (also COM 393) Not offered this year EM
An examination of various issues raised in, and by, Nietzsche's writings. Apart from discussing views like the eternal recurrence, the overman, and the will to power, this course considers Nietzsche's ambiguous relationship with philosophy, the literary status of his work, and his influence on contemporary thought. Prerequisite: one philosophy course or equivalent preparation in the history of modern thought or literature. Two lectures, one preceptorial. A. Nehamas

PHI 307 Systematic Ethics (also CHV 311) Spring EM
A study of important ethical theories with special reference to the problem of the objectivity of morality and to the relation between moral reasoning and reasoning about other subjects. Two lectures, one preceptorial. G. Harman

PHI 309 Political Philosophy (also CHV 309 / HUM 309) Not offered this year EM
A systematic study of problems and concepts connected with political institutions: sovereignty, law, liberty, and political obligation. Topics may include representation, citizenship, power and authority, revolution, civil disobedience, totalitarianism, and legal and political rights. Two lectures, one preceptorial. *J. Frick*

**PHI 311 Personal Identity**  
Fall EC  
This course will focus on the conditions for personal identity over time, with implications for the beginning and end of life. Students will investigate what it is rational to care about in survival or continued existence, and whether that should change if it is discovered either that there is no human soul, or there is no self or subject behind our various conscious acts. *M. Johnston*

**PHI 312 Intermediate Logic**  
Fall EC  
A development of logic from the mathematical viewpoint, including propositional and predicate calculus, consequence and deduction, truth and satisfaction, the Gödel completeness theorem, the Löwenheim-Skolem theorem, and applications to Boolean algebra, axiomatic theories, and the theory of models as time permits. Two lectures, one preceptorial. Prerequisite: 201 or instructor's permission. *H. Halvorson*

**PHI 313 Theory of Knowledge**  
Spring EC  
A critical study of important concepts and problems involved in the characterization, analysis, and appraisal of certain types of human knowledge. Such topics as sense perception, knowledge and belief, necessity, memory, and truth will be treated. Writings of contemporary analytic philosophers will be read and discussed. Two lectures, one preceptorial. *T. Kelly*

**PHI 314 Philosophy of Mathematics**  
Not offered this year EC  
A study of the nature of mathematics based on a logical and philosophical examination of its fundamental concepts and methods. Two lectures, one preceptorial. Some previous work in mathematics or logic at the college level is highly desirable, but no one particular branch of mathematics is presupposed in the course. *J. Burgess, H. Halvorson*

**PHI 315 Philosophy of Mind (also CHV 315 / CGS 315)**  
Not offered this year EC  
Investigation of some of the following (or similar) topics: the mind-body problem, personal identity, the unity of consciousness, the unconscious, the problem of other minds, action, intention, and the will. Readings primarily from recent sources. Two lectures, one preceptorial. *J. Thakkar*

**PHI 317 Philosophy of Language**  
Not offered this year EC  
An examination of the nature of language through the study of such topics as truth, reference, meaning, linguistic structure, how language differs from other symbol systems, relations between thought and language and language and the world, the use of language, and the relevance of theories concerning these to selected philosophical issues. Two 90-minute classes. *D. Fara*

**PHI 318 Metaphysics**  
Fall EC  
An intensive treatment of some of the central problems of metaphysics, such as substance, universals, space and time, causality, and freedom of the will. Two lectures, one preceptorial. *B. Kment*

**PHI 319 Normative Ethics (also CHV 319 )**  
Not offered this year EM  
A detailed examination of different theories concerning how we should live our lives. Special emphasis will be placed on the conflict between consequentialist theories (for example, utilitarianism) and nonconsequentialist theories (for example, common sense morality). Two lectures, one preceptorial. *G. Harman*

**PHI 320 Philosophy and Literature**  
Not offered this year LA  
A critical study of works of literature in conjunction with philosophical essays, concentrating on two or three philosophical themes, such as the will, self-identity, self-deception, freedom, and time. Two lectures, one preceptorial. *Staff*

**PHI 321 Philosophy of Science**  
Not offered this year EC  
An intensive examination of selected problems in the methodological and philosophical foundations of the sciences. Topics covered may include scientific explanation, the role of theories in science, and probability and induction. Two 90-minute classes. *S. Dasgupta*

**PHI 322 Philosophy of the Cognitive Sciences (also CGS 322 )**  
Not offered this year EC  
An examination of philosophical problems arising out of the scientific study of cognition. Possible topics include methodological issues in the cognitive sciences; the nature of theories of reasoning, perception, memory, and language; and the philosophical implications of such theories. Two lectures, one preceptorial. *S. Leslie*

**PHI 323 Advanced Logic (also MAT 306 )**  
Spring QR
This course deals with topics chosen from recursion theory, proof theory, and model theory. In recent years the course has most often given an introduction to recursion theory with applications to formal systems. Two 90-minute classes. Prerequisite: 312 or instructor's permission. J. Burgess

PHI 325 Philosophy of Religion Not offered this year EM
Critical discussion of religious and antireligious interpretations of experience and the world, the grounds and nature of religious beliefs, and of a variety of theistic and atheistic arguments. Readings from contemporary analytical philosophy of religion, and from historical sources in the Western tradition. Two 90-minute seminars. D. Hogan

PHI 326 Philosophy of Art (also HUM 326 / COM 363) Not offered this year LA
An examination of concepts involved in the interpretation and evaluation of works of art. Emphasis will be placed on sensuous quality, structure, and expression as aesthetic categories. Illustrative material from music, painting, and literature. Two lectures, one preceptorial. A. Nehamas

PHI 327 Philosophy of Physics Fall EC
A discussion of philosophical problems raised by modern physics. Topics will be chosen from the philosophy of relativity theory or more often, quantum mechanics. Two lectures, one preceptorial. D. Hogan, H. Halvorson

PHI 332 Early Modern Philosophy (also ECS 333 / POL 465) Fall/Spring EC
Detailed study of important concerns shared by some modern pre-Kantian philosophers of different schools. Topics may include identity and distinctness, the theory of ideas, substance, the mind/body problem, time, and causation. Philosophers may include Descartes, Spinoza, Hobbes, Hume, or others. One three-hour seminar. D. Garber, D. Hogan

PHI 333 Recent Continental Philosophy Not offered this year EC
Analysis of some representative 20th-century works drawn from the French and German traditions. The specific content of the course will vary from year to year, but in each case there will be some attempt to contrast differing philosophical approaches. Figures to be treated might include Sartre, Gadamer, Habermas, and Foucault. Two lectures, one preceptorial. Staff

PHI 335 Greek Ethical Theory (also CHV 335 / HLS 338) Not offered this year EM
The development of moral philosophy in Greece. Intensive study of the moral theories of such philosophers as Socrates, Plato, Aristotle, Epicurus, the early Stoics, and Sextus Empiricus. Two 90-minute lecture-discussion classes. H. Lorenz

PHI 337 Relativism Not offered this year EM
An exploration of various kinds of relativism: cultural, conceptual, epistemic, and moral, considering what structure if any different relativisms have in common, and whether relativism in any of the domains mentioned is plausible. One three-hour seminar G. Harman

PHI 338 Philosophical Analysis from 1900 to 1950 Not offered this year EC
An introduction to classics of philosophical analysis from the first half of the 20th century. Topics include early paradigms of Moore and Russell, logical atomism in Russell and early Wittgenstein, and logical positivism. Changes are traced both in metaphysical, epistemological, and ethical views and in analysis as a philosophical method. Two lectures, one preceptorial. H. Halvorson, T. Kelly

PHI 340 Philosophical Logic Not offered this year EC
An introduction to modal and many-valued logics, with emphasis on philosophical motivation through a study of applications and paradoxes. Prerequisite: 201 or instructor's permission. Two 90-minute classes.

J. Burgess

PHI 360 Democratic Theory (See POL 306)

PHI 380 Explaining Values (also CHV 380) Fall EM
The course will consider what types of explanations are possible of ordinary moral views. Students will look at philosophical, scientific, and historical explanations and consider how plausible they are, what sort of evidence might be relevant to them, and what their normative implications might be. Two lectures, one preceptorial. M. Smith

PHI 383 Freedom and Responsibility Fall EM
An introduction to the free will problem and its implications for ethics and the law. G. Rosen

PHI 384 Philosophy of Law Not offered this year EM
Conceptual and moral problems in the foundations of law. Topics may include: morality and criminal justice; the justification of punishment; moral and economic problems in private law (torts and contracts); fundamental rights and constitutional interpretation. Two lectures, one preceptorial. G. Rosen

PHI 385 Practical Ethics (See CHV 310)

PHI 490 Perspectives on the Nature and Development of Science (See HIS 490)

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Department of Physics

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Lyman A. Page Jr.

Associate Chair
Steven S. Gubser
Herman L. Verlinde

Departmental Representative
Christopher G. Tully

Director of Graduate Studies
Herman L. Verlinde

Professor
Michael Aizenman, also Mathematics
Robert H. Austin
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William Bialek, also Lewis-Sigler Institute for Integrative Genomics
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Roberto Car, Chemistry
Mihalis C. Dafermos, Mathematics
Andrew A. Houck, Electrical Engineering
Mansour Shayegan, Electrical Engineering
Yakov G. Sinai, Mathematics
David N. Spergel, Astrophysical Sciences
David W. Tank, Molecular Biology, Princeton Neuroscience Institute
Salvatore Torquato, Chemistry
Ned S. Wingreen, Molecular Biology
Information and Departmental Plan of Study

The physics department offers a comprehensive program with the flexibility to accommodate students with a range of interests. Those students wishing to maximize their preparation for graduate school can choose from a variety of advanced-level courses. The requirements of the core curriculum, however, are such that students with diverse interests can take a considerable course load outside the department. Thus, in addition to those students planning to enter graduate school in physics, the department encourages students with career goals in such areas as engineering physics, biophysics, law, medicine, materials science, and teaching.

Advanced Placement

Students who have taken one or more of the Advanced Placement Examinations in Physics are usually placed in PHY 105-106, PHY 103-104, or PHY 101-102, and with these placements no advanced placement credit is awarded. In some cases, students with strong backgrounds may be awarded up to two units of advanced placement credit and/or placed in higher level physics courses.

Prerequisites

Prerequisites for concentration in physics are the following six courses: PHY 103-104, PHY 207, PHY 208, and MAT 203-204. These six courses should be completed by the end of sophomore year. PHY 103 may be replaced by ISC 231-232 (the first term of Integrated Science Sequence), or EGR 191-192 (Engineering-Math-Physics), or PHY 105. PHY 104 may be replaced by ISC 233-234 or PHY 106. PHY 207 may be replaced by PHY 205. MAT 203 may be replaced by MAT 201 or MAT 218. MAT 204 may be replaced by MAT 202 or MAT 217. Prerequisites for concentration in physics cannot be taken on a pass/D/fail basis.

Students who do not discover their interest in physics until the sophomore year, and hence have only taken the introductory-level courses, can still complete the physics program. Such students should meet with the departmental representative as early as possible.

Program of Study

Upon completion of the prerequisites described above, courses required for concentration in physics are as follows.

1. Two semesters of quantum mechanics: PHY 208 and PHY 305.
2. One semester of thermodynamics and statistical mechanics: PHY 301.

3. One semester of advanced electromagnetism: PHY 304.

4. One semester of experimental physics: PHY 312.

5. Two math courses at the 300-level or higher, as detailed below.

6. One elective course at the 300-level or higher, as detailed below.
One of the two math courses must be selected from APC 350, MAE 305, MAE 306, MAT 330, MAT 335, or MAT 427, which all focus either on complex analysis or on differential equations. The other can be any Mathematics Department course, including cross-lists, at the 300-level or higher, with the proviso that if the first 300-level math course focused on complex analysis, the second should be on a different topic, and likewise if the first 300-level math course focused on differential equations, the second should be on a different topic.

The elective course can be any Physics Department course (including cross-lists) at 300-level or above. 400-level physics courses are particularly recommended. Courses in astrophysics, biophysics or biology, chemistry, computer science, engineering, geophysical science, materials science, plasma physics, and mathematics may also be appropriate depending on the interests of the student. Graduate courses may also be taken with permission from both the instructor and the departmental representative.

Courses required for concentration in physics may not be taken on a pass/D/fail basis by physics concentrators.

**Independent Work**

**Junior Year.** In addition to the coursework carried out during the junior year, the student is required to complete two junior papers, each of which is on a research topic of current interest. The purpose of the papers is to give students exposure to how physics research is actually performed by immersing them in journal, as opposed to textbook, literature. Each paper is written in close consultation with a faculty adviser, who is typically performing research in the subject area of the paper. A junior paper may serve as a preliminary investigation of a senior thesis topic. Junior independent work may also be satisfied with a short experimental project.

**Early Concentration.** Students who complete the prerequisites for concentration before the end of sophomore year may declare early concentration in physics. They may be offered an opportunity to undertake independent work during the spring term by writing the first junior paper.

**Senior Year.** In the senior year, in addition to coursework, students write a senior thesis based on their own research. The topic might be chosen from one of the active experimental or theoretical research fields of the Physics Department, or might be suggested by a faculty member with some subsidiary interest. A student could also choose a topic relating physics and another field, such as biophysics, geophysics, the teaching of physics, history of science, or engineering physics. Students whose main adviser is outside the Physics Department must also have a co-adviser who is a faculty member in the Physics Department.

**Senior Departmental Examination**

An oral examination conducted by a departmental committee at the end of the senior year serves as the senior departmental examination.

**Certificate Programs**

For those students with an interest in such topics as solid-state devices, optics, fluid mechanics, engineering design, control theory, computer applications, or other applied disciplines, the Program in Engineering Physics provides an opportunity for close contact with the School of Engineering and Applied Science. Specific requirements for the engineering physics certificate can be found in the section of this announcement on the Program in Engineering Physics.
The department also offers the opportunity for concentrators to participate in the biophysics certificate program. Interested students should consult the section of this announcement on the Program in Biophysics and discuss the program with the director and their departmental representative.

The Program in Quantitative and Computational Biology is designed for students with a strong interest in multidisciplinary and systems-level approaches to understanding molecular, cellular, and organismal behavior. The required courses provide a strong background in modern methodologies in data analysis, interpretation, and modeling.

Physics Department Facilities

The research laboratories in Jadwin Hall (the main physics building) are open to undergraduates to conduct supervised research for their junior papers, senior theses, and summer jobs. There is a "student shop" that offers a (noncredit) course in the use of machine tools. Students with an experimental bent are encouraged to take this course and are then able to participate actively in the construction of experimental apparatus. There is a graduate course in electronics (PHY 557) open to undergraduates that prepares students to design and build the sophisticated electronics required in modern experiments.

Courses

**PHY 101 Introductory Physics I**     **Fall STL**
A course in fundamental physics that covers classical mechanics, fluid mechanics, basic thermodynamics, sounds, and waves. Meets premedical requirements. One lecture, three classes, one three-hour laboratory.  
*Staff*

**PHY 102 Introductory Physics II**    **Spring STL**
Continuation of 101. A course in fundamental physics that covers electricity, magnetism, and an introduction to the quantum world. Meets premedical requirements. Two 90-minute lectures, one preceptorial, and one three-hour laboratory.  
*Staff*

**PHY 103 General Physics I**    **Fall STL**
The physical laws that govern the motion of objects, forces, and forms of energy in mechanical systems are studied at an introductory level. Calculus-based, primarily for engineering and science students, meets premedical requirements. Some preparation in physics and calculus is desirable; calculus may be taken concurrently. One demonstration lecture, three classes, one three-hour laboratory.  
*Staff*

**PHY 104 General Physics II**     **Spring STL**
Continuation of 103. Electromagnetism from electrostatics, DC and AC circuits to optics, and topics of modern physics are treated at an introductory level. Some preparation in physics and calculus is desirable; calculus may be taken concurrently. Calculus-based, primarily for engineering and science students, meets premedical requirements. One demonstration lecture, three classes, one three-hour laboratory.  
*Staff*

**PHY 105 Advanced Physics (Mechanics)**    **Fall STL**
This course parallels 103 at a level that assumes a good preparation in physics and calculus. The material is treated in more depth and with more mathematical sophistication than in 103. Students interested in 105 should enroll in
103. After three weeks, the course will reorganize with those students who qualify and are interested in entering 105 for the remainder of the term. Either course can lead to a major in physics. One demonstration lecture, three classes, one three-hour laboratory. Staff

**PHY 106 Advanced Physics (Electromagnetism)  Spring STL**
Parallels 104 at a more sophisticated level, emphasizing the unification of electric and magnetic forces and electromagnetic radiation. To enter this course, students must have done well in 103 or 105. 103 students must attend the lectures on special relativity given in reading period as part of 105. Three lectures, one class, one three-hour laboratory. Staff

**PHY 111 Contemporary Physics  Not offered this year STL**
Designed for students in the humanities and social sciences, the presentation stresses concepts over formulas and intuition over formalism. However, some proficiency in algebra and trigonometry is assumed. Offered both terms, this course does not satisfy requirements for science majors, premedical students, architects, or engineers. Two lectures, one class, one three-hour laboratory. Staff

**PHY 115A Physics for Future Leaders (also STC 115A )  Fall STN**
What do future leaders of our society need to know about physics and technology? The course is designed for non-scientists who will someday become our influential citizens and decision-makers. Whatever the field of endeavor, they will be faced with important decisions in which physics and technology play an important role. The purpose of this course is to present the key principles and the basic physical reasoning needed to interpret scientific and technical information and to make the best decisions. Topics include energy and power, atomic and subatomic matter, wave-like phenomena and light, and Einstein's theory of relativity. Staff

**PHY 115B Physics for Future Leaders (also STC 115B )  Fall STL**
What do future leaders of our society need to know about physics and technology? The course is designed for non-scientists who will someday become our influential citizens and decision-makers. Whatever the field of endeavor, they will be faced with important decisions in which physics and technology play an important role. The purpose of this course is to present the key principles and the basic physical reasoning needed to interpret scientific and technical information and to make the best decisions. Topics include energy and power, atomic and subatomic matter, wave-like phenomena and light, and Einstein's theory of relativity. Staff

**PHY 191 An Integrated Introduction to Engineering, Mathematics, Physics (See EGR 191) PHY 192 An Integrated Introduction to Engineering, Mathematics, Physics (See EGR 192)**

**PHY 203 Classical Mechanics A  Not offered this year STN**
Classical mechanics, with emphasis on the Lagrangian method. The underlying physics is Newtonian, but with more sophisticated mathematics introduced as needed to understand more complex phenomena. Topics include the formalism of Lagrangian mechanics, central-force motion, small oscillations, coupled oscillations, and waves. The course differs from 205 in that it assumes less preparation, omitting some material in favor of a more pedagogical treatment of the ideas and techniques needed for 208.
Prerequisites: 103-104, or 105-106, or permission of instructor; MAT 201 or 203 recommended. Two 90-minute lectures. Staff
PHY 205 Classical Mechanics B  Fall STN
Classical mechanics, with emphasis on the Lagrangian method. The underlying physics is Newtonian, but with more sophisticated mathematics introduced as needed to understand more complex phenomena. Topics in this intensive course include the formalism of Lagrangian mechanics, central-force motion and scattering, rigid body motion and noninertial forces, small oscillations, coupled oscillations, and waves. Prerequisite: 103-104, or 105-106 (recommended), or permission of instructor; prior completion of MAT 201 or 203 recommended. Two 90-minute lectures. *Staff*

PHY 207 Mechanics and Waves  Fall STN
Covers the basics of analytical mechanics, but shifts the emphasis to wave phenomena before moving on to aspects of quantum mechanics and quantum statistical mechanics. Special relativity is given greater weight than it usually is in PHY 205. Offers students a path toward the physics concentration that is less intensive than PHY 205 and more accessible to students with less mathematical background. Prerequisites: PHY103-104, or PHY105-106; one 200-level math course; or permission of instructor. Two 90-minute lectures. *Staff*

PHY 208 Principles of Quantum Mechanics  Spring STN
An introduction to quantum mechanics, the physics of atoms, electrons, photons, and other elementary particles. Topics include state functions and the probability interpretation, the Schrödinger equation, the uncertainty principle, the eigenvalue problem, operators and their algebras, angular momentum and spin, perturbation theory, and the hydrogen atom. Prerequisites: PHY 106, PHY 205, or PHY 207 and MAT 203 or MAT 217, and MAT 204 or MAT 218 (MAT 204/MAT 218 can be taken concurrently); or instructor's permission. Two 90-minute lectures. *Staff*

PHY 209 Computational Physics Seminar  Fall STL
Introductory course in the application of computers to physics research. Two main themes are numerical analysis methods and the computer-based techniques for implementing them. Methods discussed include least-squares fitting, numerical integration, and Monte Carlo simulation. Techniques include scientific programming, spreadsheets, symbolic-manipulation programs, statistical and plotting packages, and computer graphics. Examples are drawn from various fields of physics, including elementary particle physics and astrophysics. Prerequisites: 104 or 106 or permission of instructor. One 90-minute seminar, one three-hour laboratory. *Staff*

PHY 210 Experimental Physics Seminar  Spring STL
This seminar introduces students to the basic techniques of electronics and instrumentation used to conduct experiments in the physical sciences. The course begins by teaching a foundation in analog and digital circuits including programmable digital logic devices using an iPad interface for data acquisition. Students develop measurement techniques in a wide range of experimental areas. Prerequisites: PHY 102, 104, 106 or 304. One three-hour seminar. *Staff*

PHY 231 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 231)

PHY 232 An Integrated, Quantitative Introduction to the Natural Sciences I (See ISC 232)

PHY 233 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 233)

PHY 234 An Integrated, Quantitative Introduction to the Natural Sciences II (See ISC 234)
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<td>An Integrated, Quantitative Approach to Biochemistry and Neuroscience</td>
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<td>PHY 236</td>
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<td>PHY 301</td>
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<td>PHY 403</td>
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<td>PHY 405</td>
<td>Modern Physics I: Condensed-Matter Physics</td>
<td>Spring STN</td>
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**PHY 301 Thermal Physics Fall STN**
A unified introduction to the physics of systems with many degrees of freedom: thermodynamics and statistical mechanics, both classical and quantum. Applications will include phase equilibrium, classical and quantum gases, and properties of solids. Three lectures. Prerequisites: Any one of PHY 106, 205, 207 or 208, or instructor's permission. *Staff*

**PHY 304 Advanced Electromagnetism Spring STN**
Extensions of electromagnetic theory including some important applications of Maxwell's equations. Solutions to Laplace's equation—boundary value problems. Retarded potentials. Electromagnetic waves and radiation. Special relativity. Mathematical tools developed as required. Two 90-minute lectures.
Prerequisites: 104 or 106. *Staff*

**PHY 305 Introduction to the Quantum Theory Fall STN**
A second course on the basic principles of quantum mechanics with emphasis on applications to problems from atomic and solid-state physics. Two 90-minute lectures. Prerequisites: 208. *Staff*

**PHY 309 Science and Technology of Nuclear Energy: Fission and Fusion (See AST 309)**

**PHY 312 Experimental Physics Spring STL**
The course offers six different experiments from the advanced laboratory collection. Experiments include Josephson effect, ß-decay, holography, Mössbauer spectroscopy, optical pumping. Lectures stress modern experimental methods and devices. One lecture, one laboratory. *Staff*

**PHY 321 General Relativity (See AST 301)**

**PHY 371 Global Geophysics (See GEO 371)**

**PHY 401 Cosmology (See AST 401)**

**PHY 402 Stars and Star Formation (See AST 403)**

**PHY 403 Mathematical Methods of Physics (also MAT 493) Not offered this year QR**
Mathematical methods and techniques that are essential for modern theoretical physics. Topics such as group theory, Lie algebras, and differential geometry are discussed and applied to concrete physical problems. Special attention will be given to mathematical techniques that originated in physics, such as functional integration and current algebras. Three classes. Prerequisite: MAT 330 or instructor's permission. *Staff*

**PHY 405 Modern Physics I: Condensed-Matter Physics Spring STN**
An introduction to modern condensed-matter physics, this course builds on quantum and statistical mechanics to study the electronic properties of solids, including band theory. Metals, quantum Hall effects, semiconductors, superconductors and magnetism, as well as phase transitions in condensed systems and structure and dynamic of solids and liquid crystals. Two 90-minute lectures. Prerequisites: PHY 208, PHY 301, and PHY 305. *Staff*
PHY 406 Modern Physics II: Nuclear and Elementary Particle Physics  
Fall STN
The basic features of nuclear and elementary particle physics are described and interpreted, primarily in the context of the "Standard Model." Problems of current interest are discussed. Two 90-minute lectures. 

Staff

PHY 408 Modern Classical Dynamics  
Spring STN
The course discusses some of the most important and beautiful phenomena described by classical dynamics. This includes generalized Hamiltonian systems and variational principles, shock waves propagation, gravitational instabilities, simple solitons and vortices plus elementary exposition of the theories of turbulence and period doubling. Two 90-minute lectures. Prerequisite: PHY 205 or 207. Staff

PHY 419 Physics and Chemistry of Earth's Interior (See GEO 419)

PHY 442 Geodynamics (See GEO 442)
Unraveling the origins of life on Earth and determining whether life exists beyond Earth will likely be two of the most significant scientific discoveries in the 21st century. The Program in Planets and Life is an interdepartmental, multidisciplinary plan of study designed for students interested in these two questions. The goal is to provide students with an understanding of the fundamental astrophysical, chemical, biological, and geological principles and engineering challenges that will guide our search for life in extreme environments on Earth and on other planets and satellites in the solar system and among neighboring planetary systems. Research on and teaching of these topics are typically performed under the rubric of astrobiology.

The program will equip participating students with the skills they will require to assume leadership roles in discovering the origins of terrestrial and extraterrestrial life over the next decades. The cooperating departments from which the Program in Planets and Life draws faculty and other resources include Astrophysics, Chemistry, Ecology and Evolutionary Biology, Geosciences, Mechanical and Aerospace Engineering, and Operations Research and Financial Engineering, as well as the Woodrow Wilson School of Public and International Affairs.

Admission to the Program

The Program in Planets and Life is open to all A.B. and B.S.E. students. Interested students would normally take GEO 255/AST 255/EEB 255/CHM 255 in their sophomore year.

Program of Study

The following requirements are in addition to those of a student's department of concentration. By appropriate choice of courses, a student may satisfy the program and concentration requirements as well as University distribution requirements. For the certificate, core course and cognate courses may not be taken on a pass/D/fail basis.

1. Students must take the core course GEO 255/AST 255/EEB 255/CHM 255. This course will qualify for departmental credit if the student submits a 25-page term paper on astrobiology, with the emphasis in that department's discipline.
2. Students must take an additional four cognate courses. Only two of the cognate courses can be in the student's department of concentration or be requirements of their majors (though exceptions can be considered on a case-by-case basis). The cognate courses must be approved by the program chairperson, and students are encouraged to discuss their choices in the early stages of their planning.

3. To qualify for the certificate, A.B. students must (i) write at least one of the junior papers on anastrobiology topic and, as part of the senior thesis, (ii) devote a chapter to an astrobiology topic--both of them subject to approval by the program director in consultation with executive committee members. Engineering students must devote one chapter of their senior independent work to an astrobiology topic--again subject to approval by the program chairperson in consultation with executive committee members. The relevant content of the student's senior thesis or senior independent work will be presented at a special Planets and Life Symposium at the end of the senior year. Juniors are also encouraged to participate in this yearly Planets and Life Symposium.

Certificate of Proficiency

Students who meet the requirements of the program and of their home department will receive a certificate of proficiency in planets and life upon graduation.

Sample Cognate Courses (Note: an asterisk indicates a one-time-only course). Courses in addition to those listed below may also be considered by the Committee.

**Astrophysical Sciences (AST)**

204 Topics in Modern Astronomy
205 Planets and the Universe
303 Astronomical Methods
301 Thermal Physics
403 Interstellar Medium and Star Formation
514 Stellar Structure
541 Seminar in Theoretical Astrophysics (when appropriate)
542 Seminar in Observational Astrophysics

**Chemical and Biological Engineering (CBE)**

CHE 245 Introduction to Chemical Engineering Principles
CHE 446 Atmospheric Technology
CHE 447 Biochemical Engineering

**Chemistry (CHM)**

201 General Chemistry I or 202 General Chemistry II
207 Advanced General Chemistry: Materials Chemistry
215 Advanced General Chemistry: Honors Course
303 Organic Chemistry I: Biological Emphasis or 304 Organic Chemistry II: Biological Emphasis 305 The Quantum World
306 Physical Chemistry: Chemical Thermodynamics and Kinetics
405 Advanced Physical Chemistry: Quantum Mechanics
406 Advanced Physical Chemistry: Chemical Dynamics and Thermodynamics
407 Inorganic Chemistry: Structure and Bonding
408 Inorganic Chemistry: Reactions and Mechanisms
515 Biophysical Chemistry I
539 Introduction to Chemical Instrumentation
542 Principles of Macromolecular Structure (also MOL 542)
544 Metals in Biology (also ENV 544)

Computer Science (COS)
323 Computing for the Physical and Social Sciences

Ecology and Evolutionary Biology (EEB)
210 Evolutionary Ecology (also MOL 210)
211 The Biology of Organisms (also MOL 211)
309 Evolutionary Biology
320 Molecular Evolution (also MOL 330)

Electrical Engineering (ELE)
351 Electromagnetic Field Theory and Optics
352 Physical Optics
*455 Mid-Infrared Technologies for Health and the Environment (also CEE/MAE/MSE 455)

Geosciences (GEO)
207 A Guided Tour of the Solar System (also AST 207)
361 Physics of the Ocean and Atmosphere (also ENV 361, CEE 360 (STN)
363 Environmental Geochemistry: Natural Systems (also CHM 331, ENV 331)
364 Earth Chemistry: The Major Realms of the Planet (also CHM 364)
371 Global Geophysics (also PHY 371)
372 Earth Materials
417 Environmental Microbiology (also CEE 417, EEB 417)
425 Introduction to Physical Oceanography (also MAE 425)
428 Biological Oceanography
442 Geodynamics (also PHY 442)
523 Geomicrobiology

Molecular Biology
214 Introduction to Cellular and Molecular Biology (also EEB 214)
215 Quantitative Principles in Cell and Molecular Biology (also EEB 215)
345 Biochemistry (also CHM 345)
348 Cell and Developmental Biology
GEO 255A Life in the Universe (also AST 255A, EEB 255A, CHM 255A) Fall STN

Introduces students to astrobiology, a new field in which scientists trained in biology, chemistry, astrophysics, and geosciences combine their skills to unravel life's origins and to search for extraterrestrial life. Topics include the astrophysical prerequisites for life, the RNA world, the evolution of metabolism and photosynthesis, microbes in extreme environments, and the search for life within our solar system and in nearby solar systems. Two 90-minute lectures are required. Track A will be required to take a midterm exam during fall break. Prerequisite: one geoscience, chemistry, biology, or astronomy class or instructors' permission.
Department of Politics

Chair
Nolan M. McCarty

Associate Chair
Christina Davis

Departmental Representative
Matias Iaryczower

Director of Graduate Studies
Keith E. Whittington

Professor
Christopher H. Achen
R. Douglas Arnold, also Woodrow Wilson School
Gary J. Bass, also Woodrow Wilson School
Mark R. Beissinger
Charles R. Beitz
Carles Boix, also Woodrow Wilson School
Charles M. Cameron, also Woodrow Wilson School
Brandice Canes-Wrone, also Woodrow Wilson School
Thomas J. Christensen, also Woodrow Wilson School
Christina Davis, also Woodrow Wilson School
Aaron L. Friedberg, also Woodrow Wilson School
Paul Frymer
Robert P. George
Martin I. Gilens
Joanne S. Gowa
G. John Ikenberry, also Woodrow Wilson School
Kosuke Imai
Amaney A. Jamal
Atul Kohli, also Woodrow Wilson School
Melissa Lane
John B. Londregan, also Woodrow Wilson School
Stephen J. Macedo, also University Center for School
Nolan M. McCarty, also Woodrow Wilson School
Tali Mendelberg
Helen V. Milner, also Woodrow Wilson School
Andrew M. Moravcsik, also Woodrow Wilson School
Jan-Werner Müller
Alan W. Patten
Philip N. Pettit, also University Center for Human Values
Grigore Pop-Eleches, also Woodrow Wilson School
Thomas Romer, also Woodrow Wilson School
Jacob N. Shapiro, also Woodrow Wilson School
Anna B. Stilz, also University Center for Human Values
Ezra N. Suleiman
Leonard Wantchekon, also Woodrow Wilson
Keith E. Whittington
Jennifer A. Widner, also Woodrow Wilson School
Deborah J. Yashar, also Woodrow Wilson School

Visiting Professor
James E. Fleming

Associate Professor
Rafaela M. Dancygier, also Woodrow Wilson School
Matias Iaryczower
Markus Prior, also Woodrow Wilson School
Kristopher W. Ramsay

Visiting Associate Professor
David F. Forte

Assistant Professor
Faisal Z. Ahmed
David B. Carter
Germán Gieczewski
Alisha C. Holland
Desmond Jagmohan
Jonathan P. Kastellec
Melissa M. Lee, also Woodrow Wilson School
Marc Ratkovic
LaFleur N. Stephens
Rory O. Truex, also Woodrow Wilson School
Ali A. Valenzuela
Omar Wasow
Keren Yarhi-Milo, also Woodrow Wilson School

Visiting Assistant Professor
Santiago Olivella

Lecturer
Stefan Eich, also Council of the Humanities Human Values
Maria Paula Saffon Sanin, also Council of the Humanities

Associated Faculty
Christopher L. Eisgruber, Woodrow Wilson School,
University Center for Human Values
Daniel Garber, Philosophy
Robert O. Keohane, Woodrow Wilson School
Elizabeth Levy Paluck, Psychology, Woodrow Wilson School
Information and Departmental Plan of Study Prerequisites

Normally, students entering the department must have successfully completed on a graded basis two courses offered by the Department of Politics, one or both of which should be at the 200-level.

Program of Study

Course Selection. By the end of the senior year, all students in the department must complete, in addition to the prerequisites, eight departmental courses, of which two may be cognates.

Concentrators indicate a prospective primary field when they sign into the department in the spring of their sophomore year, and designate a primary field by the end of the first term of their junior year.

Concentrators take courses in at least three of the fields listed below, designating one as their primary field of study, another as their secondary field, and an additional field. Students take a minimum of three courses in their primary field, two courses in their secondary field, and one course in a third field. One of three courses in the primary field normally is a 200-level course. Prerequisites may be used to satisfy field requirements. A course taken to satisfy the analytical requirement cannot be used to satisfy the field requirement. The department's website lists additional courses that will fulfill field requirements in a given year, including one-time-only courses. It also lists topics courses offered by other departments that have POL cross-listings and that therefore can be counted as departmental courses.


IV. International relations: 240, 313, 380, 381, 383, 385, 386, 388, 389, 392, 393, 396, 397, 440, 441, 442, 443, 444

V. Methods in political science (cannot be the primary field): 250, 345, 346, 347, 350, 450, 451, 452, 453

Analytic Requirement. The department maintains a list of politics courses that have an emphasis on political analysis. Concentrators are required to take a politics course in systematic analysis, normally no later than the first term of their junior year. Courses in systematic analysis have an emphasis on how political scientists develop and test hypotheses and how various types of analytic investigation further the understanding of political ideals and processes. The course used to fulfill the analytic requirement cannot be used to fulfill primary-, secondary-, or third-
field requirements. The analytic requirement may be satisfied by POL 341, POL 345/SOC 305, POL 346, or POL 347. We will also accept ECO 202, ECO 302, ECO 312, ORF 245, SOC 404, WWS 200, or WWS 332. Effective with the Class of 2018, ANT 300A, ANT 301A, and PHI 201 will also satisfy the analytic requirement. [NOTE: POL 350 will no longer be offered as of Fall 2016, but students who have already taken it will have met the analytical requirement.]

Cognates. The department maintains a list of all cognates approved by the departmental representatives for each student. Cognates must be approved before or during the semester in which they are taken, and no later than the last Friday of classes. Courses taken in the Freshman or Sophomore year cannot be designated as cognates. Cognate courses should not be at the introductory level. Cognates cannot be used to satisfy field distribution requirements. To seek approval for a cognate, students must complete the Politics Cognate Approval Application and send it along with a current syllabus to the director of undergraduate studies or the relevant politics academic advisor for their review. Once a cognate has been approved, it may not be rescinded. Approved cognates will be used in the departmental honors calculation.

Graduate Courses. Well-prepared undergraduates may take graduate seminars for full University and departmental credit. To enroll in a graduate seminar, the student must have the signature approval of the instructor in charge of the seminar, the director of undergraduate studies, and the student's residential dean. The graduate course approval form can be picked up from and returned to the student's residential college office.

Independent Work

Junior Year. Students are required to complete two semesters of junior independent work. Effective with the Class of 2018, fall junior research workshops will meet every week of teaching period alternating between small group meetings and plenary lectures. The plenary component provides common instruction in research procedures and techniques. In their fall workshops, juniors will complete a series of assignments building up to a research prospectus. In the spring semester, juniors will complete a Junior Paper under the supervision of an independent work advisor.

Senior Year. During the senior year, each student writes a thesis. The senior thesis normally is written on a topic within a student's primary field.

The department encourages students to use the summer between junior and senior year for work on the senior thesis.

Senior Departmental Examination

For the Class of 2017, the senior comprehensive examination tests knowledge in a concentrator's primary field. The senior comprehensive normally involves a one-day, take-home, closed-book examination. Effective with the Class of 2018, seniors will be required to prepare and present a professional poster describing their Senior Thesis results in lieu of taking the senior comprehensive exam.

Study Abroad

The department encourages students to consider studying abroad for one term or even for a full year in conjunction with departmental concentration in politics. If, under a program approved in advance by the dean of the college, a concentrator in politics studies abroad for the equivalent of an academic year at Princeton, the department is willing to credit as departmentals as many as four courses in political science or related fields when they are taken at a
foreign university. Normally, the department is willing to substitute no more than one cognate and one departmental or two cognates for concentrators studying abroad for one term.

**Program in Political Economy.** The Department of Politics offers the Program in Political Economy for students who wish to further their understanding of social phenomena and individual behavior by combining and comparing the perspectives of its two constituent disciplines.

Requirements. To participate in this program, students must complete two politics courses, ECO 100 and 101, and MAT 103 before the end of their sophomore year. All five of these courses should be taken on a graded basis (e.g., not pass/D/fail). Students may substitute a higher-level math course that subsumes MAT 103, such as MAT 104, MAT 175, or MAT 215. **NOTE:** Students can apply for these prerequisites to be waived by committing to complete MAT 175, ECO 300/310, and ECO 301/311 before the end of the junior year. This will be considered by the political economy adviser on a case-by-case basis.

It is important for each student to select a combination of economics and politics courses that form a coherent and meaningful program. Before signing up for the first term of the junior year, the student should work out a tentative course outline for the next two years; this outline must be approved and signed by the political economy adviser.

A student in the political economy program is required to take at least seven upper-level courses in the politics department, at least five of which must be numbered 300 and above; two upper-level courses in the economics department; and one course in quantitative methods in either economics or politics. These courses will be counted as departmentals. This 10-course combination fulfills the requirements both for the political economy program and for the major and is used in calculating department honors.

All students must pass the following courses:

(1) One of the following Political Economy courses: Political Economy (POL 349) or Comparative Political Economy (POL 352);
(2) Mathematical Models in the Study of Politics (POL 347);
(3) One of the following Quantitative Methods courses: POL 345/SOC 305, POL 346, ECO 202, ECO 302, or 312;
(4) One of the following Intermediate Microeconomics courses: ECO 300, ECO 310, or WWS 300;
(5) One of the following upper level Economics courses: Intermediate Macroeconomics (ECO 301 or ECO 311), International Trade (WWS 301/ECO 352), International Development (WWS 302/ECO 359), Public Economics (WWS 307/ECO 349). Except for extraordinary circumstances (approved by the PE representative) students must complete both the Intermediate Microeconomics course requirement and the Political Economy course requirement by the end of the junior year.

Students in the Political Economy Program must also fulfill the distribution requirement of the Department, however, the quantitative methods course will satisfy the Politics Department's analytical requirement, while POL 347 can serve as a course in a third field.

While a student in the Program must write a thesis on a topic related to the student's primary field, the thesis must also incorporate significant Political Economy content. On or before the thesis draft deadline, the Political Economy content of the thesis must be certified by the Political Economy Advisor. The student should meet with the Political Economy Advisor well in advance of this deadline to discuss the Political Economy content of the thesis.

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Concentrators who successfully complete the program's requirements will receive a departmental certificate.

**Student Departmental Committee.** All students in the department have an opportunity to elect five seniors and four juniors to serve as members of the Undergraduate Student Departmental Committee. This committee discusses and makes recommendations on matters affecting the undergraduate program in the department. The committee normally meets with the faculty Committee on the Undergraduate Program, and its members represent all undergraduate students in departmental meetings.

**Courses**

**POL 210 Political Theory**  
Fall EM  
An introduction to political theory that explores the relevance of theory to a critical understanding of political and social problems. The course will examine the major classical and contemporary expressions of liberal, conservative, and socialist theory and relate them to the problems of order, freedom, equality, and justice. Two lectures, one preceptorial. *M. Lane*

**POL 220 American Politics (also WWS 310)**  
Fall SA  
An introduction to the national institutions and political processes of American government. Topics include the Constitution, the American political tradition, public opinion, interest groups, political institutions, civil rights, civil liberties, and public policy. Two lectures, one preceptorial. *N. McCarty, S. Staszak*

**POL 230 Introduction to Comparative Politics (also WWS 325)**  
Spring SA  
This course will focus on the process of democratic transition and consolidation in a comparative and historical manner. In particular, we will analyze the democratic revolution that has swept the globe during the last 30 years by examining the communist and authoritarian backgrounds of newly democratized countries, the factors influencing the emergence of democracy, the problems associated with building stable democratic systems, and finally, the prospects for a regime shift in parts of the world still under autocratic rule. Two lectures, one preceptorial. *A. Holland*

**POL 240 International Relations (also WWS 312)**  
Spring SA  
A comprehensive introduction to the major issues of contemporary international relations. The course presents competing theoretical perspectives and reviews the historical record to explore such puzzles as the causes of war, explanations of cooperation, the behavior of states, and the proper ethical standards for judging international relations. Two lectures, one preceptorial. *A. Moravcsik*

**POL 250 Introduction to Game Theory**  
Not offered this year SA  
This course serves as an introduction to strategic issues in politics as well as non-cooperative game theory. The course develops the basic concepts and equilibrium concepts of normal and extensive form games with both complete and incomplete information. We will look at collective action problems, bargaining, voting, legislative politics, deliberation, deterrence and campaigns. Evaluation is through problem sets, exams and a short paper in which students develop their own model and analysis. Two lectures, one preceptorial. *Staff*
POL 268 Political and Economic Development of the Middle East (See NES 265)

POL 301 Ancient and Medieval Political Theory (also CLA 301 / HLS 303 )  Not offered this year  EM
This course focuses on classical political theory in ancient Greece and its appropriation and development in the Roman, medieval, and Renaissance periods. It examines Greek democracy, drawing on tragedy, rhetoric, and history; the ethics and politics of Plato and Aristotle; and the Roman republican thought of Cicero and Livy. It considers the influence of Plato on Augustine and More, Aristotle on Aquinas and Marsilius, and Cicero and Livy on Machiavelli. Topics include nature and convention; democracy, oligarchy and tyranny; church and state; consent and representation; and virtue, property, and law. Two lectures, one preceptorial. Staff

POL 302 Continental Political Thought from Rousseau to Nietzsche  Not offered this year EM
An examination of the development of political thought in Europe from the second half of the 18th century to the end of the 19th. The course will focus on Kantian, Hegelian, and Marxist developments in this tradition. Emphasis on the important role played by different conceptions of freedom, human nature, and history in the political thought of the period, with particular attention to issues concerning autonomy and authority, the nature of the state, and the limits to state power. Two lectures, one preceptorial. Staff

POL 303 Modern Political Theory  Spring EM
A study of the writings of some major political theorists from the 17th through the 19th centuries, including Hobbes, Locke, Rousseau, Kant, and J. S. Mill. Two lectures, one preceptorial. Staff

POL 304 Conservative Political Thought  Not offered this year EM
A historical and analytic examination of conservative political theories. Topics include the classical and medieval roots of modern conservatism, the development of conservatism in Europe and America, fascism and the radical right, and the tensions between libertarianism and traditionalism in contemporary conservative thought. Two lectures, one preceptorial. Staff

POL 305 Radical Political Thought  Not offered this year EM
This course will examine traditions of political thought--mostly, but not only, on the Left--which challenge mainstream conceptions of liberal democracy and modern capitalist society. The main focus will be on Marxism, anarchism, feminism, religious radicalism, ecological thought, and critiques of alienation in everyday life. Particular attention is paid to the relationship between political and cultural criticism, and to the philosophical anthropologies underlying different theories as well as the mechanisms for social change they envisage. We also ask if liberal democratic thought can effectively respond to radical challenges. Staff

POL 306 Democratic Theory (also PHI 360 / CHV 306 )  Not offered this year EM
A study of the intellectual foundations of the modern democratic state. Topics include the meaning and justification of democracy, the rationality of voting, political representation, property rights, civil disobedience, and education. Two lectures, one preceptorial. Staff

POL 307 The Just Society (also CHV 307 )  Spring EM
An introduction to alternative theories of social justice and examination of the implications of those theories in areas of contemporary social and political controversy. Readings and lectures focus on utilitarian, libertarian, liberal egalitarian, communitarian, and feminist conceptions of what it means to live in a just society. Two lectures, one preceptorial. A. Patten

A. Patten  575
POL 308 Ethics and Public Policy (See WWS 370)

POL 309 Politics and Religion (also REL 309) Not offered this year EM
Close study of a number of texts that have illuminated the connection between religiosity and politics, and, in particular, the role of religious language and ideas to establish, preserve, reform, and redeem republics. Special attention will be given to the religious dimensions of revolutionary and messianic politics, and to the role that religiosity has played in the development of contemporary social movements and in the moral and political resistance to totalitarian regimes. Two lectures, one preceptorial. Staff

POL 313 Global Justice (also CHV 313) Not offered this year EM
What, if any, norms of justice apply to the institutions and practice of world politics? Topics include "political realism" and skepticism about global morality; just wars and justice in warfare; ethics of humanitarian intervention; the nature and basis of human rights; world poverty and global distributive justice; and democracy and accountability in global institutions. Readings chosen from recent works in political philosophy. Two lectures, one preceptorial. Staff

POL 314 American Constitutional Development Fall SA
The development of American constitutionalism, considered historically as the product of legal, political, and intellectual currents and crises (e.g., the Founding, the Marshall and Taney eras, the slavery crises, the rise of corporate capitalism, the emergence of the modern state, the New Deal crisis, and new forms of rights and liberties). Topics include the growth of Supreme Court power, the court's relation to the states and the other federal branches, and the influence on constitutional understandings of economic developments, reform movements, wars, party competition, and legal and political thought. Two lectures, one preceptorial. K. Whittington

POL 315 Constitutional Interpretation Fall SA
A study of the development of the United States Constitution, chiefly through close analysis of selected judicial decisions. One 90-minute lecture, one two-hour preceptorial. R. George

POL 316 Civil Liberties Spring EM
A study of selected problems concerning civil liberties in contemporary America, with specific focus on privacy and on problems derived from living in a pluralistic society. One 90-minute lecture, one 90-minute class. R. George

POL 317 Discrimination and the Law Not offered this year EM
How can law change (or reinforce) the ways in which race, gender, and sexual orientation affect status? This course examines the purposes of antidiscrimination law and asks if it is appropriate to extend antidiscrimination protection from race to other categories. Conflicts with tradition, autonomy of community, and liberty are also considered. Two lectures, one preceptorial. Staff

POL 318 Law and Society Spring SA
An exploration of the relationships between law and society, using judicial and other materials from the American legal system. Topics considered include the stages of legal development, law and morality, judicial decision making, formal resolution of disputes, social control through law, the political nature of law, and courts. Two lectures, one preceptorial. S. Staszak

POL 320 Judicial Politics Spring SA
An introduction to the political science of law and courts. Topics typically include: bargaining and decision making on the U.S. Supreme Court; political struggles over doctrine within the judicial hierarchy; the politics of Supreme Court nominations; juries as political institutions; court packing, jurisdiction stripping, and judicial intimidation; political use of litigation by activists, firms, and interest groups; judicial oversight of the administrative state; judicial activism by state attorneys general; and the social and economic impact of courts. Two lectures, one preceptorial. J. Kastellec

**POL 321 American Political Thought**  Not offered this year EM
The origin and development of political ideas and institutions. Drawn from primary sources, the readings feature the ideas and deeds of those who from colonial times to the present have shaped the American concept of free government. Two lectures, one preceptorial. *Staff*

**POL 322 Public Opinion**  Not offered this year SA
An examination of public opinion and mass political behavior, particularly in the American context. Topics include formation of political attitudes and ideology, conflict and consensus on basic issues, political participation and voting, the effects of the media, and the impact of public opinion on governmental policy. Two lectures, one preceptorial or laboratory. *Staff*

**POL 323 Party Politics**  Not offered this year SA
An examination of party organization and activities, the forces that shape them, and their consequences. The course is concerned primarily with U.S. party politics in the contemporary period but gives some attention to American political history and foreign party systems. Two lectures, one preceptorial. *Staff*

**POL 324 Congressional Politics**  Not offered this year SA
An examination of the role of Congress in American politics, with a special focus on the political world of individual legislators. The course explores how legislators run their campaigns, interact with their constituents, operate within Congress, and make public policy. Two lectures, one preceptorial. *Staff*

**POL 325 The Presidency and Executive Power**  Not offered this year SA
A study of the place of the presidency in the American political order that stresses tension between power and accountability inherent in the office and the system. Topics include: separation of powers, presidential selection, impeachment, relations with Congress and bureaucracy, emergency powers, presidential character, and leadership. Two lectures, one preceptorial. *Staff*

**POL 330 Electing the President: Voter Psychology and Candidate Strategy**  Not offered this year SA
An examination of how U.S. election campaigns are conducted and how they affect political reasoning and voting behavior. Empirical analyses of public opinion data and campaign communication provide the foundation for studying campaigns. The goal of the course is to offer a broad theoretical understanding of the conduct of campaigns and their effects. Recent elections serve to illustrate key insights. Two lectures, one preceptorial. *Staff*

**POL 332 Topics in American Statesmanship**  Fall EM
What is statesmanship? Can qualities of statesmanship be critically assessed? If so, by what analytical methods of political science? This course explores statesmanship through a study of the biographies, principles, practices, and leadership styles of men and women who have been widely regarded as having exemplified the craft. Among the
goals is to deepen understanding of how the practical necessities of democratic politics have been combined with appeals to democracy's loftiest ideals. D. Forte

POL 333 Latino Politics in the U.S. (also LAS 333 / LAO 333 / SOC 325 ) Not offered this year SA
The course will explore the personal, political, historical and sacred aspects of Latinas/Latinos in the United States from the perspective of a theory of transformation. The course intends to provide Latinas/Latinos as well as students from all backgrounds the opportunity to see a people in their own midst becoming and being political as they move forward to create a new culture and community in this country. Staff

POL 338 Race and the American Legal Process: Emancipation to the Voting Rights Act (See AAS 362)

POL 345 Introduction to Quantitative Social Science (also SOC 305 ) Fall QR
Would universal health insurance improve the health of the poor? Do patterns of arrests in US cities show evidence of racial profiling? What accounts for who votes and their choice of candidates? This course will teach students how to address these and other social science questions by analyzing quantitative data. The course introduces basic principles of statistical inference and programming skills for data analysis. The goal is to provide students with the foundation necessary to analyze data in their own research and to become critical consumers of statistical claims made in the news media, in policy reports, and in academic research. K. Imai, M. Frye

POL 346 Applied Quantitative Analysis Spring QR
Develops the use of statistical techniques appropriate for empirical exploration of political topics. Each statistical topic is motivated by a significant question in political science that can be addressed by an available data set. Computers will be used both as part of the lecture and for completing classwork. Emphasis is on hands-on training that will give students the capacity to use these statistical techniques in other courses and independent work. Prerequisites: 345 or instructor's permission. Two lectures, one preceptorial. O. Wasow

POL 347 Mathematical Models in the Study of Politics Fall QR
An introduction to the use of mathematical models and, especially, game theory in the study of politics. The basics of game theory are presented through applications to a broad range of political phenomena: voting, legislative politics, political campaigns, comparison of electoral systems, the evolution of cooperation, and international relations. Two lectures, one preceptorial. M. Iaryczower

POL 349 Political Economy Fall SA
This course provides a rigorous introduction to some of the central ideas in political economy. Game theoretic models of voting are used to illustrate the way that democratic institutions filter interests. Topics may include the measurement of income inequality, the median voter theorem, models of income redistribution, political agency, and the link between institutions and economic performance. Two lectures, one preceptorial. T. Romer

POL 350 Research Methods in Political Science Not offered this year SA
An introductory undergraduate course in research methods for politics concentrators, designed to help prepare students for junior papers and the senior thesis. The material is chosen to convey an understanding of research design, choice of method, and data analysis. Both qualitative and quantitative methods will be taught, but this is not a statistics course. It provides an introduction to a range of research methodologies as they are applied to political science topics. Two lectures, one preceptorial. Staff
POL 351 The Politics of Development (also WWS 311) Fall SA
A comparative study of politics in selected developing countries of Asia, Africa, and Latin America. Topics include colonialism, nationalism, class and ethnic conflict, political instability, military coups, revolutionary change, and development strategies such as land reforms, green revolution, import substitution, and management of external dependencies. Two lectures, one preceptorial. J. Widner

POL 352 Comparative Political Economy Spring SA
Explores the dynamic relationship in theory between market-formation and reform on the one hand, and economic ideas and cultural values on the other. The course examines classical and contemporary works in comparative political economy. Two lectures, one preceptorial. J. Londregan

POL 353 The Politics of Modern Islam (See NES 269)

POL 355 Comparative Politics of Legislatures Not offered this year SA
This course examines the workings of legislatures in a comparative setting. The course will look at the internal workings of legislative institutions, and at the relationship between electoral systems and legislative outcomes. We will consider and compare parliamentary and presidential systems, unicameral and bicameral legislatures. The course will look at the determinants of cabinet duration in parliamentary systems, and the emergence of committee systems. We will also take up the linkage between electoral systems and the structure of political parties, and the reasons for political parties to emerge from within and outside the legislature. Staff

POL 356 Comparative Ethnic Conflict Spring SA
This course introduces students to the study of ethnic conflict. It will examine different theories of ethnically based identification and mobilization; cover different types of ethnic conflict such as riots, genocide, hate crime and war; and study past and present cases of ethnic conflict around the world. Two lectures, one preceptorial. D. Aksoy

POL 360 Social Movements and Revolutions Not offered this year SA
This course investigates the politics of protest and revolution, examining the conditions under which protest movements emerge, their choice of protest tactics, the effects of repression and concessions, and the determinants of movement success. The second part of the courses focuses on revolutions, examining the forms that they assume and the conditions under which they develop and prove successful. Examples discussed include the civil rights, women's and environmental movements; the French, Russian, and Iranian revolutions; the collapse of communism; and the "colored" revolutions and other waves of revolution in the contemporary world. Staff

POL 362 Chinese Politics (also WWS 323 / EAS 362 ) Not offered this year SA
Traditional politics; the rise of warlords, nationalists, and radicals; causes of the "Liberation," land reform, Hundred Flowers, Great Leap Forward, Cultural Revolution, and Four Modernizations; policies of Mao and Deng for development, health, law, and rights. Two lectures, one preceptorial. Staff

POL 364 Politics of the Middle East (also NES 322 ) Not offered this year SA
Focuses on social and economic change in the Middle East as reflected in development strategies, political competition and conflict, and state intervention in economic and social life. The emphasis is on domestic and comparative politics in the Middle East rather than its international relations. Two lectures, one preceptorial. Staff

POL 366 Politics in Africa (also AFS 366 ) Fall SA
A comparative approach to African political systems. The meanings of the concepts of modernization, national integration, and development are explored. Topics include the inheritances of colonial rule, independence and the new tasks, political patterns in the postindependence period, prospects for political change, and African interstate relations. Two lectures, one preceptorial. *J. Widner*

**POL 367 Latin American Politics (also LAS 367) Fall SA**
A study of the governments and politics of Latin America. The political systems of the Latin American countries will be examined, as well as the common political problems and processes of the area. Special attention will be given to the role of revolution, military rule, and constitutional democracy in Latin American political development. Two lectures, one preceptorial. *M. Saffon Sanin*

**POL 374 Russian and Post-Soviet Politics Not offered this year SA**
This course surveys the politics of Russia and the post-Soviet states, focusing on the four major political challenges that these states confront: state-building, nation-building, democratization, and economic development. Particular attention is given to the ways in which the Soviet experience continues to shape the politics of the Eurasian region, nation-building and identity politics, modes of authoritarian rule and democratization, the politics of energy, and the role of external actors and Russian policies in affecting the political evolution of the region. *Staff*

**POL 375 Politics after Communism Not offered this year SA**
An examination of the political and economic change in Russia and some of the former Soviet republics from Gorbachev to the present. After briefly reviewing the main institutions of the Soviet system and theories of its collapse, the course examines specific reforms and the social impact of rapid systemic change. Topics include shock therapy (privatization and economic liberalization), nationalism, crime, and legislative reform among others. The course will also compare the process of change in the former Soviet Union with democratic and market transitions in Latin America and elsewhere. Two lectures, one preceptorial. *Staff*

**POL 376 Political Islam (See NES 268)**

**POL 378 Politics in India Not offered this year SA**
An introduction to politics in the large subcontinental country of India. The course will address themes that are important both to India and to a general study of politics in a developing country. The following questions help organize the course: How does one make sense of democracy in a poor, multiethnic setting? How has democratic politics shaped and been shaped by a society divided along numerous lines, such as caste, class, and linguistic and religious identities? And how well has the democratic state fared in promoting both economic growth and social welfare? Two lectures, one preceptorial. *Staff*

**POL 380 Human Rights Spring SA**
A study of the politics and history of human rights. What are human rights? How can dictatorships be resisted from the inside and the outside? Can we prevent genocide? Is it morally acceptable and politically wise to launch humanitarian military interventions to prevent the slaughter of foreign civilians? What are the laws of war, and how can we punish the war criminals who violate them? Cases include the Ottoman Empire, Nazi Germany, the Soviet Union, Bosnia, and Rwanda. Two lectures, one preceptorial. *G. Bass*

**POL 381 Theories of International Relations Not offered this year SA**
Examination of selected theories and issues of international relations including the following: causes of war, theories of imperialism, the issue of order and change, the relationship of morality and statecraft. Course readings drawn from historical and theoretical materials. Two lectures, one preceptorial. Staff

**POL 383 International Cooperation**  
Not offered this year SA  
Examines theories about how international cooperation can be initiated and maintained. Topics include the achievement of cooperation under conditions of anarchy, regimes and norms, international and multilateral organizations, tacit bargaining, formal and informal agreements, and strategies for punishing noncompliance. Two lectures, one preceptorial. Staff

**POL 384 European Politics and Society in the 20th Century (See EPS 300)**

**POL 385 International Political Economy**  
Not offered this year SA  
A study of the relationship between political and economic processes in international affairs. Attention will be given to problems that lie on the boundary between politics and economics. Two lectures, one preceptorial. Staff

**POL 386 Violent Politics**  
Not offered this year SA  
Governments have tremendous power over our lives and thus the competition over who controls them is always intense and often violent. This course will study various ways in which violence is used to political ends. The larger goal of the course is to understand the sources of violence in political competition and the conditions under which political disputes can be peacefully resolved. Specific forms of violence to be covered include assassination, civil war, ethnic conflict, insurgency, revolution, riots, terrorism, and war. Staff

**POL 388 Causes of War**  
Not offered this year SA  
Why do states and peoples go to war? Conversely, how can war be avoided? This course surveys some of the most important explanations—including human nature, the anarchic international system, domestic politics, economics, technology, nationalism, and terrorism—and evaluates them in light of historical wars, and of crises resolved short of war. The course will examine cases ranging from the Peloponnesian War to the ongoing American-led war against terrorism. Two lectures, one preceptorial. Staff

**POL 389 International Relations of East Asia (See WWS 317)**

**POL 392 American Foreign Policy**  
Not offered this year SA  
A systematic study of major issues and problems of American foreign policy in the contemporary world. Two lectures, one preceptorial. Staff

**POL 393 Grand Strategy (See WWS 315)**

**POL 396 International Organization**  
Not offered this year SA  
This course examines the role played by international organizations (IOs)—especially inter-state multilateral institutions—in the international system. It focuses on the effectiveness of IOs in managing global issues in a rapidly changing world and addresses questions such as: Why do IOs exist? What do they do? How do we gauge their success? Are they simply irrelevant? The course begins by covering several theoretical approaches to understanding
IOs, their functions, and their shortcomings, then moves on to a critical examination of the work of different types of IOs. Two lectures, one preceptorial. Staff

**POL 397 National Security** Not offered this year SA  
An introduction to classic texts (for example, Sun Tzu, Clausewitz) and dominant theoretical approaches in the study of national security. Why states fight and how they fight are examined with an emphasis on how they generate and employ military power in combat. The determinants of battlefield effectiveness, the limits of military power, and the historical evolution of warfare are also considered. Attention is paid to alternative conceptions of security (including human security) and warfare, including civil wars, insurgencies, and genocides. Cases are drawn from diverse Western and non-Western historical eras. Two lectures, one preceptorial. Staff

**POL 403 Architecture and Democracy** (also CHV 403 / ARC 405 / URB 403 ) Not offered this year EM  
What kind of public architecture is appropriate for a democracy? Should public spaces and buildings reflect democratic values - such as transparency and accessibility - or is the crucial requirement for democratic architecture that the process of arriving at decisions about the built environment is as participatory as possible? The course will introduce students to different theories of democracy, to different approaches to architecture, and to many examples of government architecture from around the world (the U.S., Germany, and China in particular), via images and films. Might include one or two field trips. Staff

**POL 410 Seminar in Political Theory** Not offered this year SA  
Investigation of a major theme in political theory. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. Staff

**POL 411 Seminar in Political Theory** Not offered this year SA  
Investigation of a major theme in political theory. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. Staff

**POL 412 Seminar in Political Theory** Not offered this year EM  
Investigation of a major theme in political theory. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. Staff

**POL 413 Seminar in Political Theory** Not offered this year SA  
Investigation of a major theme in political theory. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. Staff

**POL 416 Moral Conflicts in Public and Private Life** (also CHV 416 ) Not offered this year EM  
The distinction between public and private spheres of life is both foundational to modern liberal democratic politics and also fraught with controversy. This course examines such conflicts in the context of political theory, ethics, law, and public policy. Including the tense interface between public values and religious conscience and practice, and the scope of freedom with respect to marriage, family, and sexual relations. How broad are the claims of private liberty and what is the nature and extent of legitimate public authority when it comes to activities claimed to be private? Can paternalist and perfectionist policies ever be justified? Staff

**POL 420 Seminar in American Politics** (also GSS 421 ) Not offered this year SA
Investigation of a major theme in American politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **Staff**

**POL 421 Seminar in American Politics** Not offered this year SA
Investigation of a major theme in American politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **Staff**

**POL 422 Seminar in American Politics (also GSS 422)** Spring SA
Investigation of a major theme in American politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **D. Strolovitch**

**POL 423 Seminar in American Politics** Not offered this year SA
Investigation of a major theme in American politics. Reading and intensive discussion of selected issues in the literature. **Staff**

**POL 424 Topics in African American Religion (See AAS 368)**

**POL 430 Seminar in Comparative Politics** Not offered this year SA
Investigation of a major theme in comparative politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **Staff**

**POL 431 Seminar in Comparative Politics** Not offered this year SA
Investigation of a major theme in comparative politics. Reading and intensive discussion of selected issues in the literature. **Staff**

**POL 432 Seminar in Comparative Politics** Not offered this year SA
Investigation of a major theme in comparative politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **Staff**

**POL 433 Seminar in Comparative Politics** Spring SA
Investigation of a major theme in comparative politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **L. Wantchekon**

**POL 434 Seminar in Comparative Politics** Not offered this year SA
Investigation of a major theme in comparative politics. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **Staff**

**POL 440 Seminar in International Relations** Not offered this year SA
Investigation of a major theme in international relations. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. **Staff**

**POL 441 Seminar in International Relations** Not offered this year SA
Investigation of a major theme in international relations. Reading and intensive discussion of selected issues in the literature. *Staff*

**POL 442 Seminar in International Relations** Not offered this year SA
Investigation of a major theme in international relations. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. *Staff*

**POL 443 Seminar in International Relations** Fall SA
Investigation of a major theme in international relations. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. *J. Shapiro, K. McKiernan*

**POL 444 International Institutions and Law** (See WWS 420)

**POL 450 Seminar in Methods in Political Science** Not offered this year QR
Investigation of a major theme in methods of political science. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. *Staff*

**POL 451 Seminar in Methods in Political Science** Not offered this year QR
Investigation of a major theme in methods of political science. Reading and intensive discussion of selected issues in the literature. *Staff*

**POL 452 Seminar in Methods in Political Science** Not offered this year
Investigation of a major theme in methods of political science. Reading and intensive discussion of selected issues in the literature. One three-hour seminar. *Staff*

**POL 453 Seminar in Methods in Political Science** Not offered this year
Investigation of a major theme in methods of political science. Reading and intensive discussion of selected issues in the literature. One three-hour seminar *Staff*

**POL 463 Public Leadership and Public Policy in the U.S.** (See WWS 363)
**POL 465 Early Modern Philosophy** (See PHI 332)
**POL 479 Comparative Constitutional Law** (See WWS 421)
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Founded in 1994, the Princeton Environmental Institute (PEI) is the interdisciplinary center of environmental research, education, and outreach at Princeton University. PEI's mission is to advance knowledge and to develop the next generation of leadership by providing outstanding academic programs and opportunities for advanced scholarship and cutting edge research with an environmental focus.

PEI draws strength from more than 100 members of the Princeton faculty, representing 25 academic disciplines, whose research and teaching focuses on the scientific, technical, policy, and human dimensions of environmental issues. The center functions as a central resource for faculty, postdoctoral fellows, graduate and undergraduate students, alumni, and others with interest in environmental topics.

PEI's principal research centers and programs address complex issues surrounding global change; energy and climate; biogeochemical cycles; molecular geochemistry; biodiversity; conservation; environmental science and policy;
environmental humanities; infectious disease and global health; and sustainable development in impoverished and resource-challenged regions of the world.

In 2007, PEI launched the Grand Challenges Program to address the world's most vexing environmental problems through an integrated research and teaching program. The program involves cutting-edge research carried out locally and around the world and engages a broad cross-section of the university research community. The program's academic mission is advanced through innovations in teaching and learning including graduate and undergraduate courses, internships, and opportunities for research in and around faculty research cooperatives.

PEI offers an array of courses that explore environmental issues through the lenses of the natural sciences, engineering, humanities, and social sciences. Undergraduate students who wish to demonstrate proficiency in the environmental field may pursue a Certificate in Environmental Studies through PEI's Program in Environmental Studies. As early as the freshman year, students are eligible to apply for internships with Princeton faculty and for other mentored research opportunities. These paid fellowships provide exposure to cutting edge research on a wide-variety of environmental topics. Additionally, PEI provides support for field research connected to independent work in the junior and senior year. The ENV program and related opportunities are open to all students regardless of academic major.

PEI offers several novel programs and opportunities for graduate students including the PEI-STEP Fellowship Program and the Princeton Energy and Climate Scholars Program (PECS).

Additional information about PEI is available on the Institute's website.
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Eric S. Gregory, Religion, *ex officio*
Stephen Kotkin, History, Woodrow Wilson School

Denise L. Mauzerall, Woodrow Wilson School, Civil and Environmental Engineering
F. Nick Nesbitt, French and Italian
Gyan Prakash, History
Stephen J. Redding, Woodrow Wilson School, Economics
Cecilia E. Rouse, Woodrow Wilson School, Economics, *ex officio*
Edwin L. Turner, Astrophysical Sciences, *ex officio*
Yu Xie, Sociology, Princeton Institute for International and Regional Studies
Muhammed Q. Zaman, Near Eastern Studies, Religion

The Princeton Institute for International and Regional Studies (PIIRS) promotes research, learning and dialogue on issues of global importance and sponsors a variety of programs and activities aimed at advancing knowledge of world cultures and global problems.

PIIRS supports five regional studies programs, including African Studies; South Asian Studies; Contemporary European Politics and Society; and Russian, East European, and Eurasian Studies. PIIRS is also home to the Program in Translation and Intercultural Communication which enables students to develop their understanding around the complexity of translation issues. These five certificate programs offer courses, research opportunities and periodic lectures open to the entire Princeton community.

Since 2007, PIIRS has led Global Seminars, six-week courses taught by Princeton faculty in a variety of overseas locations each summer. These courses offer undergraduates the opportunity to study abroad with Princeton faculty, gaining first-hand experience of the societies that they are studying in the classroom, while also learning the basics of local languages, engaging in community service and understanding the history and culture of the societies in which they live.

PIIRS also administers the Undergraduate Fellows program, which provides mentoring and funding for a select group of juniors working in international studies who are interested in conducting summer research abroad for their senior thesis.

Additionally, the Institute provides extensive research resources to faculty and graduate students in the form of funding for conferences, for dissertation research, and for language study abroad. PIIRS’ research communities initiative seeks to promote sustained interdisciplinary and cross-regional dialogue among faculty and students in international and regional studies. Because its mission is to enhance the capacity of Princeton’s departments and programs to undertake international research and teaching, PIIRS co-sponsors conferences, seminars, short-term
visits of distinguished scholars from around the world, and curriculum development grants to assist in the preparation of new undergraduate courses.

In 2013, PIIRS inaugurated the Fung Global Fellows Program, which brings six exceptional, international, early career faculty working in the social sciences and the humanities to Princeton for a year of research, writing and collaboration around a common theme.

In 2015, PIIRS introduced the Center for Contemporary China led by Yu Xie, a prominent sociologist. The mission of the Center is to advance the study of contemporary China at Princeton and to provide substantive analysis of the dramatic sociological shifts taking place in China today.

PIIRS is the sponsoring institution of World Politics, one of the premier journals in political science. The journal publishes peer-reviewed research that addresses salient theoretical and empirical questions on topics in international relations, comparative politics and various related subfields.
The Princeton Institute for the Science and Technology of Materials (PRISM) is a multidisciplinary research and education center in the fields of materials science and photonics. Its mission includes graduate and undergraduate education and research that will have a long-term impact on society. Key elements of PRISM are the integration of the sciences and engineering, with work spanning from fundamental materials theory through device and system applications, and the integration of our work with that outside Princeton. Departments participating in PRISM include chemical and biological engineering, chemistry, civil and environmental engineering, computer science, electrical engineering, geosciences, mechanical and aerospace engineering, molecular biology, and physics. Education is carried out formally through the undergraduate Program in Materials Science and Engineering, joint Ph.D. programs, course curricula, and the ability for all students to participate in the research programs of the institute.

On the highest level, the mission of PRISM can be described as "nano" science and technology for the "macro" world. New discoveries and properties emerge from new structures on the scale of atoms and nanometers, which can then be tailored for devices and systems to address real world problems -- which include those in the areas of health, energy, environment, information, and security. The underlying areas of technical expertise at PRISM encompass quantum materials science; scalable structures, interfaces and processes; photons and light-matter interactions; the bio/nano intersection; and theory and computation.

Critical to our interaction both within Princeton and outside of Princeton are professionally staffed central research facilities. These include the Micro/Nano Fabrication Lab and the Imaging and Analysis Center.
Understanding how the brain works, and how it gives rise to mental function, is one of the most exciting challenges in science. This effort is inherently interdisciplinary, and the Princeton Neuroscience Institute (PNI) draws upon developments in molecular and cell biology, genetic engineering, and cognitive and social psychology, as well as applied math, chemistry, computer science, economics, engineering, and physics, for new methods of measuring and understanding neural function.

One of the goals of the institute is to understand how the whole system works together as one unit from all of the very complex interactions and underlying parts. Princeton collaborators utilize their expertise in quantitative disciplines to answer these questions. There is a particular emphasis on the close connection between theory, modeling, and experimentation using the most advanced technologies.

One of the most important objectives of the institute is to provide Princeton undergraduates with training at the forefront of neuroscience. The program encourages the serious study of molecular, cellular, developmental, and systems neuroscience as it interfaces with cognitive and behavioral research. Current research at Princeton includes molecular, genetic, and pharmacologic analysis of learning and memory; the role of neural stem cells in the adult
brain; viral infections of the nervous system; optical and electrical recordings of neuronal function; brain imaging
studies of cognitive functions, such as attention and memory in humans; and mathematical and computational
analysis of neural network function. A more extensive listing of research opportunities in neuroscience is available
online.

In addition to providing centralized curricular resources for students and faculty, the institute offers shared scientific
facilities and access to state-of-the-art instruments for studying the brain, including two research dedicated scanners,
integrated EEG systems, an eye tracker, a laser scanning confocal and two-photon microscope, a transmission
electron microscope, and large computing clusters to name a few.
Writing is integral to intellectual pursuits of every kind, whether in the humanities, the social or natural sciences, mathematics, or engineering. The Princeton Writing Program encourages excellence in writing across the University through a variety of initiatives, including Writing Seminars for freshmen and a Writing Center for all students.

The Writing Seminars give Princeton freshmen an early opportunity to belong to a lively academic community in which members investigate a shared topic and discuss their writing together, with the aim of clarifying and deepening their thinking. Focused instruction on the writing process and the key elements of academic writing enriches and guides the Writing Seminar experience. Students learn to frame interesting questions, position an argument within a genuine academic debate, substantiate and organize claims, purposefully integrate a wide variety of sources, and
revise for greater cogency and clarity. As they work on completing four major assignments of increasing complexity, students submit drafts for review, and participate in conferences with their instructor. Through an extensive collaboration with the University library, Writing Seminar students also learn to locate and evaluate sources. Writing Seminars are interdisciplinary in nature to emphasize transferable reading, writing, and research skills. The Writing Seminar is required of all freshmen, who are assigned in late July to a term, fall or spring, in which to take the course and who make their topic selection based on their interests. The Writing Center offers student writers free one-on-one conferences with experienced fellow writers trained to consult on assignments in any discipline. Students may bring writing projects to the Writing Center in any form—ideas, rough notes, or a first or full draft. Writing Center Fellows offer advice about the writing process, from getting started to revising, and can work with students on essential elements of academic writing, such as thesis, organization, use of sources, and clarity of ideas and sentences. Appointments may be scheduled online.

For more information about the Princeton Writing Program, visit the program website.
Program of Freshman Seminars

Director
Elizabeth L. Colagiuri

Howard A. Stone, Mechanical and Aerospace Engineering
Shirley M. Tilghman, Molecular Biology, Woodrow Wilson School

Executive Committee
Joshua T. Katz, Classics

Robert J. Wuthnow, Sociology

In 2016-17, the Program of Freshman Seminars in the Residential Colleges will offer approximately 80 seminars on a wide variety of special topics. The seminars are designed to introduce first-year students to the excitement and challenge of working in a small, discussion-oriented setting with a faculty member and fellow students on a topic of special interest. While freshman seminars are not required, they count as regular courses and may fulfill distribution requirements.

The seminars are open to all first-year students, but enrollment is limited to 12 to 15 per seminar. A full roster of seminars to be offered in a given year will be available on the program website in July.

The application process, which is described on the program website, typically begins in July.
Department of Psychology

Chair
Elizabeth Gould

Associate Chair
Nicholas B. Turk-Browne

Departmental Representative
Michael S. Graziano

Director of Graduate Studies
Stacey Sinclair

Professor
Jonathan D. Cohen, also Princeton Neuroscience Institute
Joel Cooper
Nathaniel D. Daw, also Princeton Neuroscience Institute
Susan T. Fiske, also Woodrow Wilson School
Asif A. Ghazanfar, also Princeton Neuroscience Institute
Adele Goldberg
Joan S. Girgus
Elizabeth Gould, also Princeton Neuroscience Institute
Barry L. Jacobs, also Princeton Neuroscience Institute
Sabine Kastner, also Princeton Neuroscience Institute
Elizabeth Levy Paluck, also Woodrow Wilson School
Kenneth A. Norman, also Princeton Neuroscience Institute
Daniel N. Osherson
Deborah A. Prentice, also Woodrow Wilson School
Eldar B. Shafir, also Woodrow Wilson School
J. Nicole Shelton

Stacey Sinclair, also African American Studies
Susan L. Sugarman
Alexander T. Todorov
Nicholas B. Turk-Browne
Elke U. Weber, also Woodrow Wilson School and Andlinger Center for Energy and the Environment

Associate Professor
Michael S. Graziano, also Princeton Neuroscience Institute
Uri Hasson, also Princeton Neuroscience Institute
Yael Niv, also Princeton Neuroscience Institute
Jonathan W. Pillow, also Princeton Neuroscience Institute
Emily Pronin, also Woodrow Wilson School

Assistant Professor
Timothy J. Buschman, also Princeton Neuroscience Institute
Alin I. Coman, also Woodrow Wilson School
Lauren L. Emberson
Johannes A. Haushofer, also Woodrow Wilson School
Casey Lew-Williams
Diana I. Tamir
Jordan A. Taylor
Ilana B. Witten, also Princeton Neuroscience Institute

Senior Lecturer
Justin A. Jungé

Associated Faculty
Sarah-Jane Leslie, Philosophy

Information and Departmental Plan of Study

The Department of Psychology welcomes students interested in all aspects of life and society. A rigorous understanding of human behavior and mental processes can be useful for almost any vocation. Students with a psychology degree have successfully pursued careers in science, clinical psychology, computer technology, teaching, public policy, medicine, business, law, economics and sometimes even the performing arts. The psychology concentration, within the Division of Natural Sciences, provides foundational and advanced
undergraduate courses on sensation, perception, movement, language, reasoning, decision making, social interaction, and computational models of the brain. Because psychological science involves working with large and complex datasets, students learn basic statistical methods. The psychology concentration also provides a grounding in neuroscience, since mental processes and behavior arise from the brain.

Psychology majors have an opportunity to be involved in cutting-edge research for their independent work. Our faculty members represent a diversity of research topics including the development of perception and language in infants and children, the use of neural measures for understanding memory and attention, the impact of implicit biases and stereotypes on social cognition, the neural basis of social communication, and many other topics. These research experiences, combined with the course offerings, prepare concentrators for a range of possible careers. Some students pursue graduate studies in psychological science, cognitive science, or neuroscience. Some pursue careers in data science, policymaking, or teaching. The psychology concentration is compatible with fulfilling requirements for medical school and law school.

For the Classes of 2018 and earlier: Students may fulfill either the former requirements in place at the time of matriculation or the current requirements. Please consult the 2014-2015 Undergraduate Announcement regarding the former requirements.

Prerequisites

The prerequisites for entering the Department of Psychology are successful graded completion of PSY 255 (Cognitive Psychology), PSY 252 (Social Psychology), and PSY 251 (Quantitative Methods). We are open to other course combinations to prepare students for entering the major. For example, students may fulfill the quantitative methods prerequisite by taking and passing (with a grade) a pre-approved course in another department (for example, ORF 245 or ECO 202). All requests for an alternative set of prerequisites must be approved by the department representative.

Early Concentration

Sophomores who have fulfilled the prerequisites may apply for early concentration. If accepted, they may engage in independent reading with a faculty adviser and submit a paper at the end of the spring semester. This preparation may qualify them for more advanced independent work in the junior year.

Program of Study

Psychology concentrators must successfully pass at least eight courses within the department and one course in a related field, in addition to the prerequisites. One of the eight departmental courses must be PSY 300 (Research Methods in Psychology), which must be completed by the end of junior year. One of the eight departmental courses must also be NEU 201/PSY 258 (Fundamentals of Neuroscience) or NEU 101/MOL 110/STC 102 (Neuroscience and Everyday Life). It is recommended that NEU 201 or NEU 101 be completed before the end of the junior year. For the remaining six PSY courses, the following requirements must be met: two 200-level courses or higher; three 300-level courses or higher; and one additional 400-level course. In addition, students must take one pre-approved course in another department related to psychology, such as ANT 206 (Human Evolution), CHV 333 (Bioethics), COS 126 (General Computer Science), ECO 100 or 101 (Introduction to Microeconomics or Macroeconomics), MAT 103 (Calculus), MOL 214 (Introduction to Cellular and Molecular Biology), or SOC 204 (Social Networks).
Independent Work

Junior Independent Work. To satisfy the junior independent work requirement, each student, in consultation with a faculty adviser, must (i) write a report that includes a critical evaluation and a synthesis of compiled articles during the fall semester and (ii) write a research proposal during the spring semester.

1. Fall Semester Papers: Each student is assigned to work with one faculty member from the Department of Psychology for the entire fall semester. The faculty adviser will create a list of three key readings on a specific topic most likely related to the adviser's research. Students are expected to discuss the key readings with their adviser, find at least three additional relevant articles on their own, and write a 15- to 20-page report that includes a critical evaluation of each article and a synthesis of all of the articles. To help students learn how to locate relevant primary sources, students will be required to attend one tutorial led by the psychology and neuroscience librarian.

2. Spring Semester Paper: Each student is assigned to work with one faculty member from the Department of Psychology for the entire spring semester. Students are required to write a 30-40 page research proposal. A research proposal consists of: (i) a comprehensive review and an exploration of the research literature on a psychology topic of importance; (ii) extensive evaluation of the quality, findings, and implications of that body of research, including an ongoing appreciation and assessment of the research designs used throughout the research literature; (iii) continuing display of both critical and original thought and analysis; and (iv) presentation of at least one detailed research study idea (proposed hypotheses, methods, and statistical analyses) that would further the knowledge of, and/or address key issues raised in, the relevant literature. The research proposal will provide practice developing a research question and designing a study, and in some cases may lead to the student's senior thesis. If the student collects pilot data, it can be included in the spring junior paper.

A second adviser, serving as a reader, will also be assigned for the spring semester. Second advisers are usually from the Department of Psychology. Advisers from other departments will be considered only after the student has obtained permission from the primary adviser, the departmental representative in psychology, and the potential second adviser. Then the student must submit written notification to the Student Program Administration Office indicating the name and department of the second adviser.

Senior Independent Work. Each concentrator must prepare a senior thesis, based either on an experimental investigation conducted by the student in a laboratory or field setting or on a theoretical inquiry or computational modeling endeavor. In close consultation with a faculty adviser, each student develops, carries out, and writes up his or her own research project. The resulting thesis serves as the basis for the first part of the senior comprehensive exam (see below). Students are required to select a primary adviser from within the Department of Psychology. They will not be assigned a faculty member as was done for their junior independent work. A second adviser, serving as a reader, will be assigned. Advisers from other departments will be considered only after the student has obtained permission from the primary adviser, the departmental representative in psychology, and the potential second adviser. Then the student must submit written notification to the Student Program Administration Office indicating the name and department of the second adviser.

Senior Departmental Examination

The senior comprehensive exam is a 60-minute oral examination conducted by two members of the faculty. The exam consists of two parts: (1) a defense of the senior thesis and a discussion of its implications, and (2) more general questions on the student's coursework and the broader field of psychology.
Study Abroad

The department allows psychology concentrators to study abroad for one semester or a full year. Concentrators may receive credit for up to two courses per semester spent studying abroad, to count toward their departmental course requirements. Courses taken while studying abroad require the prior approval of the departmental representative. To secure approval, students must document the work load and material covered by proposed courses.

Additional Information

Program in Neuroscience. The department offers the opportunity for concentrators to earn a certificate through the Program in Neuroscience. Interested students should discuss the program with the certificate directors and the departmental representative. Certain advanced courses taken in the program can count as cognates in the Department of Psychology.

Facilities. The laboratories of individual faculty members are open to undergraduates for their independent work. Information about the Department of Psychology can be found online, including a current description of the research being conducted in the laboratories. Broader resources available include: the Lewis Library's collection of psychology books and journals, computer labs and high-performance computing clusters, Princeton Neuroscience Institute shared equipment such as fMRI, EEG, TMS, eyetrackers, and microscopes, and the Princeton Survey Research Center.

Courses

PSY 101 Introduction to Psychology Spring STL
The scientific study of human thought and behavior with an emphasis on experimental methods. Two lectures, three hours of laboratory assignments. J. Cooper

PSY 207 Psychopathology Fall SA
An examination of the different patterns of abnormal behavior. Each will be examined from the perspective of such models of explanation as the psychoanalytic, behavioristic, humanistic, physiological, and cognitive models. Two lectures, one preceptorial. M. Spokas

PSY 208 The Brain: A User's Guide Not offered this year EC
A survey of brain and mind, emphasizing issues related to human behavior. Topics include: psychoactive drugs, aging and Alzheimer's disease, reengineering the brain, learning and memory, sleep-waking and biological rhythms, and major mental diseases. Two lectures, one preceptorial. B. Jacobs

PSY 212 The Psychology of Moral Behavior (also CHV 212 ) Not offered this year EM
A survey of the psychological, situational, and cultural determinants of moral thought and action. Topics will include the development of moral reasoning abilities, moral education, the relation between morality and rationality, altruism, and moral transgressions. Precepts will examine methods used in the psychological study of moral behavior. Two lectures, one preceptorial. D. Prentice

PSY 214 Human Identity in the Age of Neuroscience and Information Technology Not offered this year EC
A central challenge for modern society is to construct individual and group identity in the face of technologies that come ever closer to understanding the mechanisms of thought and feeling. We live in a time when cognitive
neuroscience is poised to trace the executive functions of the mind to the workings of the brain, and computer science is coming closer to replicating those functions. This course offers a multidisciplinary introduction to the scientific and social issues that underlie the potential cultural impact of advances in self-understanding. Faculty from a wide range of departments provide lectures. Two lectures, one preceptorial. *D. Osherson*

**PSY 216 Language, Mind, and Brain (See LIN 216)**

**PSY 237 The Psychology and Philosophy of Rationality (also PHI 237) Not offered this year EC** The human capacity for rationality is fundamental; however there is ample evidence for irrationality in human affairs—including notions such as hysteria, addiction, lack of self-control, wishful thinking, and self-deception. This course considers both errors and achievements, providing an introduction to a wide array of topics, such as logic, probability, decision theory, relativism, and psychopathology. It provides a background for further study of subjects such as logic, philosophy of mind, cognitive psychology, cognitive science, the psychology of judgment and choice, and the psychology of thinking. One two-hour lecture, one preceptorial. *E. Shafir, P. Johnson-Laird, G. Harman*

**PSY 251 Quantitative Methods Spring QR**
A general introduction to statistical techniques, both descriptive and inferential, employed by psychologists. Required for concentrators. Two lectures, one laboratory. *J. Junge*

**PSY 252 Social Psychology Fall SA**
The scientific study of social behavior, with an emphasis on social interaction and group influence. Topics covered will include social perception, the formation of attitudes and prejudice, attraction, conformity and obedience, altruism and aggression, and group dynamics. Two lectures, one preceptorial. *D. Tamir*

**PSY 254 Developmental Psychology (also CGS 254) Fall EC**
A survey of human development emphasizing the nature of children's minds and experience and the relation of childhood to adulthood. Two lectures, one preceptorial. *C. Lew-Williams*

**PSY 255 Cognitive Psychology (also CGS 255) Fall STL**
The course will survey the major themes and experimental findings of cognitive psychology and consider their relevance to the cognitive sciences in general. Topics covered will include attention, perception, imagery, memory, language, and reasoning. Two lectures, one preceptorial. *J. Taylor*

**PSY 257 Personality Not offered this year SA**
A survey of major approaches to the study of personality, including psychodynamic, social learning, and trait-theory approaches. The focus will be on the assumptions made by each approach, relevant techniques for collecting and analyzing data, and theoretical and practical implications. Two lectures, one preceptorial. *Staff*

**PSY 258 Fundamentals of Neuroscience (See NEU 201)**

**PSY 259A Introduction to Cognitive Neuroscience (See NEU 202A)**

**PSY 259B Introduction to Cognitive Neuroscience (See NEU 202B)**
PSY 302 Linguistics and Language Acquisition (See LIN 314)  
PSY 306 Memory and Cognition (also NEU 306)  
PSY 307 Educational Psychology  
PSY 308 Personality and Social Psychology  
PSY 309 Psychology of Language (also LIN 309)  
PSY 310 Psychology of Thinking  
PSY 311 Rationality and Human Reasoning  
PSY 312 Social Psychology I  
PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

Empirical facts, theoretical issues, and scientific techniques in the area of human memory. Potential topics include models of memory, eyewitness testimony, comprehension, representation of knowledge, autobiographical memory, reality monitoring, amnesia, and other disorders of memory and cognition. Two lectures, one preceptorial. Prerequisite: 255 or 259, or instructor's permission. K. Norman

PSY 307 Educational Psychology  
PSY 308 Personality and Social Psychology  
PSY 309 Psychology of Language (also LIN 309)  
PSY 310 Psychology of Thinking  
PSY 311 Rationality and Human Reasoning  
PSY 312 Social Psychology I  
PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

Principles of psychology relevant to the theory and practice of education. Through selected readings, discussion, and classroom observations, students study theories of development, learning, cognition (including literacy), and motivation, as well as individual and group differences in these areas; assessment; and the social psychology of the classroom. The course focuses on how learning by children and adolescents at the elementary, middle, and secondary school levels is influenced by their own characteristics and experiences and the various contexts in which they learn: family, school, community, and culture. One three-hour seminar. M. Glat

PSY 309 Psychology of Language (also LIN 309)  
PSY 310 Psychology of Thinking  
PSY 311 Rationality and Human Reasoning  
PSY 312 Social Psychology I  
PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

The cognitive and interpersonal processes involved in language use. Topics include speech production and perception, the nature of grammatical and lexical knowledge, semantics and pragmatics, computer systems for natural language understanding, language acquisition, and the social bases of human communication. Two lectures, one preceptorial-laboratory. Prerequisite: 255 or instructor's permission. A. Goldberg

PSY 310 Psychology of Thinking  
PSY 311 Rationality and Human Reasoning  
PSY 312 Social Psychology I  
PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

The study of human problem solving, reasoning, and decision making. Phenomena of interest include thinking in everyday situations and contexts as well as in more specialized areas, such as logic, mathematics, and the sciences. Two lectures, one preceptorial. Prerequisite: 255 or instructor's permission. Staff

PSY 311 Rationality and Human Reasoning  
PSY 312 Social Psychology I  
PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

An examination of the fundamental theories of belief and decision, from both the normative and descriptive perspectives. Utility, logic, probability, and abduction will be considered, with additional topics drawn from computability theory and from collective choice. Two lectures, one preceptorial. D. Osherson

PSY 312 Social Psychology I  
PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

Considers how one infers the motives, dispositions, and abilities of other persons. Next examines how these inferential processes are used to draw inferences about oneself. Students will design an original experiment (with consultation). Two lectures, one preceptorial. Prerequisite: 252 or instructor's permission. E. Pronin

PSY 313 Interpersonal Perception  
PSY 314 Research Methods in Social Psychology

An examination of the various methods by which social psychologists conduct research, including laboratory and field experiments, quasi-experiments, survey research, and naturalistic observation. Over the course of the semester, students will design and conduct social psychological research using these methods. Although valuable for all psychology majors, this course will be particularly useful for those who anticipate completing a senior thesis based on empirical research. Prerequisites: 251 or permission of instructor. One three-hour seminar. J. Shelton

PSY 314 Research Methods in Social Psychology  
PSY 315 Social Psychology II  
PSY 316 Social Psychology III
PSY 319 Childhood Psychopathology Not offered this year SA
An examination of the major forms of childhood psychopathology. Causal roles played by individual factors, traumatic events, the family, school, and community as well as the prevention and treatment of childhood disorders will also be examined. One three-hour seminar. Prerequisites: 207 and 254. Offered in alternate years. Staff

PSY 320 Theories of Psychotherapy Not offered this year SA
An examination of the various forms of psychotherapy, including the psychoanalytic, behavioristic, humanistic, and cognitive approaches. The focus will be upon the theoretical base, format, and empirical support for each approach. The impact of different treatment settings will also be considered. One three-hour seminar, including field-setting preceptorials. Prerequisite: 207 or permission of instructor. Staff

PSY 321 The Psychology of Decision Making and Judgment (See WWS 340)

PSY 322 Human-Machine Interaction (also ORF 322 ) Not offered this year EC
A multidisciplinary study of the fundamentals of human-machine interactions from both the human psychology/philosophy side and the machine engineering and design side. Philosophical, psychological, and engineering models of the human processor. Functional differences between people and machines, the nature of consciousness and intelligence, massively parallel computing and neural networks, and the concept of resonant synergism in human-machine interactions. Two 90-minute lectures; three laboratories during semester. A. Kornhauser, P. Johnson-Laird, J. Cooper

PSY 323 Experimental Psychopathology Not offered this year SA
An examination of the relationship between important topics in abnormal psychology and laboratory research conducted in other areas of psychology. Topics will include the ties between laboratory-learned helplessness and mood disorders, human memory research and dissociative disorders, and coping strategies and anxiety disorders. Two 90-minute classes. Prerequisite: 101 and 207, or instructor's permission. R. Comer

PSY 326 Social and Personality Development Not offered this year SA
Major issues in social and personality psychology examined from a developmental perspective with emphasis on developmental processes and change. Data on children, adolescents, and adults will be considered. Topics will include: social attachment, stranger and separation anxiety, self-concept, self-esteem, achievement, sex roles, and antisocial, prosocial, and moral behavior. Prerequisite: 252 or 254 or 257 or instructor's permission. Two 90-minute seminars. J. Girgus

PSY 327 Close Relationships Not offered this year SA
This course introduces the scientific perspective on close relationships. Students will learn how research psychologists apply the scientific method of data collection and analysis to investigate how people experience and think about relationships in general, and romantic relationships in particular. Two lectures, one preceptorial. J. Shelton

PSY 329 Psychology of Gender (also GSS 329 ) Fall EC
Gender is a topic with which everybody feels intimately familiar. This course holds up to scientific scrutiny the strong beliefs people have about how women and men are similar to and different from each other, examining major theories and empirical findings in psychological research on gender. Topics include the development of gender identity, empirical comparisons of men and women, gender stereotypes and their perpetuation, and the role of
gender and gendered beliefs in achievement, interpersonal relationships, and physical and psychological well-being. Prerequisite: any course in psychology. Two 90-minute lectures, one preceptorial. K. Brynildsen

**PSY 330 Introduction to Connectionist Models: Bridging between Brain and Mind (See NEU 330)**

**PSY 336 The Diversity of Brains (also EEB 336 / NEU 336) Fall EC**
A survey of the unique behaviors of different animal species and how they are mediated by specialized brain circuits. Topics include, for example, monogamy in voles, face recognition in primates, sex- and role-change in fish, and predation by bats. The role of evolutionary and developmental constraints on neural circuit construction will be a key underlying theme. Prerequisites: 258 or 259. One three-hour seminar. A. Ghazanfar

**PSY 365 Freud on the Psychological Foundations of the Mind (See HUM 365)**

**PSY 400 Topics in Social and Personality Psychology Spring SA**
An examination of various topics in social and personality psychology not emphasized in other courses. The topic and prerequisites will vary from year to year. Staff

**PSY 404 Cellular and Systems Neuroscience (See NEU 408)**

**PSY 410 Depression: From Neuron to Clinic (also NEU 410) Not offered this year EC**
This course focuses on clinical depression as a model topic for scientific discourse. Depression is a subject of growing individual and societal importance, and it is an ideal topic because it intersects such a broad range of issues. Our work will emphasize a neurobiological approach, with topics ranging from the molecular to the clinical. Prerequisites: 208 or 258, or EEB 211, or MOL 214, and instructor's permission. One three-hour seminar. B. Jacobs

**PSY 437 Computational Neuroscience (See NEU 437)**
Program in Quantitative and Computational Biology

Director
Eric F. Wieschaus

Executive Committee
Peter Andolfatto, Ecology and Evolutionary Biology, Lewis-Sigler Institute for Integrative Genomics
Coleen T. Murphy, Molecular Biology, Lewis-Sigler Institute for Integrative Genomics
Joshua D. Rabinowitz, Chemistry, Lewis-Sigler Institute for Integrative Genomics

The Program in Quantitative and Computational Biology is offered by the Lewis-Sigler Institute for Integrative Genomics and its affiliated departments. It is designed for students with a strong interest in multidisciplinary and systems-level approaches to understanding molecular, cellular, and organismal behavior. The curriculum introduces students to experimental and analytic techniques for acquisition of large-scale quantitative observations, and the interpretation of such data in the context of appropriate models. Strong emphasis is placed on using global genome-wide measurements (e.g., microarray gene expression, sequence, phenotype) to understand physiological and evolutionary processes.

Examples of ongoing research include organizational principles of metabolic networks, quantitative modeling of cell-biological processes, mapping the genetic basis of complex bacterial behavior, comparative genomics analysis of regulatory networks, the genetic basis of quantitative phenotypic variation, and genomic plasticity and mechanisms of phenotypic adaptation.

At the core of the curriculum is independent research initiated in the fall of junior year, in which students participate in the design, execution, and analysis of experiments in a host laboratory of their choice. The required courses provide a strong background in modern methodologies in data analysis, interpretation, and modeling. A certificate in quantitative and computational biology is awarded to students who successfully complete the program requirements.

Admission to the Program

Students are admitted to the program after they have chosen a concentration and consulted with the program committee, or the Director of the program, in May of their sophomore year. Although students are encouraged to find a lab on their own, the program committee will, if necessary, assist students in selecting a laboratory for their junior independent and thesis work. Students must have identified a lab and research project by the first day of their junior year fall semester. Admission requires the completion of prerequisites listed below. Electives are chosen in consultation with the adviser.

There are two possible tracks for entry into the QCB certificate program:

1. Integrated Science ISC 231-234
   -OR-
2. All of the following courses:
• COS126 or higher
• MOL215 or the equivalent by permission of the Director
• PHY103-104 or the equivalent by permission of the Director
• CHM 201-202 or the equivalent by permission of the Director
• One 200-level math course (or higher) - OR - one semester of statistics: SML201, ORF245, MOL/EEB355 or higher (but not PSY251)

Please note that students can use their AP credits for the PHY and CHM requirements as per the university's Reference Table for AP Credit.

• AP 5 on Parts I and II of Physics C gives equivalency for PHY103-104
• AP 4 on Chemistry gives equivalency for CHM201 (but not CHM202)
• AP 5 on Chemistry gives equivalency for CHM201-202

Applications for program admission, including the Research Lab form, must be submitted by May 31 of sophomore year and should include the following information: prerequisite courses, plans for courses in the junior and senior years, and independent work plans. Admission decisions are made by June 30.

Program of Study

1. QCB 302: Research Topics in QCB (taken in the fall of junior year)

2. Three electives from the course list below (Additional courses may be taken as electives with approval from the Director):

   CBE433 Mechanics/Dynamics of Soft Living Matter
   CBE440 The Physical Basis of Human Disease
   CBE448/MAT481 Introduction to Nonlinear Dynamics
   CHM440 Drug Discovery in the Genomics Era
   COS/MOL557 Analysis & Visualization of Large-Scale Genomic Data Sets
   ISC326 Human Genomics: Past, Present, Future
   ISC335 Organic Chemistry of Metabolism
   MAT/APC321 Numerical Methods
   NEU408 Cellular and Systems Neuroscience
   PHY209 Computational Physics Seminar
   PHY412 Biological Physics
   PSY338 Animal Learning and Decision Making: Psychological, Computational and Neural Perspectives
   QCB455 Introduction to Genomics and Computational Molecular Biology
   QCB505 Topics in Biophysics and Quantitative Biology: Statistical Mechanics for Real Biological Networks
   QCB511 Modeling Tools for Cell and Developmental Biology
3. Junior and senior independent work must have significant overlap with areas in quantitative and computational biology.

A minimum of a B average in program courses and junior and senior independent work is required for successful completion of the program. Program courses cannot be taken pass/D/fail.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in quantitative and computational biology upon graduation. Students who pursue a certificate in quantitative and computational biology may not also receive a certificate in biophysics.

Courses

ISC 231 An Integrated, Quantitative Introduction to the Natural Sciences I (also CHM 231 / COS 231 / MOL 231 / PHY 231 ) Fall STL
An integrated, mathematically and computationally sophisticated introduction to physics, chemistry, molecular biology, and computer science. Alternative to the combination of PHY 103-104, CHM 201-202, MOL 214-215 and COS126. Students must enroll in ISC231 and ISC232 in the fall and ISC233 and ISC234 in the spring. Prerequisites: familiarity with calculus at the level of MAT 103-104 or Advanced Placement Calculus BC, solid high school physics and chemistry courses. Five lectures, one three-hour laboratory, one three-hour computational laboratory, one evening problem session. T. Gregor, S. Shvartsman, E. Wieschaus

ISC 232 An Integrated, Quantitative Introduction to the Natural Sciences I (also CHM 232 / COS 232 / MOL 232 / PHY 232 ) Fall QR
An integrated, mathematically and computationally sophisticated introduction to physics, chemistry, molecular biology, and computer science. Alternative to the combination of PHY 103-104, CHM 201-202, MOL 214-215 and COS126. Students must enroll in ISC231 and ISC232 in the fall and ISC233 and ISC234 in the spring. Prerequisites: familiarity with the calculus at the level of MAT 103-104 or Advanced Placement Calculus BC, solid high school physics and chemistry courses. Five lectures, one three-hour laboratory, one three-hour computational laboratory, one evening problem session. T. Gregor, S. Shvartsman, E. Wieschaus

ISC 233 An Integrated, Quantitative Introduction to the Natural Sciences II (also CHM 233 / COS 233 / MOL 233 / PHY 233 ) Spring STL
An integrated, mathematically and computationally sophisticated introduction to physics and chemistry, drawing on examples from biological systems. Alternative to the combination of PHY 103-104, CHM 201202, MOL 214-215, and COS126. Students must enroll in ISC231 and ISC232 in the fall and ISC233 and
ISC 234 in the spring. Prerequisites: familiarity with the calculus at the level of MAT 103-104 or Advanced Placement Calculus BC, solid high school physics and chemistry courses. Five lectures, one three-hour laboratory, one three-hour computational laboratory, one evening problem session. J. Shaevitz, O. Troyanskaya, H. Yang

ISC 234 An Integrated, Quantitative Introduction to the Natural Sciences II (also CHM 234 / COS 234 / MOL 234 / PHY 234 ) Spring
An integrated, mathematically and computationally sophisticated introduction to physics and chemistry, drawing on examples from biological systems. Alternative to the combination of PHY 103-104, CHM 201202, MOL 214-215 and COS126. Students must enroll in ISC231 and ISC232 in the fall and ISC233 and ISC234 in the spring. Prerequisites: familiarity with the calculus at the level of MAT 103-104 or Advanced Placement Calculus BC, solid high school physics and chemistry courses. Five lectures, one three-hour laboratory, one three-hour computational laboratory, one evening problem session. J. Shaevitz, O. Troyanskaya, H. Yang

ISC 235 An Integrated, Quantitative Approach to Biochemistry and Neuroscience (also CHM 235 / COS 235 / MOL 235 / PHY 235 ) Not offered this year
An integrated, mathematically and computationally sophisticated introduction to biochemistry, neurobiology, genetics, genomics, and evolution. Prerequisites: ISC231-234 or equivalent preparation (MOL214, COS126, CHM 201-202 or 203-204, PHY 103-104 or 105-106) or by permission from the instructor. Two lectures, one precept, one evening problem session. Staff

ISC 236 An integrated, Quantitative Approach to Genetics and Genomics (also CHM 236 / COS 236 / MOL 236 / PHY 236 ) Not offered this year
An integrated, mathematically and computationally sophisticated introduction to biochemistry, neurobiology, genetics, genomics, and evolution. Prerequisites: ISC231-234 or equivalent preparation (MOL214, COS126, CHM 201-202 or 203-204, PHY 103-104 or 105-106) or by permission from the instructor. Two lectures, one precept, one evening problem session. Staff

ISC 326 Human Genomics: The Past, Present and Future of the Human Genome (also EEB 326 / MOL 326 ) Spring
The completion of the human genome and the continuing effort to sequence tens of thousands of human genomes is yielding unprecedented insights into human biology and the evolutionary history of our species. We will review the key advances enabling researchers to decipher the structure and function of the human genome as well as the genetic basis of variation among individuals and populations. Topics include the evolutionary origins and current structure of human populations, methods for detecting genomic features, cancer genomics and mapping the genes and variants underlying population-specific adaptations and disease susceptibility. P. Andolfatto, J. Ayroles, M. Singh

ISC 335 Organic Chemistry of Metabolism (also CHM 335 ) Fall
A rigorous one-semester introduction to the organic chemical reactions of greatest biological importance, taught through the lens of metabolism. Covers organic mechanisms underlying fundamental enzymecatalyzed reactions and quantitative analysis of enzyme kinetics and metabolic networks. For quantitatively-inclined students interested in biology, this course is an alternative to the standard twosemester organic chemistry sequence (CHM303/304). Does not replace CHM303/304 for Chemistry majors. Satisfies the organic chemistry requirement for Molecular Biology majors and provides appropriate preparation for subsequent studies in Biochemistry. J. Rabinowitz
QCB 301 Experimental Project Laboratory in Quantitative and Computational Biology (also MOL 301)  
Not offered this year STL
An intensive double-credit course focusing on state-of-the-art experimental design and practice in quantitative biology. Emphasis is placed on functional genomics using global genome-wide measurements (e.g., microarray gene expression, sequence, phenotype) to understand physiological and evolutionary processes. Begins with a short introduction to technology and principles, followed by the design and execution of independent projects done by pairs of students in collaboration, with the continuing guidance and advice of the teaching staff. Prerequisites: ISC 231-234 and ISC 235-236. Four three-hour laboratories.

Staff

QCB 302 Research Topics in QCB  Fall STN
Junior independent research projects will be discussed in order to provide guidance and feedback. We will emphasize critical thinking about experiments and large dataset analysis along with the ability to clearly communicate one's research. Students will present background research and progress reports. Written work will consist of an NSF-style proposal and an NIH-style grant proposal/research paper. Students must choose research labs in the spring of their sophomore year and be engaged in the research from the start of the fall term. Prerequisites: ISC231-234 or equivalent preparation (see QCB Certificate prerequisites). A. Amodeo, N. Wingreen

QCB 455 Introduction to Genomics and Computational Molecular Biology (also MOL 455 / COS 455)  Fall QR
Introduction to computational and genomic approaches used to study molecular systems. Topics include computational approaches to sequence similarity and alignment, phylogenetic inference, gene expression analysis, structure prediction, comparative genome analysis, and high-throughput technologies for mapping genetic networks. Two lectures, one preceptorial. A. Baryshnikova, M. Levine, M. Singh


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Department of Religion

Chair
Leora F. Batnitzky

Acting Chair
Judith I. Weisenfeld (fall/spring)

Departmental Representative
Jessica Delgado

Director of Graduate Studies
AnneMarie Luijendijk

Professor
Leora F. Batnitzky
Wallace D. Best, also African American Studies
Eddie S. Glaude Jr., also African American Studies
Eric S. Gregory
Martha Himmelfarb
AnneMarie Luijendijk
Elaine H. Pagels
Jacqueline I. Stone
Stephen F. Teiser
Jeffrey L. Stout

Judith L. Weisenfeld
Muhammad Q. Zaman, also Near Eastern Studies

Associate Professor
Jonathan C. Gold
Shaun E. Marmon

Assistant Professor
Jessica Delgado
Naphtali S. Meshel, also Judaic Studies
Seth Perry
Moulie Vidas, also Judaic Studies

Lecturer with Rank of Professor
John G. Gager Jr.

Lecturer
Eric R. Huntington, also Council of the Humaniti

Information and Departmental Plan of Study Prerequisites

Any course offered by the department.

Early Concentration

A sophomore may apply for early concentration through consultation with the departmental representative.

Program of Study

Normally, each term juniors and seniors will take two courses offered by the department.
Concentrators are required to complete at least eight religion courses taught by department faculty (including visitors to the Department of Religion) by the end of their senior year. All students are required to complete Religion 222, which is considered one of the eight religion courses. In addition, students are encouraged, but not required, to take two approved cognate courses in other departments. The cognate courses will be calculated into departmental honors. The departmental representative must approve cognate courses.

Students will select at least one course from each of the following three areas:

1. Religions of the Ancient Mediterranean: Judaism and Christianity from Antiquity to the Middle Ages: 230, 251, 252, 340, 350, 352, 353, and occasional courses

2. Religions of the Americas: 258, 319, 357, 358, 360, 367, and occasional courses


Students will select two courses in the following area from two different traditions:

Islam and the Religions of Asia: 225, 226, 228, 229, 235, 236, 240, 322, 326, 328, 334, 335, 336, 338, 382, and occasional courses

Not all courses satisfy area requirements. A course may be counted toward one area requirement only. In any year it is offered, 373 Studies in Religion will be assigned to the appropriate area.

Religion concentrators are required to take Religion courses for a letter grade. However, once senior religion majors have satisfied all departmental and area requirements, they are allowed to P/D/F departmental courses with permission from the departmental representative. Majors must obtain the written approval of the department representative prior to choosing this grading option.

When registering for the first term of senior year, each student will decide upon a focus of study in consultation with the departmental representative. Possible focuses of study include Japanese religions, Chinese religions, Buddhism, Islam, philosophy of religion, modern Jewish thought, religious and philosophical ethics, social criticism, African American religious movements, gender, sexuality, and religion in the Americas, global pentecostalism, new religious movements, religion and American politics, visual, material, and popular culture in American religions, race and religion in the Americas, Biblical studies, ancient Judaism and Christianity, Rabbinic Judaism, and Gnosticism. Senior independent work will be in the student's focus of study, and two courses must be completed in the focus of study by the end of the first term of the senior year. All changes to the focus of study must be approved by the departmental representative.

Independent Work

Junior Year. During the fall term of the junior year, all department juniors will participate in a colloquium (see below for study abroad) with a member or members of the faculty. In addition to short assignments throughout the term that prepare majors to research and write a junior paper (JP), students are expected to produce a five to seven-page JP proposal. The JP proposal and colloquium participation constitute 40 percent of the junior independent grade. During the spring term, juniors will do independent reading and write a 30-40 page junior paper under
supervision. The departmental representative, in consultation with the director of the colloquium, will assign
advisers. The spring junior paper will constitute 60 percent of the junior independent work. At the end of junior
year, students will review their work in the department and discuss with a faculty committee their plans for senior
independent work.

Senior Year. Every senior will prepare a 70-90 page thesis under the supervision of a faculty adviser.

Senior Departmental Examination

At the end of the senior year, students will take an oral examination concerning their senior independent work, focus
of study, and work in the department generally.

Study Abroad

The Department of Religion welcomes study abroad for departmental majors in their junior year. Those juniors who
study abroad in their fall term will be exempt from the colloquium but will be required to write a fall junior paper
under the supervision of a religion department faculty member. Juniors who study abroad in the spring term will
write the required spring junior paper under the supervision of a religion department faculty member. Normally,
students are expected to have junior year independent work completed before the start of the senior year. Students
must consult with the departmental representative before leaving for their study abroad program.

Preparation for Graduate Study

Those students considering graduate work in religion are strongly advised to develop a reading knowledge of
languages most appropriate to their focus of study, for example, Hebrew, Greek, Latin, Arabic, Chinese, Japanese,
German, and French.

Religion and Special Programs. Students who wish to combine the study of religion with work in programs should
consult the departmental representative. In recent years, religion majors have received certificates in African
American studies, African studies, American studies, dance, East Asian studies, European cultural studies, Hellenic
studies, Judaic studies, Near Eastern studies, theater, visual arts, and gender and sexuality studies.

Courses

REL 202 Great Books of the Jewish Tradition (See JDS 202)

REL 221 Choral Music (See MUS 221)

REL 222 Theories and Methods in the Study of Religion (also HUM 222 ) Spring EC
An examination of thinkers (e.g. Pascal, Hume, Marx, Emerson, Freud) and filmmakers (e.g. Hitchcock, Kurosawa,
Friedrich) who distinguish between a way of life they regard as sinful, oppressive, or deluded and a process of change
in which the alleged defects are overcome. The course provides an introduction to modern debates over what religion
is and how it affects individuals and societies, for good or for ill. The course also concerns film as a vehicle for
ethical reflection and social criticism. Two lectures, one preceptorial, one film screening. L. Carlson
REL 223 Introduction to Judaism: Religion, History, Ethics (See JDS 201)

REL 225 The Buddhist World of Thought and Practice Fall HA
An introduction to the thought and history of Buddhism. Emphasis is upon the beginnings of the religion in India, the interaction between Buddhism and the various cultures of Asia, basic schools of Buddhist religious philosophy, the relationship between thought and practice, and the place of Buddhism in the modern world. Two lectures, one preceptorial. J. Stone

REL 226 The Religions of China (also EAS 226) Spring EM
A thematic introduction to the history of Chinese religion. Topics include: cosmology, family, shamanism, divination, mortuary ritual, and women. Readings are drawn from a wide range of sources, including sacred scriptures, popular literature, and modern ethnography. Two lectures, one preceptorial. S. Teiser

REL 227 Tibetan Buddhism Not offered this year EM
This course is a survey of the Buddhist traditions of Tibet, focusing on the doctrines and practices associated with the main schools of tantric ritual and meditation. Topics covered will include: the origins of the distinct forms of Buddhism in Tibet; Buddhist responses to historical challenges; the special relationship between politics and religion in Tibet; the role of Tibetan Buddhist scholars and scholasticism; Tibet through the lenses of the Chinese, and the West; and Tibetan Buddhist art. Required field trip to the Rubin Museum of Art in NYC. J. Gold

REL 228 Religion in Japanese Culture (also EAS 228) Not offered this year HA
An introduction to Japanese religion from ancient to modern times, focusing on its role in culture and history. Representative aspects of Shinto, Buddhist, Confucian, and other traditions will be studied, as well as such topics as myth, ritual, shamanism, and ancestor worship. Two 90-minute classes. J. Stone

REL 229 Great Books in Buddhism (also HUM 229) Not offered this year LA
Close reading of great stories in the formative period of Buddhism, 50 BC to 400 AD. Examines Buddhist literature against the background of religious doctrine and cultural history. Explores themes such as: previous lifetimes, rebirth and cosmology, genres of Buddhist narrative, parables, personal quests versus social justice, emptiness, and changing conceptions of the Buddha. Two lectures, one preceptorial. S. Teiser

REL 230 Who Wrote the Bible (also JDS 230) Not offered this year HA
The course will introduce students to the Hebrew Bible ("Old Testament") in its ancient Near Eastern setting. Key concepts often associated with the Hebrew Bible, such as God, damnation, sin, and history, will be scrutinized through a careful reading of a selection of Biblical texts including the Creation and Garden of Eden narratives in Genesis, the laws of Leviticus, the prophecies of Ezekiel and the poetry of Song of Songs. Particular attention will be paid to the transformations that the texts underwent through a continuous process of transmission and interpretation. Two 90-minute classes. Staff

REL 235 In the Shadow of Swords: Martyrdom and Holy War in Islam (also NES 235) EM
This course is an examination of the changing concepts of martyrdom, holy war, and suicide in both Sunni and Shi'i Islam. How are war and martyrdom presented in the sacred texts of these traditions? Historically, how have Sunni and Shi'i Islam constructed, idealized, and also questioned the concept of the Islamic martyr and/or the holy warrior? In what ways have modern religious revivalism, revolutionary movements, and struggles for nationhood created a
new and still contested understanding of the Islamic martyr? Course materials include sources in translation, films, Internet sites, and journals. Two lectures, one preceptorial.

S. Marmon

**REL 236 Introduction to Islam (also NES 236 ) SA**
The doctrines and practices of Islamic communities from the Prophet Muhammad up to and including the modern period. Topics covered include the Qur'an; Sunnis and Shi'is; Islamic law and philosophy; Sufism; Islamic art and architecture; Islamic understandings of physical space and time; the structure of Muslim households; gender issues; Islamic education; modern Islamic "fundamentalist" movements. Materials include sources in translation, films, modern novels. Guest speakers representing diverse Muslim perspectives will be an important component. Two lectures, one preceptorial. S. Marmon

**REL 240 Muslims and the Qur'an (See NES 240)**

**REL 242 Jewish Thought and Modern Society (also JDS 242 ) Not offered this year EM**
What is the relation of Judaism and the individual Jew to the modern world? Is Judaism a religion, a nationality, an ethnicity, or a combination of these? This course explores various answers to these questions by examining various historical and cultural formations of Jewish identity in Europe, America, and Israel from the 18th century to the present, and by engaging particular issues, such as Judaism's relation to technology, the environment, biomedical ethics, feminism, and democracy. Two lectures, one preceptorial. L. Batnitzky

**REL 251 The New Testament and Christian Origins Spring HA**
This course is a historical introduction to early Christian texts within and outside of the New Testament canon. We investigate how the Christian movement began, using ancient sources - Jewish, Greek, Roman, and Christian - about Jesus of Nazareth. We read the letters of the Apostle Paul and New Testament gospels, and the recently discovered gospels of Thomas and Mary. We will discuss the formation of the New Testament canon, views of Jesus, and attitudes toward gender, race and community. The course is accessible to students new to these sources, as well as to those familiar with them. Two lectures, one preceptorial. Staff

**REL 252 Christianity: From Illegal Movement to World Religion Not offered this year HA** We investigate what is known about Jesus from earliest gospels, Roman and Jewish sources, and "gnostic gospels;" letters between a Roman governor and emperor telling why they had Jesus' followers tortured and executed; first hand accounts of conversion, trials and martyrdom's; how pagans saw Christians, and how the movement emerged from Judaism; debates over virgin birth, resurrection, sexual practices, gender roles; and how emperor Constantine's conversion- and the work of Augustine-transformed the movement. Two lectures, one preceptorial. E. Pagels

**REL 258 Religion in American Society SA**
A broad survey of religion in American society from the colonial era to the present. Emphasis on religious encounter and conflict; the relationship between religious change and broader social and political currents; religious innovations and transformations; immigrant religions; secularization, resurgence, and pluralism. Mix of primary and secondary source readings. Two lectures, one preceptorial. Staff

**REL 261 Christian Ethics and Modern Society (also CHV 261 ) Not offered this year EM** An examination of the meaning of Christian ethics through a study of selected contemporary moral and political issues: bioethics, capital punishment, sex and marriage, pluralism, race, class, gender, the environment, the morality of warfare, torture, and the role of religion in public life. Two lectures, one preceptorial. E. Gregory
REL 300 Topics in the Study of Gender (See GSS 302)

REL 309 Politics and Religion (See POL 309)

REL 311 Religious Existentialism Not offered this year EC
An in-depth study of existentialist philosophies of, among others, Søren Kierkegaard, Martin Buber, Martin Heidegger, Jean-Paul Sartre, and Emmanuel Levinas. The course will focus on their respective arguments about the relations between philosophy and existence, reason and revelation, divine law and love, philosophy, religion and politics, and Judaism and Christianity. One three-hour seminar. L. Batnitzky

REL 312 Augustine and Aquinas Not offered this year EM
A comparative study of the primary texts of Augustine of Hippo and Thomas Aquinas. Topics include: the problem of evil, human nature, the existence of God, freedom and grace, ethics and politics, and the relation of theology to philosophy. Attention also given to the legacy of these influential and contested thinkers. One three-hour seminar. E. Gregory

REL 313 Pragmatism and Religion: James and Dewey Spring EC
Examines the works of two important classical pragmatists, William James and John Dewey, and their views about religion. Focuses on questions such as: How do James and Dewey understand and respond to evil and death? Is a conception of God important to their thoughts about religion? Attention given throughout the course to the concepts of nature, experience, and piety. One three-hour seminar. E. Glaude Jr.

REL 317 Recent Jewish and Christian Thought (also JDS 317) Not offered this year EM
Explores recent Jewish, Christian, and postmodern thought, all of which seek to criticize universalist conceptions of reason and ethics while defending a view of Jewish, Christian, or philosophical particularity. Examines the historical reasons for and philosophical contents of these arguments and also their philosophical, ethical, and political implications. Seminar. L. Batnitzky

REL 319 Religious Encounters in the Colonial Atlantic World Not offered this year HA
The encounter of Europeans, Africans, and native Americans in the world of the colonial Atlantic from the mid-15th to the 18th centuries constituted "America." This course will examine the religious dimensions of the encounter of these different peoples across time and space. One three-hour seminar. Staff

REL 321 Black Power and Its Theology of Liberation (See AAS 321)

REL 322 Buddhism in Japan (also EAS 322) Not offered this year HA
An examination of representative aspects of Buddhist thought and practice in Japan from the sixth century to the present. Possible topics include: major Buddhist traditions (Lotus, Pure Land, Zen, and Tantrism), meditation, ritual, cosmology, ethics, influence on literature, and interaction with other religions. Two 90-minute seminars. J. Stone

REL 324 Mind and Meditation Fall EC
An examination of the philosophy, history, and methods of Buddhist meditation. Buddhist theoretical works will be studied in their traditional contexts and considered in the light of modern philosophy of mind and cognitive science
regarding the emotions, the will, and the effects of meditation. Some coursework in Philosophy or Religion is expected. J. Gold

**REL 326 Buddhist Literature**  
Not offered this year HA  
An intensive reading and discussion of selected Buddhist texts from various cultures, from ancient times to the present. Readings may represent a range of genres, such as Buddhist scriptures, philosophical writings, sacred biography, narrative, sermons, poetry, drama, and fiction. Alternatively, we may study the reception across Buddhist cultures and time periods of a single significant text. Prerequisite: 225 or equivalent recommended. Two 90-minute classes. J. Stone

**REL 328 Women and Gender in Islamic Societies (also GSS 328)**  
Fall SA  
This seminar focuses on issues of gender and sexuality in Islamic societies, past and present. Topics include women's lives, women's writings, changing perceptions of male vs. female piety, marriage and divorce, motherhood and fatherhood, sexuality and the body, and the feminist movement in the Middle East. Course materials include a wide range of texts in translation, including novels and poetry, as well as contemporary films. One three-hour seminar. S. Marmon

**REL 329 Topics in Ancient History (See CLA 326)**

**REL 334 Modern Islamic Political Thought (See NES 334)**

**REL 335 Moses and Jesus in the Islamic Tradition (also NES 356)**  
HA  
The "monotheistic superheroes" in the Islamic tradition are the "brother prophets" who preceded Muhammad, the "seal of the prophets." These prophets include figures who have parallels in the Jewish and Christian traditions, such as Abraham, Moses, Solomon and Jesus. We will explore the history of the rich post scriptural Islamic tradition, both oral and written, that developed and expanded the "stories of the prophets" and made them into the "monotheistic superheroes" that they continue to be today. One three-hour seminar. S. Marmon

**REL 336 Pilgrimage, Travel, and Sacred Space: Muslims, Christians, and Jews in the Land of Islam (also NES 336)**  
HA  
Muslim, Christian, and Jewish travelers and pilgrims in the lands of Islam before the period of European dominance in the Middle East. The course uses original accounts (in translation) along with a range of contemporary scholarly literature drawn from history, religious studies, and anthropology. One three-hour seminar. S. Marmon

**REL 338 Islam in India and Pakistan (also NES 340)**  
Not offered this year HA  
India and Pakistan, home to nearly a third of the world's Muslim population, offer an unusually rich spectrum of the ways in which Islam has been lived, thought about, and transformed in recent times, both within this vast region and in the wider world. Our topics include: Sufism; the evolving relations between Sunni and Shi'ite Muslims; major trends in Islamic law, theology, and political thought; Islamic institutions of learning (madrasas); and Muslim and non-Muslim minorities. One three-hour seminar. M. Zaman

**REL 339 Introduction to Islamic Theology (See NES 339)**

**REL 340 Ancient Judaism and the Dead Sea Scrolls (also JDS 340)**  
Not offered this year HA
A study of the history of Judaism in ancient Palestine from the emergence of the Torah as an authoritative document under Persian rule in the middle of the fifth century BCE through the destruction of the Second Temple in 70 CE, with an emphasis on the critical reading of primary sources. Much of the second half of the course is devoted to the Dead Sea Scrolls and their implications for our understanding of ancient Judaism. Other texts to be studied include 1 Enoch, the Wisdom of Ben Sira, 1 and 2 Maccabees, Daniel, Jubilees, and 4 Ezra. Two 90-minute classes. M. Himmelfarb

REL 346 Reason and Revelation in Jewish Thought (also JDS 346 ) Not offered this year EC A critical introduction to some of the classics of medieval and modern thought. Specific topics include prophecy, miracles, and the possibility of knowing the divine, with particular attention to the relation between modern and premodern conceptions of reason and Moslem, Christian, and secular philosophical influences on Jewish thought. Two 90-minute classes. L. Batnitzky

REL 347 Religion and Law (also JDS 347 ) Not offered this year EM A critical examination of the relation between the concepts of "religion" and "law" as they figure in the development of Jewish and Christian law, as well as in contemporary legal theory. Particular attention to the ways in which, historically, theological debates play out in contemporary secular legal arguments about the value underlying law. One three-hour seminar. L. Batnitzky

REL 350 Demons and Angels, "the gods," God and Satan Not offered this year HA The seminar will investigate sources ranging from the Babylonian creation story and Homer's Iliad to passages from Genesis, Exodus, Job, the Hebrew prophets, the Dead Sea Scrolls, and the New Testament to see how stories of invisible beings (gods, demons, angels) construct group identity (who "we" are, and who are the "others"--and what characterizes each) and express group values. One three-hour seminar. E. Pagels

REL 352 Who Was or Is Jesus? Not offered this year HA This seminar investigates the earliest sources about Jesus--New Testament gospels, "gnostic" gospels, and Jewish and Roman historical accounts--to explore various views of Jesus in historical context, as well as contemporary interpretations in poetry, fiction, and film. One three-hour seminar. E. Pagels

REL 353 Inspiration, Revelation, and Conversion Not offered this year LA Exploration of some of the classics of religious experience from ancient through contemporary times, using where possible comparison of Eastern and Western sources. Sources range from Western writers as diverse as Augustine, Teresa of Avila, Thomas Merton, Simone Weil to the life of the Tibetan monk Milarepa, and the Hindu Ramakrishna. One three-hour seminar. E. Pagels

REL 357 Religion in Colonial America and the New Nation (also HIS 310 ) Not offered this year HA Intellectual and cultural aspects of American religion from the 17th century through the early republic. Special attention to early Protestant traditions (Anglican, Puritan, Quaker, and Methodist, among others), the Great Awakening, the Enlightenment, and the transformation of religion through the Revolution and its shape in the new nation. Two 90-minute lecture/seminars. S. Perry

REL 358 Religion in American Culture since 1830 Fall HA
The relationship between religion and society in the U.S. in the 19th and 20th centuries. Attention will be paid to Transcendentalism, the Civil War, the social gospel, Fundamentalism, New Thought, Pentecostalism, civil rights, immigration, and recent religious movements. Two 90-minute classes. Staff

**REL 360 Women and American Religion (also GSS 360)** Not offered this year SA
An exploration of women's roles and experiences, and constructions of gender in diverse settings within North American religion. The seminar will examine female religious leaders and participants in such subcultures as Puritanism, evangelicalism, Catholicism, Judaism, African American Protestantism, native traditions, and American Islam. Emphasis on the dilemmas faced by women in religious institutions as well as the creative uses women have made of their social and religious "place." One three-hour seminar. Staff

**REL 363 Religion and Ethical Theory** Not offered this year EM
This seminar will examine philosophical accounts of what it means to live well, focusing mainly on works written in the last half century that are relevant to issues in religious ethics: whether morality requires a religious foundation, the ethical significance of divine commandments, and the concepts of virtue, goodness, evil, horror, holiness, sainthood, faith, and the sacred. Among the philosophers to be discussed are Richard Rorty, John Finnis, Alasdair MacIntyre, Iris Murdoch, Stanley Cavell, and Robert Merrihew Adams. One three-hour seminar. J. Stout

**REL 364 Love and Justice** Not offered this year EM
Analysis of philosophical and theological accounts of love and justice, with emphasis on how they interrelate. Is love indiscriminate and therefore antithetical to justice, or can love take the shape of justice? What are the implications for moral, political, and legal theory? The seminar also considers recent efforts to revive a tradition of political theology in which love's relation to justice is a prominent theme. One three-hour seminar. E. Gregory

**REL 366 African American Autobiography (See AAS 325)**

**REL 367 The American Jeremiad and Social Criticism in the United States (also AAS 346)** Not offered this year HA
An examination of the religious and philosophical roots of prophecy as a form of social criticism in American intellectual and religious history. Particular attention is given to what is called the American Jeremiad, a mode of public exhortation that joins social criticism to spiritual renewal. Michael Walzer, Sacvan Bercovitch, and Edward Said serve as key points of departure in assessing prophetic criticism's insights and limitations. Attention is also given to the role of black prophetic critics, such as James Baldwin, Martin Luther King Jr., and Cornel West. Two lectures, one preceptorial. E. Glaude Jr.

**REL 368 Topics in African American Religion (See AAS 368)**

**REL 373 Studies in Religion** Not offered this year EM
A study of a selected topic such as mysticism, scriptures of the world religions, or of particular religious movements, leaders, and thinkers. Staff

**REL 378 Religion, Gender, and Sexuality in Early Latin America (also GSS 378 / LAS 379 / HIS 331)** Fall HA
This seminar explores scholarship on the history of religion, gender, and sexuality in Latin America, focusing primarily on the mainland colonial period (1492-1821), but including some pre-colonial and the nineteenth century material. Through historical studies, primary documents, and discussion, students will consider connections between religious beliefs, spiritual and sexual practices, gendered social relations, and the ways race, class, and gender intersected with ideas about moral and social order in the period under study. We will also think critically about how scholars have portrayed these subjects. *J. Delgado*

**REL 382 Death and the Afterlife in Buddhist Cultures**  
Spring HA  
A study of Buddhist approaches to death, dying, and the afterlife with a focus on South Asia, Tibet, and East Asia. Topics may include: anthropological studies of mortuary rites; Buddhist cosmology and doctrines of karmic causality; Buddhism, the family, and rites for ancestors; Buddhist deathbed and funerary practices; accounts of afterlife journeys; placation of ghosts; and changes in contemporary Buddhist funerals. Buddhist doctrinal teachings and social roles with respect to death and the afterlife as well as interactions of Buddhism with local religious cultures are considered. Two 90-minutes classes. *J. Stone*

**REL 390 God of Many Faces: Comparative Perspectives on Migration and Religion** (See SOC 340)

**REL 412 Anthropological Approaches to the Study of Religion** (See ANT 412)

**REL 435 The Madrasa: Islam, Education, and Politics in the Modern World** (See NES 435)
Program in Robotics and Intelligent Systems

Director
Robert F. Stengel

Executive Committee
Sigrid M. Adriaenssens, Civil and Environmental Engineering
Mark P. Brynildsen, Chemical and Biological Engineering
Jonathan D. Cohen, Psychology, Princeton Neuroscience Institute
Paul W. Cuff, Electrical Engineering
Gilbert H. Harman, Philosophy
Yannis G. Kevrekidis, Chemical and Biological Engineering
Alain L. Kornhauser, Operations Research and Financial Engineering
Sanjeev R. Kulkarni, Electrical Engineering
Michael G. Littman, Mechanical and Aerospace Engineering
Stephen A. Lyon, Electrical Engineering
Daniel M. Nosenchuck, Mechanical and Aerospace Engineering
Daniel N. Osherson, Psychology
Clarence W. Rowley III, Mechanical and Aerospace Engineering
Szymon M. Rusinkiewicz, Computer Science
Robert F. Stengel, Mechanical and Aerospace Engineering
Jordan A. Taylor, Psychology

The Program in Robotics and Intelligent Systems is designed for undergraduate students who are interested in pursuing careers or graduate education in three general areas:

1. The analysis, design, and development of systems that automate manufacturing, transportation, healthcare, environmental stewardship, scientific research, and other activities,

2. The creation of systems for learning, adaptation, decision making, identification, estimation, and control using concepts drawn from cognitive and biological sciences, and

3. The understanding of human intelligence from the perspective of neuroscience and computation.

New industries and organizations depend increasingly on the interplay between engineering, computing, and the life sciences. Innovations and inventions require multidisciplinary approaches and entrepreneurship, as well as grounding in theory and practice, in topics that may not be covered by a single department. The program offers an integrated set of core and elective courses, introducing students to fundamental concepts, providing depth in specific fields of interest, and setting the stage for further achievement. Students are encouraged to expand their experience through summer internships with companies, government agencies, and university laboratories.

Admission to the Program

The program is open to juniors and seniors who have a satisfactory background in mathematics, science, and computing. Students should have successfully completed:
1. Mathematics through MAT 202 or 204.

2. The A.B. science and technology distributional requirement or the B.S.E. freshman science requirement.

3. COS 126 or an equivalent computing course.

A student planning to earn the program certificate should contact the program director as early as possible and no later than the seventh week of the fall term of the senior year.

Program of Study

A student in this program must satisfy both program and departmental requirements. The program for each student is worked out by the student and the student's departmental adviser. The program requirements are as follows:

1. All students must take six courses, including three core courses and three electives. To qualify for the certificate, a minimum grade average of B- in the six program courses is required. In some cases, a course can fulfill both a certificate program requirement and a regular departmental requirement (contact program director for details).

Core Courses (one from each group):

Laboratory (1)

ELE 203 Electronic Circuits
ELE 206 Introduction to Logic Design
MAE 224 Integrated Engineering Science Laboratory
PHY 210 Experimental Physics Seminar

Control Systems (1)

CBE 445 Process Control
MAE 345 Robotics and Intelligent Systems
MAE 433 Automatic Control Systems
MAE 434 Modern Control
Cognition, Language, and Decision Making (1)

PSY 255 Cognitive Psychology
PSY 321/WWS 340 The Psychology of Decision Making and Judgment
PSY 322 Human-Machine Interaction
NEU 258 Fundamentals of Neuroscience (also PSY 258)
NEU 259 Introduction to Cognitive Neuroscience (also PSY 259)
NEU 330 Introduction to Connectionist Models: Bridging between Brain and Mind (also PSY 330)
Elective Courses (maximum of two from the same department to satisfy the requirement): an up-to-date list of approved elective courses may be found on the program website.

2. A senior independent work project or thesis must be completed and presented to the program committee on a topic relevant to the program and acceptable to the program committee.

3. Close collaboration with faculty is expected. Program students are expected to demonstrate strong academic performance. Program courses may not be taken on a pass/D/fail basis, unless that is the only grading alternative for the course.

4. Program students must fill out the student profile form at the beginning of each year in which they are members of the program. This is especially important during the senior year to assure that requirements for the certificate will be met by the end of the year.

Certificate of Proficiency

Students who fulfill all program requirements will receive a certificate of proficiency in robotics and intelligent systems upon graduation.

Courses

MAE 102A Engineering in the Modern World (See CEE 102A)

MAE 102B Engineering in the Modern World (See CEE 102B)

MAE 131 Technology of Flight: An Introduction Fall

Accounts of human flight are pervasive in the myths of ancient civilizations, some dating back as far as 3500 BC. So, why did it take so long for humankind to take charge of the Kingdom of the Air? This course is an introduction to the fundamentals, disciplines, and technologies associated with flight, including elements of aerodynamics, light-weight structures, propulsion, and flight mechanics. A practical laboratory component, designed to give the students a hands-on experience in these basic disciplines, complements the lectures. L. Martinelli

MAE 206 Introduction to Engineering Dynamics Spring QR

Formulation and solution of equations governing the dynamic behavior of engineering systems. Fundamental principles of Newtonian mechanics. Kinematics and kinetics of particles and rigid bodies. Motion relative to moving reference frames. Impulse-momentum and work-energy relations. Free and forced vibrations of mechanical systems. Introduction to dynamic analysis of electromechnical and fluid devices and systems. Two lectures, one laboratory. Prerequisites: MAT 201, PHY 103, and MAE 223 or CEE 205. Staff

MAE 221 Thermodynamics (also ENE 221) Fall STL

Heat and work in physical systems. Concepts of energy conversion and entropy, primarily from a macroscopic viewpoint. Applications to engines, heat pumps, refrigeration, and air-conditioning systems. In the laboratory students will carry out experiments in the fields of analog electronics and thermodynamics. For MAE concentrators only, a combined final laboratory grade will be issued in the spring laboratory course 224, which includes the
laboratory work of both 221 and 224. Three lectures, one class, and one three-hour laboratory. Prerequisites: PHY 103 and MAT 201, which may be taken concurrently. D.

Steingart

MAE 222 Mechanics of Fluids (also CEE 208) Spring
Introduction to the physical and analytical description of phenomena associated with the flow of fluids. Topics include the principles of conservation of mass, momentum, and energy; lift and drag; open channel flow; dynamic similitude; laminar and turbulent flow. Three lectures, one preceptorial. Prerequisites: MAT 104 and 202; MAT 202 may be taken concurrently. A. Smits

MAE 223 Modern Solid Mechanics (also CEE 323) Fall
Fundamental principles of solid mechanics: equilibrium equations, reactions, internal forces, stress, strain, Hooke's law, torsion, beam bending and deflection, and deformation in simple structures. Integrates aspects of solid mechanics with applications to mechanical and aerospace structures (engines and wings), and microelectronic and biomedical devices (thin films). Topics include stress concentration, fracture, plasticity, fatigue, visco-elasticity and thermal expansion. The course synthesizes descriptive observations, mathematical theories, and engineering consequences. Two 90-minute lectures. Prerequisites: MAT 104, and PHY 103. A. Kosmrlj

MAE 224 Integrated Engineering Science Laboratory Spring STL
Core laboratory course for concentrators, who carry out experiments in the fields of digital electronics, fluid mechanics, and dynamics. Students also complete an independent research project. Continuation of the laboratory component of 221; a combined final grade will be issued based upon laboratory work in both 221 and 224. Prerequisite: 221 Typically taken concurrently with 222. One three-hour laboratory, one class. M. Hultmark

MAE 228 Energy Technologies in the 21st Century (also EGR 228 / CBE 228 / ENE 228) Fall STN
Addresses issues of regional and global energy demands, including sources, carriers, storage, current and future technologies, costs for energy conversion, and their impact on climate and the environment. Also focuses on emissions and regulations for transportation. Students will perform cost-efficiency and environmental impact analyses from source to end-user on both fossil fuels and alternative energy sources. Designed for both engineering and non-engineering concentrators. Two 90-minute lectures, one preceptorial. J. Benziger

MAE 234 The Flow of Life: An Introduction to Biological Fluid Mechanics Fall STN
An overview of the fundamental principles underlying the fluid mechanics of animal swimming and flying. The course will emphasize the importance of using dimensionless physical numbers to gain insight into the mechanisms responsible for animal locomotion in a fluid and interactions of flow with living organisms. Physiological and zoological flows will be studied. Physiological flows will examine internal flows inside living organisms. Zoological flows will concentrate on flows external to living bodies at the macroscopic and microscopic level. A. Smits, J. Sznitman

MAE 244 Introduction to Biomedical Innovation and Global Health (also EGR 244) Spring STN
The course will focus on introductory biomedical innovation in three specific areas: Biomedical Implants; Nanotechnology and BioMEMS for Cancer Detection and Treatment; and Ceramic Water Filters for Water Purification. Topics will include basic concepts in cell and molecular biology, as well as fundamentals of materials science and bioengineering. The course will demonstrate how biomedical innovation has had an impact on global health and enterprise in the developed and the developing world. W. Soboyejo, K. Malatesta
MAE 303 Mathematics Methods for Engineering Analysis  Fall QR
A treatment of the theory of ordinary differential equations. The objective is to provide the student with an ability to solve standard problems in this field. MORE DESCRIPTION WILL BE ADDED RE LINEAR ALGEBRA L. Martinelli

MAE 305 Mathematics in Engineering I (also MAT 391 / EGR 305 / CBE 305 )  Fall/Spring QR

MAE 306 Mathematics in Engineering II (also MAT 392 )  Spring

MAE 308 Engineering the Climate: Technical & Policy Challenges (See ENE 308)

MAE 309 Science and Technology of Nuclear Energy: Fission and Fusion (See AST 309)

MAE 321 Engineering Design  Fall
Focus on design processes and procedures using modern engineering tools. Parametric design techniques are introduced in the computer-design laboratory along with simulation tools. Instruction in basic and computer-based manufacturing methods is given in the manufacturing laboratory. Teams of students conduct projects that involve the complete design cycle from concept and first principles through optimization, prototype, and test. Two lectures, one laboratory. Prerequisites: 206, 221, 222, and 223 or CEE 205, or instructor's permission. G. Northey

MAE 322 Mechanical Design  Spring
This course builds on the technical foundation established in 321, and extends the scope to include a range of advanced mechanical design. Teams of students will design and fabricate a wheeled robotic system that will draw upon multidisciplinary engineering elements. The robot will facilitate common daily tasks which vary each year. CAD, CAE, and CAM will be utilized in the design/simulation/prototype process. Labs are designed to reinforce and expand CAD and CAE skills. Two 90-minute lectures, one laboratory. Prerequisites: 321 or instructor's permission. D. Nosenchuck

MAE 324 Structure and Properties of Materials (also MSE 324 )  Fall
An introduction to the properties of engineering materials that emphasizes the correlation between atomic and microscopic structure and the macroscopic properties of the materials. Topics include structural, mechanical, thermodynamic, and design-related issues important to engineering applications. Two lectures, one preceptorial. C. Arnold

MAE 325 Matrix Structural Analysis and Introduction to Finite-Element Methods (See CEE 361)
MAE 328 Energy for a Greenhouse-Constrained World (also EGR 328 / ENV 328 / ENE 328) Spring STN
This course addresses, in technical detail, the challenge of changing the future global energy system to accommodate constraints on the atmospheric carbon dioxide concentration. Energy production strategies are emphasized, including renewable energy, nuclear fission and fusion, the capture and storage of fossilfuel carbon, and hydrogen and low-carbon fuels. Efficient energy use is also considered, as well as intersections of energy with economic development, international security, local environmental quality, and human behavior and values. Two 90-minute lectures. J. Mikhailova

MAE 331 Aircraft Flight Dynamics Fall
Introduction to the performance, stability, and control of aircraft. Fundamentals of configuration aerodynamics. Methods for analyzing the dynamics of physical systems. Characterization of modes of motion and desirable flying qualities. Two 90-minute lectures. Prerequisites: 206 and 222. R. Stengel

MAE 332 Aircraft Design Spring
Building on strength of materials and calculus, this course integrates physical laws to analyze stress and displacement fields in structures. The course introduces basic concepts and equations in three dimensions and then applies them to aircraft structures. Phenomena to be discussed include elastic anisotropy, bending, buckling, fracture, and fatigue. The course is important for anyone interested in structured design. Two 90-minute lectures. Prerequisites: 335 or instructor's permission. L. Martinelli

MAE 335 Fluid Dynamics Fall
Low-speed incompressible potential flow theory and high speed compressible flows. Low-speed topics include circulation, vorticity, d'Alembert's paradox, potential flows, and finite wing theory. High-speed topics include speed of sound, nozzles, shock waves, expansion waves, and effects of heat addition and friction. Three lectures, one preceptorial. Prerequisites: 221, 222 or instructor's permission. D. Nosenchuck

MAE 338 The Energy Water Nexus (See CBE 335)

MAE 339 Independent Work Fall
Independent work is intended for juniors doing only a one-term project. Students develop a topic of their own or select from a list of topics prepared by the faculty. They develop a work plan and select an adviser and are assigned a second reader. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in either 339 for fall or 340 for spring. This course does not fulfill the departments independent work or thesis requirement. M. Littman

MAE 339D Independent Work with Design Fall
Independent work with design is intended for juniors doing only a one-term project. Similar to 339, with the principal difference that the project must incorporate aspects and principles of design in a system, product, vehicle, device, apparatus, or other design element. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in 339D for fall, or 340D for spring. This course does not fulfill the departments independent work or thesis requirement. M. Littman

MAE 340 Independent Work Spring
Independent work is intended for juniors doing only a one-term project. Students develop a topic of their own or select from a list of topics prepared by the faculty. They develop a work plan and select an adviser and are assigned a second reader. At the end of the term, students submit a written report and make a presentation to faculty, staff,
fellow students, and guests. Enroll in either 339 for fall or 340 for spring. This course does not fulfill the departments independent work or thesis requirement. L. Martinelli

MAE 340D Independent Work with Design Spring
Independent work with design is intended for juniors doing only a one-term project. Similar to 340, with the principal difference that the project must incorporate aspects and principles of design in a system, product, vehicle, device, apparatus, or other design element. At the end of the term, students submit a written report and make a presentation to faculty, staff, fellow students, and guests. Enroll in 339D for fall, or 340D for spring. This course does not fulfill the departments independent work or senior thesis requirement. L. Martinelli

MAE 341 Space Flight Not offered this year
This course addresses the various concepts that form the basis of modern space flight and astronautics. The focus is on space flight analysis and planning and not hardware or spacecraft design. The topics include space flight history, orbital mechanics, orbit perturbations, near-Earth and interplanetary mission analysis, orbit determination and satellite tracking, spacecraft maneuvers and attitude control, launch, and entry dynamics. Use of advanced software for the planning and analysis of space missions. Two 90-minute lectures. Prerequisite: 305 or instructor's permission. N. Kasdin

MAE 342 Space System Design Not offered this year
This course examines the design of a modern spacecraft or complex space system, including the space environment and its impact on design. The principles and design aspects of the structure, propulsion, power, thermal, communication, and attitude subsystems are studied. The course also introduces systems engineering, project management, manufacturing and test, mission operations, mission design, and space policy. Acting as a single project team, students will design a satellite or space system from conception to critical design review. Two 90-minute lectures. Prerequisite: 305; 341 recommended, or instructor's permission. Staff

MAE 344 Introduction to Bioengineering and Medical Devices Fall STN
The fundamental concepts required for the design and function of implantable medical devices, including basic applications of materials, solid mechanics and fluid mechanics to bone/implant systems. The course examines the interfaces between cells and the surfaces of synthetic biomaterials that are used in orthopedic and dental applications. Prerequisites: MAT 103 and 104, and PHY 103 and 104. Two 90-minute lectures.
W. Soboyejo

MAE 345 Robotics and Intelligent Systems Not offered this year
This course provides students with a working knowledge of methods for design and analysis of robotic and intelligent systems. Particular attention is given to modeling dynamic systems, measuring and controlling their behavior, and making decisions about future courses of action. Topics include system modeling and control, principles of decisionmaking, Monte Carlo evaluation, genetic algorithms, simulated annealing, neural networks, and expert systems. Prerequisites: MAT 202 or 204, and COS 111 or COS 126 or ORF 201. A.B. students must have met ST requirement; B.S.E. students must have met freshman science requirement. Two 90-minute lectures. R. Stengel

MAE 353 Science and Global Security: From Nuclear Weapons to Cyberwarfare (See WWS 353)

MAE 354 Unmaking the Bomb: The Science & Technology of Nuclear Nonproliferation, Disarmament, and Verification Spring
This course covers the science and technology underlying existing and emerging nuclear security issues.
Part I introduces the principles of nuclear fission, nuclear radiation, and nuclear weapons (and their effects). Part II develops the concepts required to model and analyze nuclear systems, including the production of fissile materials and the detection and characterization of these materials with radiation measurement techniques. Relevant applications are explored in Part III and include nuclear forensic analysis, nuclear archaeology, and nuclear warhead verification. Such case studies will also be part of the final projects. *A.*

*Glaser*

**MAE 399 Faster & Higher: The Romance and Reality of Space Flight (also EGR 399)**  
Spring STL  
This is an introductory aerospace engineering course for non-engineers. It gives an elementary technical understanding of what it takes to explore and operate in outer space. We will cover the history of space flight, the space environment, rockets, orbits, launches, re-entries, spacecraft subsystems, and human factors. Students will work with the technical tradeoffs in space mission design in weekly computer labs. Guest lecturers from the engineering and scientific communities will present case studies. Towards the end of the course students will lead critical evaluations of realistic science fiction and visionary non-fiction. *R.*

*Burk*

**MAE 412 Microprocessors for Measurement and Control**  
Fall  
Introduction to microcontroller applications. A laboratory course dealing with the design and construction of self-contained computer-based electronics projects. Major topics include a review of digital and linear electronics, an introduction to microcomputer architecture and assembly language programming, device interfacing, and system design. Two lectures, two two-hour laboratories. Prerequisite: 221 and 224, or equivalent. *M. Littman*

**MAE 423 Heat Transfer (also ENE 423)**  
Fall  
Covers the fundamentals of heat transfer and applications to practical problems in energy conversion and conservation, electronics, and biological systems. Emphasis will be on developing a physical and analytical understanding of conductive, convective, and radiative heat transfer, as well as design of heat exchangers and heat transfer systems involving phase change in process and energy applications. Students will develop an ability to apply governing principles and physical intuition to solve multi-mode heat transfer problems. Three lectures, one preceptorial. *D. Nosenchuck*

**MAE 424 Energy Storage Systems (also ENE 424)**  
Spring  
This is a survey course on energy storage systems with a focus on electrochemical energy storage. Fundamentals of thermodynamics will be reviewed and fundamentals of electrochemistry introduced. These fundamentals will then be applied to devices such as batteries, flywheels and compressed air storage. Device optimization with respect to energy density, power density, cycle life and capital cost will be considered. *D. Steingart*

**MAE 425 Introduction to Ocean Physics for Climate (See GEO 425)**

**MAE 426 Rocket and Air-Breathing Propulsion Technology**  
Spring  
The study of principles, flight envelopes, and engine designs of rocket and ram/scramjet propulsion systems. Topics include jet propulsion theory, space mission maneuver, combustion control, and system components of chemical and non-chemical rockets (nuclear and electrical propulsion), gas turbine, ramjet, and scramjet engines. Characteristics, optimal flight envelopes, and technical challenges of combined propulsion systems will be analyzed. Prerequisites: 221 and 222. Three lectures. *Y. Ju*
MAE 427 Energy Conversion and the Environment: Transportation Applications (also ENE 427) Spring

An overview of energy utilization in, and environmental impacts of, current and future propulsion systems for ground, air, and space propulsion applications. Introduces students to principles of advanced internal combustion, electric hybrid, and fuel cell energy conversion systems for ground transportation. Relevant thermodynamics, chemistry, fluid mechanics, and combustion fundamentals will be stressed. Performance properties of power plants, control of air pollutant emissions, and minimization of resource-to-application carbon emissions will be explored. Three lectures, one preceptorial. Prerequisites: 221, 222, or instructor's permission. M. Mueller

MAE 428 Cleaner Transport Fuels, Combustion Sensing and Emission Control (See ELE 428)

MAE 433 Automatic Control Systems Fall
Introduction to the analysis and design of automatic control systems. Mathematical models of mechanical and electrical feedback systems. Block diagram algebra. Accuracy, speed of response, and stability. Root locus, Bode, and Nyquist techniques. Introduction to digital control. Regulation, tracking, and compensation. Effects of nonlinearity, disturbance, and noise. Prerequisite: 305 or instructor's permission. Two 90-minute lectures, one three-hour laboratory. C. Rowley III, M. Littman

MAE 434 Modern Control Spring

MAE 435 Special Topics in Mechanical and Aerospace Engineering Not offered this year
Presentation of timely and advanced topics in mechanical and aerospace engineering. Subject matter will vary depending upon the interest of the faculty and students. Possible topics could include acoustics and noise, biomechanics, lasers, space propulsion, solar energy conversion. Three lectures. Staff

MAE 436 Special Topics in Mechanical and Aerospace Engineering Not offered this year
Presentation of timely and advanced topics in mechanical and aerospace engineering. Subject matter will vary depending upon the interest of the faculty and students. Possible topics could include acoustics and noise, biomechanics, lasers, space propulsion, solar energy conversion. Staff

MAE 439 Senior Independent Work Fall
Senior independent work is the culminating experience for the mechanical and aerospace engineering programs. Students select a subject and adviser, define the problem to be studied and propose a work plan. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. A list of possible subjects of particular interest to faculty and staff members is provided. Students must submit a written final report and present their results to faculty, staff, fellow students, and guests. M. Littman

MAE 440 Senior Independent Work Spring
Senior independent work is the culminating experience for the mechanical and aerospace engineering programs. Students select a subject and adviser, define the problem to be studied and propose a work plan. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. A list of possible
subjects of particular interest to faculty and staff members is provided. Students must submit a written final report and present their results to faculty, staff, fellow students, and guests. L. Martinelli

**MAE 442 Senior Thesis**  **Spring**
Senior thesis is a year-long independent study for individual students. It is the culminating experience for the mechanical and aerospace programs. Work begins in fall, but enrollment is in spring when a double grade is recorded. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. Students develop their own topic or select a faculty proposed topic. Students create a work plan and select an adviser. A written progress report is expected at the end of the fall term. Students submit a written final report and make an oral presentation at the end of the spring term. L. Martinelli

**MAE 444 Senior Project**  **Spring**
The senior project is a year-long independent study intended for students who choose to work in teams of two or more. Work begins in fall, but enrollment is in spring when a double grade is recorded. Projects include engineering design, defined as devising a system, component, or process to meet desired needs. Groups develop their own topic or select a faculty proposed topic. Groups create a work plan and select an adviser. A written progress report is expected at the end of the fall term. Students submit a written final report and make an oral presentation at the end of the spring term. L. Martinelli

**MAE 453 Wind Turbine Aerodynamics and Technology (See ENE 453)**

**MAE 455 Mid-Infrared Technologies for Health and the Environment (See ELE 455)**

**MAE 456 Global Technology**  **Not offered this year**
An introduction to key ideas in science, technology, humanities, and social sciences relevant to global development. Highlights essential needs in the rural environment and considers how to develop environmentally friendly scientific and technological solutions to satisfy these needs. Also examines the potential role of global technology in the development of rural and urban areas within the developing world. Morning lectures will be followed by field activities and group projects. Enrollment is restricted to students participating in the Tropical Biology Program in Kenya. W. Soboyejo
The Program in Russian, East European, and Eurasian Studies, an affiliate of the Princeton Institute for International and Regional Studies, draws on a core faculty in the humanities, history, and social sciences to support and maintain a diverse undergraduate curriculum. The program offers a certificate of proficiency to undergraduates who combine study of Russia, Eastern Europe, and Eurasia with any other departmental concentration from the humanities and the Woodrow Wilson School of Public and International Affairs to the sciences and engineering.

The program's purpose is to provide undergraduates with expertise in a core language of Eurasia--for most students that would be Russian--and a scholarly grounding in the study of the region. Other languages applicable toward the certificate include Polish, Czech, the languages of Southeastern Europe (Romanian, Bulgarian, and Bosnian-Croatian-Serbian), and Turkish, the last being the basis for most Central Asian languages as well as some in the Caucasus and in Russia.

Russian, East European, and Eurasian Studies offers preparation for government service, international business and finance, law, media, science, teaching, nongovernmental organizations, and other aspects of global affairs. As such, courses from many departments count toward the certificate. The program is compatible with all concentrations.

Information and Departmental Plan of Study

To be eligible for admission to the Program in Russian, East European, and Eurasian Studies a student must meet the following requirements by the end of his or her sophomore year:

Satisfactory completion of the established requirements for admission to one of the cooperating departments or to a department whose plan of study may be combined with this interdepartmental program.
Initiation of study of the Russian language or other target language. Students without previous training in Russian are advised to begin their study not later than the first term of the sophomore year and earlier if possible.

A student choosing to pursue a Certificate of Proficiency in Russian, East European, and Eurasian Studies must complete the normal requirements in their department as well as the following requirements of the program. The proposed course of study must be approved each term by the director.

**Program of Study**

To obtain the certificate students must choose one of the two tracks currently offered by the Program, the Russian and Eurasian Studies (RES) track, or the East European Cultures and Societies (EECS).

1. Russian and Eurasian Studies (RES) track

The Russian and Eurasian Studies track is offered to undergraduates who combine study of Russia and Eurasia with any other departmental concentration: from the humanities and the Woodrow Wilson School of Public and International Affairs to the sciences and engineering.

Course Requirements

The certificate requires students to complete four regular courses (at least two courses at the 300-level or above, in addition to two 200-level courses) in the following disciplines:

**History:** One upper-level course on the history of the Russian empire, the Soviet Union, or Eurasia.

**Literature:** One upper-level course in the literatures of Russia and/or Eurasia.

**Social Sciences:** One course in the anthropology, sociology, politics and/or economics of Russia and/or Eurasia.

**Plus 1:** One additional course from the three main subject areas or from a list of preapproved specialty courses.

**Language courses**

RUS 101 Beginner's Russian I  
RUS 105 Intermediate Russian I  
RUS 207 Advanced Russian Reading and Conversation I  
RUS 208 Advanced Russian Reading and Conversation II  
RUS 407 Advanced Russian through Film  
RUS 408 Advanced Russian through History and Culture

**History**

HIS 360 The Russian Empire: From Peter the Great to Nicholas II  
HIS 362 Soviet Empire
HIS 480 Property How, Why, and What We Own
NES 406 The Great War in the Middle East

Literature (and Culture)

ART 337/GER 337 Court, Cloister, and City: Art and Architecture in Central and Eastern Europe
COM 410/SLA 410 Bakhtin, Formalists, Cultural Semiotics
COM 415/SLA 415/RES 415 Leo Tolstoy War and Peace, and the Tasks of Literature
ECS 360/SLA 360 Central European Literature of the 20th Century
MUS 339/SLA 311 Russian Music
SLA 219/RES 219 Pushkin, Gogol, Dostoevsky: Introductions to the Great Russian Novel
SLA 220/RES 220 The Great Russian Novel and Beyond: Dostoevsky, Tolstoy, Chekhov, and Others
SLA 221/RES 221 Soviet Literature 1917-1965
SLA 301/ANT 382/RES 301 Russian Folklore
SLA 312/RES 312 Russian Drama
SLA 345/ECS 354/COM 345/RES 345 East European Literature and Politics
SLA 347/JDS 337 Jewish Topics in East European Cinema
SLA 361/RES 361 The Evil Empire: Reading Putin's Russia
SLA 395/RES 395 Czeslaw Milosz: Poetry, Politics, History
SLA 396/ECS 397 Polish Literature on Screen
SLA 411/RES 411 Selected Topics in Russian Literature and Culture
SLA 412/COM 414/ENG 407/ RES 412 Selected Topics in Russian Literature and Culture: Chekhov
SLA 417/COM 418/ENG 424/RES 417 Vladimir Nabokov
SLA 421/JDS 421/COM 420/GER 421 East-Central European Jewish Biographies

Social Science

POL 433 Sem. in Comparative Politics: Democratization and Economic Reforms after Communism
SOC 308/RES 308 Communism and Beyond: China and Russia
SLA 338/ANT 338 Between Heaven and Hell: Myths and Memories of Siberia
NES 364/REL 399 Secularism in Muslim Central Asia and the Middle East NES 362
Blood, Sex, and Oil: The Caucasus

Independent Work

Senior thesis or junior paper in the student's home department related to Russian and Eurasian studies. Students should consult with the director of the Program in Russian, East European, and Eurasian Studies for approval of their independent work plans.

Languages for RES track

Expertise in a core language of Eurasia is central to the program. Applicable languages include Russian and Turkish, Students whose primary language is Russian must successfully complete one Russian-language course beyond 207,
or otherwise achieve this level of competence. Students in the program whose focus is Turkish must complete the equivalent of the second year in that language. Native speakers and students with previous training in any of the languages of Eurasia can fulfill the language requirement by demonstrating intermediate proficiency on a placement examination.

2. East European Cultures and Societies (EECS) track

The East European Cultures and Societies (EECS) track is offered to undergraduates who combine study of Eastern Europe with any other departmental concentration: from the humanities and the Woodrow Wilson School of Public and International Affairs to the sciences and engineering.

Course Requirements

The certificate requires students to complete one gateway course and four regular courses. The four courses can be chosen from the fields of literature, art, history, anthropology, politics, economy (two courses in one of these fields are permitted if a student concentrates in that field). The gateway course will be the Eastern European survey course offered every second year.

Gateway Course

SLA 366/ECS 356/RES 347 Eastern Europe: Culture and History

Language courses

BCS 101 102 Beginning Bosnian-Croatian-Serbian I and II
BCS 105 107 Intermediate Bosnian-Croatian-Serbian I and II
PLS 101 102 Beginning Polish I and II
PLS 105 107 Intermediate Polish I and II
CZE 101 102 Beginning Czech I and II
CZE 105 107 Intermediate Czech I and II

History

EPS 302/ECS 302 Landmarks of European Identity
HIS 346/HLS 346 Introduction to Byzantine Civilization
HIS 358/HLS 358 Balkan Nationalisms: Greeks, Turks, and Slavs
HIS 452/EPS 452 Communism and Dissent in Eastern Europe

Literature and (Culture)

ART 334/GER 337 Court, Cloister, and City: Art and Architecture in Central and Eastern Europe
COM 404 Literature Across Languages: The East European Novel of the 20th Century
COM 410/SLA 410 Bakhtin, the Russian Formalists, and Cultural Semiotics
ECS 360/SLA 360 Central-European Literature of the 20th Century
ECS 391/COM 391/JDS 391 Holocaust Testimony
JDS 221 PHI 221 Philosophy after Auschwitz
SLA 236 Rituals, Songs, and Stories: Balkan and East European Oral Traditions
SLA 345/ECS 354/COM 345 East European Literature and Politics
SLA 347/JDS 337 Jewish Topics in East European Cinema
SLA 366/ECS 356/RES 347 Eastern Europe: Culture and History SLA
396/ECS 397 Polish Literature on Screen

Social Sciences:

ANT 351/HLS 351 Tolerance and Governance in the Mediterranean

Study and Work Abroad

Students pursuing the Russian, East European, and Eurasian Studies certificate are expected to combine classwork with study abroad for a term or a summer to sharpen their language skills, conduct independent research, and, in general, gain a better appreciation of at least one country and culture in Eurasia. Summer internships abroad, partly subsidized by the program or the University, are also highly encouraged.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in Russian, East European, and Eurasian Studies upon graduation.

Courses

RUS 101 Beginner's Russian I Fall
Introduction to the essentials of Russian grammar. Presentation of grammar reinforced by oral practice of grammatical patterns. One hour per week devoted specifically to development of oral skills. Five classes, one one-hour laboratory. No credit is given for RUS 101 unless followed by RUS 102. M. Pettus

RUS 102 Beginner's Russian II Spring
A continuation of 101. Introduction to the essentials of Russian grammar. Presentation of grammar reinforced by oral practice of grammatical patterns. One hour per week devoted specifically to development of oral skills. Five classes, one one-hour laboratory. M. Pettus

RUS 103 Russian for Heritage Speakers Fall
This course is designed for students who can speak and understand Russian, but have little or no practice in reading and writing. The course will train students in literate writing and advanced reading. Normally followed by 107. K. Blank

RUS 105 Intermediate Russian I Fall
Grammar review; advanced grammar; introduction to word formation; expansion of vocabulary through readings of classical and modern fiction and history. One hour per week of translation and discussion of readings. Prerequisite: successful completion of 102 or placement test at Princeton. Five classes, one one-hour laboratory. M. Pettus
RUS 107 Intermediate Russian II  
Spring
A continuation of 105. Grammar review; advanced grammar; introduction to word formation; expansion of vocabulary through readings of classical and modern fiction and history. One hour per week of translation and discussion of readings. Prerequisite: 105. Five classes, one one-hour laboratory. *M. Pettus*

RUS 207 Advanced Russian Reading and Conversation I  
Fall
Selected texts (19th- and 20th-century poetry and prose, contemporary journalistic prose) with discussion and analysis in Russian. Four classes. *K. Blank*

RUS 208 Advanced Russian Reading and Conversation II  
Spring
A continuation of 207. Selected texts (19th- and 20th-century poetry and prose, contemporary journalistic prose) with discussion and analysis in Russian. Four classes. *K. Blank*

RUS 209 Introduction to the History of the Russian Language (also LIN 209)  
Spring
Introduction to the History of the Russian language is intended for undergraduates and graduate students in all fields, e.g. (Russian literature, history, linguistics) who are interested in the Russian language. The course's primary focus is how modern Russian emerged from Old Russian, which involves the history of the Russian sound system, as well as a survey of key changes in Russian word structure and sentence structure.
Reading of Old Russ. texts. *L. Babby*

RUS 405 Advanced Russian Grammar through Reading  
Fall
A practical approach to advanced Russian grammar and structure through reading and translation of Russian prose texts with special focus on difficult grammatical constructions. Two 90-minute classes.
Prerequisite: 207 or 208. *Staff*

RUS 406 Russian Sentence Structure through Reading  
Spring
A basic introduction to Russian sentence structure with special emphasis on word order, use of participles and gerunds, impersonal sentences, negation, voice, and long/short form adjectives. The course includes substantive readings of Russian texts and their syntactic analysis. Two 90-minute classes. Prerequisite: 207 or 208. *Staff*

RUS 407 Advanced Russian through Film
A language course based on Russian films and designed to develop a more sophisticated level of spoken and written Russian. Discussions of life in Russia. Compositions, exercises, short texts for reading comprehension, oral presentations. Two 90-minute classes. Prerequisite: 207 or instructor's permission. *K. Blank*

RUS 408 Advanced Russian through History and Culture
The course aims to improve students' proficiency in idiomatic Russian by using materials on historical and cultural topics. The materials cover Russian history from the days of Kievan Rus' to the post-Soviet era. Weekly reading and compositions. Two 90-minute classes. Prerequisite: instructor's permission. *K. Blank*

RUS 409 The History of Russian Rock  
Spring
The course will examine the emergence of rock music in the period leading up to the collapse of the Soviet Union, and its enduring cultural and political significance in post-Soviet Russia (including recent protest movements) while
developing students' appreciation of colloquial Russian. We will encounter a number of fascinating people and artists, charting their musical development, their forays into other genres (particularly film), and their political impact. Assignments will be listening to the music while studying the original Russian lyrics (with glosses and translations). *Staff*
Department of Slavic Languages and Literatures

Chair
Michael A. Wachtel

Assistant Professor
Elena Fratto
Katherine M. Hill Reischl

Acting Chair
Olga Peters Hasty (fall/spring)

Senior Lecturer
Ksana Blank

Departmental Representative
Ellen B. Chances (fall)
Katherine M. Hill Reischl (spring)

Lecturer
Margaret H. Beissinger
Irena Grudzinska Gross
Chloë Kitzinger, also Council of the Humanities
Svetlana Korshunova
Mark Pettus

Director of Graduate Studies
Ilya Vinitisky

Irina Grudzinska Gross

Professor
Ellen B. Chances
Olga Peters Hasty
Ilya Vinitisky
Michael A. Wachtel

Associated Faculty
Devin A. Fore, German
Michael Gordin, History
Simon A. Morrison, Music

Associate Professor
Serguei A. Oushakine, also Anthropology

Information and Departmental Plan of Study Advanced Placement

The department gives its own placement test to all incoming students who have studied Russian. On the basis of this test students are placed in an appropriate course. Successful completion of RUS 107 or immediate assignment to a higher course satisfies the A.B. foreign language requirement.

Program of Study

A minimum of eight departmental courses is required. Four upper-level courses must be within the department; two of which must be from the core survey courses (SLA 219, 220, 221); the other four courses may be from cognate areas depending on the student's particular interests. For example, if the major field of concentration is 19th-century prose, the program might include courses from French or German literature. Students with a strong interest in Russian and Soviet studies might take area courses in the Program in Russian and Eurasian Studies such as Russian history, politics, anthropology, or sociology.

These are only sample suggestions. The program is flexible and strives to satisfy as wide a range of interests as possible.

Concentrators are required to complete RUS 207 and one or more advanced language courses (RUS 208, 405, 406, 407, or 408; or one of the upper-level literature courses taught in Russian (SLA 308, 312, 413).
**Independent Work**

Junior Independent Work. Slavic majors write two junior papers. The first, 5,000-6,000 words in English (20-25 pages), can be on any topic related to Russian literature, culture, linguistics, language, history, or society. Russian sources must be used, although the extent of Russian will be determined largely by the individual student's linguistic background. Students who wish to write about other Slavic traditions (e.g., Czech or Polish), assuming they have the linguistic competence, are encouraged to do so. The second paper is a choice of either a paper in Russian (2,000 words), or a paper in English (3,000 words). The Russian paper is normally devoted to the analysis of a Russian short story or poem chosen by the student (in consultation with the adviser). For the short paper in English, students provide a critique of an English translation (or possibly two English translations) of a poem, based on a close reading of the Russian original.

Senior Independent Work. In the senior year, the student's independent work, written under departmental supervision, consists of a thesis of about 20,000 words to be submitted two weeks before the first day of the spring term reading period. After the thesis is submitted, students do a brief (5-minute) presentation in Russian (or relevant Slavic language), and then in English for the Slavic Department Faculty and fellow students. Total presentation time will run roughly 15 minutes per student. This presentation does not receive a grade.

**Senior Departmental Examination**

Graduating seniors are required to take a comprehension examination on Russian literature. Together with the thesis and departmental grades, this examination is one of three components that determine departmental honors. The take-home exam is based on a core list of works taught in the three survey courses offered by the department. Students may substitute a limited number of works based on their individual interests for the comprehensive exam. The finalized list must be submitted to the Departmental Representative one month before the exam.

**Study Abroad**

For students who begin Russian at Princeton, the department has organized a second-year course (RUS 105R-107R) for credit in St. Petersburg that may be taken the summer immediately following the completion of RUS 102. This course is taught by Princeton faculty as well as the instructors of the Derzhavin Institute. The Dean of the College office is generally able to provide financial assistance to students enrolling in the summer course. More advanced students are urged to spend either a summer or semester in Russia.

**Certificate in Language and Culture**

The certificate program in Russian language and culture offers two options: the first weighted toward language study, and the second weighted toward literary study.

Course Work. For the language track, students must complete RUS 207 and take at least two of the language courses listed below and at least one Russian literature course conducted in Russian. For the literature track, students must complete RUS 207 and take at least one of the language courses listed below and at least two literature courses conducted in Russian.

Language courses: RUS 208, RUS 405, RUS 406, RUS 407, RUS 408
Literature courses: SLA 308 (Short Story), SLA 312 (Russian Drama), SLA 413 (Pushkin and His Time), most topics courses (e.g., Lermontov, Russian poetry), most graduate literature courses. Should the student take a course on Russian literature which offers a Russian precept, that course may also count towards the certificate if additional work is completed for the course in Russian. This work must be approved by the departmental representative in consultation with the course instructor at the start of the term. Credit will not be granted retroactively.

Independent Work. Students must complete a paper in Russian of approximately 1,000 words. The paper ordinarily will be devoted to a close analysis of a literary text of about 10 to 20 pages. However, a student with strong related interests could write on questions of linguistics or a topic of broader cultural significance (e.g., Russian art, Russian film). In any case, readings in Russian will be a mandatory component of the paper. All topics must be cleared in advance with the departmental representative, who will decide on their appropriateness in consultation with other department members.

Note: Students may obtain the certificate in Russian language and culture in addition to the certificate in Russian and Eurasian studies. However, they may not apply the same courses toward both certificates (with the necessary exception of RUS 207).

**Preparation for Graduate Study**

Departmental concentrators who are considering pursuing graduate studies in Slavic are reminded that most graduate schools require a reading knowledge of a second modern foreign language. French and German are important for Russian literature. Graduate programs in Russian literature often require another Slavic language. Students should think about preparing themselves while still undergraduates to meet these requirements.

**Courses**

**BCS 101 Beginning Bosnian-Croatian-Serbian I**  
Fall
An introduction to the Bosnian-Croatian-Serbian (also called Serbo-Croatian) language that develops the four major language skills: speaking, listening comprehension, reading, and writing. Class time is devoted to mastering conversational skills, grammar explanations, oral drills, and reading a variety of texts-popular writing, fiction, poetry, and expository prose. Covers the fundamentals of BCS grammar (verbal conjugations, aspect, the primary verbal tenses, and all cases); high-frequency vocabulary will be progressively learned and reinforced. Five classes. No credit is given for BCS 101 unless followed by BCS 102.

**M. Beissinger**

**BCS 102 Beginning Bosnian-Croatian-Serbian II**  
Spring
A continuation of BCS 101. This course continues to develop and refine the four language skills (speaking, listening, reading, and writing), concentrating on conversational practice, advanced grammar points, oral drilling, increased reading (BCS literature, folklore, and expository prose, including works chosen according to students' interests), and viewing films. Prerequisite: BCS 101. Five classes. **M. Beissinger**

**CZE 101 Beginning Czech I**

Introductory course designed to teach the basic aspects of Czech grammar, vocabulary, and communication in a variety of situations. The course aims to teach all four language skills: reading, writing, listening comprehension, and speaking. Five classes. No credit is given for CZE 101 unless followed by CZE 102. **Staff**

**CZE 102 Beginning Czech II**
A continuation CZE 101. This course continues to develop and refine the four language skills (speaking, listening, reading, and writing), teaching all fundamental aspects of Czech grammar and basic communication skills in a variety of situations. As the course progresses, the rich Central European culture of Bohemia and Moravia will be sampled through poetry, film, and fictional as well as expository prose. Prerequisite: CZE 101. Five classes. Staff

CZE 105 Intermediate Czech I Fall
Advanced grammar topics, building of vocabulary through studying Czech word formation and reading challenging samples of Czech literature (prose, poetry, drama). Continuing practice in oral communication. Prerequisite: CZE 102 or instructor's permission. Three classes supplemented by required discussion sections, tutorials, and language lab. Staff

CZE 107 Intermediate Czech II Spring
Advanced grammar topics, building of vocabulary through the study of Czech word formation and reading challenging samples of Czech literature. Continuing practice in oral communication. Prerequisite: CZE 105. Three classes supplemented by required discussion sections, tutorials, and language lab. Staff

PLS 101 Beginning Polish I Fall
A beginner's course that introduces the student to four areas of competence in Polish: speaking, grammatical knowledge, listening and reading comprehension, and writing. Emphasizes active language targeted at concrete practical contexts and communicative situations. Previous knowledge of other Slavic languages is advantageous, but not mandatory. Classes combine lectures, recitation, and drill formats. Five classes. No credit is given for PLS 101 unless followed by PLS 102. M. Pettus

PLS 102 Beginning Polish II Spring
A continuation of PLS 101. This course continues to develop and refine the four language skills (speaking, grammatical knowledge, listening and reading comprehension, and writing). Emphasize active language targeted at concrete practical contexts and communicative situations. Classes combine lectures, recitation, and drill formats. Prerequisite: PLS 101. Five classes. M. Pettus

RUS 101 Beginner's Russian I Fall
Introduction to the essentials of Russian grammar. Presentation of grammar reinforced by oral practice of grammatical patterns. One hour per week devoted specifically to development of oral skills. Five classes, one one-hour laboratory. No credit is given for RUS 101 unless followed by RUS 102. M. Pettus

RUS 102 Beginner's Russian II Spring
A continuation of 101. Introduction to the essentials of Russian grammar. Presentation of grammar reinforced by oral practice of grammatical patterns. One hour per week devoted specifically to development of oral skills. Five classes, one one-hour laboratory. M. Pettus

RUS 105 Intermediate Russian I Fall
Grammar review; advanced grammar; introduction to word formation; expansion of vocabulary through readings of classical and modern fiction and history. One hour per week of translation and discussion of readings. Prerequisite: successful completion of 102 or placement test at Princeton. Five classes, one one-hour laboratory. M. Pettus

RUS 107 Intermediate Russian II Spring
A continuation of 105. Grammar review; advanced grammar; introduction to word formation; expansion of vocabulary through readings of classical and modern fiction and history. One hour per week of translation and discussion of readings. Prerequisite: 105. Five classes, one one-hour laboratory. M. Pettus

RUS 207 Advanced Russian Reading and Conversation I Fall
Selected texts (19th- and 20th-century poetry and prose, contemporary journalistic prose) with discussion and analysis in Russian. Four classes. K. Blank

RUS 208 Advanced Russian Reading and Conversation II Spring
A continuation of 207. Selected texts (19th- and 20th-century poetry and prose, contemporary journalistic prose) with discussion and analysis in Russian. Four classes. K. Blank

RUS 405 Advanced Russian Grammar through Reading Fall
A practical approach to advanced Russian grammar and structure through reading and translation of Russian prose texts with special focus on difficult grammatical constructions. Two 90-minute classes. Prerequisite: 207 or 208. Staff

RUS 406 Russian Sentence Structure through Reading Spring
A basic introduction to Russian sentence structure with special emphasis on word order, use of participles and gerunds, impersonal sentences, negation, voice, and long/short form adjectives. The course includes substantive readings of Russian texts and their syntactic analysis. Two 90-minute classes. Prerequisite: 207 or 208. Staff

RUS 407 Advanced Russian through Film
A language course based on Russian films and designed to develop a more sophisticated level of spoken and written Russian. Discussions of life in Russia. Compositions, exercises, short texts for reading comprehension, oral presentations. Two 90-minute classes. Prerequisite: 207 or instructor's permission. K. Blank

RUS 408 Advanced Russian through History and Culture
The course aims to improve students' proficiency in idiomatic Russian by using materials on historical and cultural topics. The materials cover Russian history from the days of Kievan Rus' to the post-Soviet era. Weekly reading and compositions. Two 90-minute classes. Prerequisite: instructor's permission. K. Blank

SLA 219 Pushkin, Gogol, Dostoevsky: Introduction to the Great Russian Novel (also RES 219) Fall LA
A survey in English of Russian literature up to 1860. The course concentrates on master prose writers of the first half of the 19th century: Pushkin, Gogol, Lermontov, the early Dostoevsky, and the early Tolstoy. Two lectures, one preceptorial. Knowledge of Russian not required. E. Chances

SLA 220 The Great Russian Novel and Beyond: Dostoevsky, Tolstoy, Chekhov, and Others (also RES 220) Spring LA
A survey in English of Russian literature from mid-19th century to Soviet literature. Authors read include, among others, Turgenev, Dostoevsky, Tolstoy, Chekhov, Nabokov, and Bely. Two lectures, one preceptorial. Knowledge of Russian not required. E. Chances
SLA 221 Soviet Culture, Above and Below Ground (also RES 221 ) LA
A survey in English of Soviet literature from 1917 to 1965 against the background of major social and political developments. Readings include works by Zamyatin, Babel, Bulgakov, Solzhenitsyn, and other representative authors. Two lectures and preceptorial. Knowledge of Russian not required. K. Reischl

SLA 311 Russian Music (See MUS 339)

SLA 312 Russian Drama (also RES 312 ) Spring LA
Introduction to major dramatic works of the 19th and 20th centuries, including Pushkin, Gogol, Chekhov, Shvarts, and Vampilov. Readings, discussions, oral and written reports in Russian. Two 90-minute seminars. Prerequisite: RUS 207 or instructor's permission. O. Hasty

SLA 316 Ethical Dimensions of Contemporary Russian Cinema (also RES 316 / VIS 353 ) EM
Exploration of the quest for moral values in Soviet and post-Soviet Russian cinema of the 1960s to the present. Topics include, among others, the effects of Stalinism; the struggle for freedom of individual conscience under totalitarianism; the artist's moral dilemmas in Soviet and post-Soviet society; materialism versus spirituality. Films of Andrei Tarkovsky, Nikita Mikhalkov, and others. One three-hour seminar. Knowledge of Russian not required. E. Chances

SLA 410 Bakhtin, the Russian Formalists, and Cultural Semiotics (See COM 410)

SLA 411 Selected Topics in Russian Literature and Culture (also RES 411 ) LA
Topics include: Russian literature and the city; Russian literature and the intellectual; the search for moral value in post-Communist literature; satire; Russian literature and music; 20th-century Russian poetry, Russian emigre literature. M. Wachtel

SLA 412 Selected Topics in Russian Literature and Culture LA
Topics include: Russian literature and the city; Russian literature and the intellectual; the search for moral value in post-Communist literature; satire; Russian literature and music; 20th-century Russian poetry, Russian emigré literature. O. Hasty

SLA 413 Pushkin and His Time LA
An introduction to Pushkin's works with attention to a number of genres (lyric, long poem, drama, short story). Readings in Russian with discussions in Russian or English, depending on students' preference. Two 90-minute classes. Prerequisite: RUS 207 or instructor's permission. M. Wachtel

SLA 415 Leo Tolstoy, War and Peace, and the Tasks of Literature (See COM 415)

SLA 416 Dostoevsky (also RES 416 ) Fall LA
A consideration of Dostoevsky's major works with particular emphasis upon their relation to the political, social, religious, and literary currents of his time. Knowledge of Russian not required. One three-hour seminar. E. Chances
Sociology at Princeton offers a cutting-edge undergraduate concentration for people interested in the social dimensions of politics, economics, history, psychology, and demography. The concentration encourages students to engage in cross-disciplinary thinking even as it provides a thorough grounding in a single field. Both quantitative and qualitative approaches to social science are utilized by our students and faculty. The best way to learn about the concentration is to hear our own students talk about their experiences in the department.

Princeton sociology graduates are admitted to the leading medical, law, and business schools; and they take jobs from Wall Street to social activism. Students concentrating in sociology are in increasing demand as corporations and governments want graduates with the conceptual and/or statistical tools to make sense of rapid social change and the recent explosion of digital data generated by the Web.
Department faculty do research and teaching on important topics of concern in the "real world," from social networks, immigration, and inequality to globalization, politics, and economic sociology.

Prerequisites

Students are normally encouraged to complete one or more courses in sociology by the end of the sophomore year. Sociology 101 is highly recommended, though some concentrators take it after they have enrolled in the department.

Program of Study

Students are required to take a minimum of nine courses in sociology, including an upper limit of two cognate courses in other departments which must receive approval from Sociology in order to count toward the required nine. A "cognate" course is a Princeton class offered by another department that has substantial sociological content. All departmental courses or approved cognates that count toward the required nine must be taken for a grade and cannot be taken pass/D/fail. SOC 101, SOC 300, POL 345/SOC 305, and SOC 302 are requirements for the major. Collectively they are designed to help students carry out their junior and senior independent work. These courses expose students to the nature of sociological problems and theory, the logic of inquiry, the techniques of empirical investigation, and the elements of statistics. SOC 300 and POL 345/SOC 305 are usually taken in the fall of the junior year and are offered at that time to facilitate students who wish to study abroad in the spring. SOC 302 is normally offered in the spring.

Independent Work

Junior Independent Work. Juniors begin their independent work in the fall of their junior year, but the work is due at the end of the spring semester.

The junior paper is written with SOC 300 and POL 345/SOC 305 providing the basic research tools to formulate the project. Junior papers require students to conduct limited data analysis, whether of primary data (generated by students themselves) or secondary data (derived from existing data sources). In some cases, the junior paper becomes the foundation for the student's senior thesis. All junior papers are graded by a second reader, in addition to the major adviser.

Senior Independent Work. Senior independent work consists of completing a thesis that (a) explores the various theoretical approaches that have been used to explain a particular social phenomenon and (b) examines that phenomenon through extensive analysis of data, whether primary (generated by students themselves) or secondary (derived from existing data sources). Students whose thesis topics require advanced quantitative skills may acquire the necessary competence by enrolling in suitable statistics courses. Students who are contemplating collecting their own data may need the prior approval of the University's Institutional Review Board for Human Subjects.

Senior Departmental Examination

Each senior takes an oral examination based on the senior thesis and the broader subfield to which it contributes. A departmental committee conducts this examination in May.
Study Abroad

Sociology welcomes students with international interests who wish to study abroad for one or two semesters. The department makes every effort to accommodate these students by coordinating special arrangements for advising on independent work and by permitting them to take required courses out of sequence, either before or after the period of foreign study. Normally, two courses taken during a semester or a year abroad count as departmentals. Such courses will need preapproval from the departmental representative.

Undergraduate Departmental Committee. At the beginning of every year, an Undergraduate Student Advisory Committee is selected. This committee, consisting of equal numbers of junior and senior majors, advises the department on matters pertaining to curriculum, staffing, and requirements.

Research Facilities. The Social Science Reference Center, the Data and Statistical Services unit, and the Stokes Library provide facilities for study and research in the form of collections of books, journal articles, reports, microfilm, and electronic data. Staff members in these units are available to majors who are completing their independent work, looking for appropriate data sets to analyze, or seeking advice on where to find literature relevant to their research topics.

Courses

**SOC 101 Introduction to Sociology**   Fall SA
Orientation to basic sociological concepts as analytical tools for the study of continuities and change in social and individual behavior. Influence of family, school, and the market. Social construction of the self and selected aspects of the life course including childhood, love, and death. Two lectures, one preceptorial.

*M. Duneier, P. Starr*

**SOC 201 American Society and Politics**   Not offered this year SA
An introduction to changing patterns of family structure, community life, economic relations, voluntary associations, moral beliefs and values, social and political movements, and other aspects of civil society and politics in the United States. Two lectures, one preceptorial. *P. Starr*

**SOC 202 Introductory Research Methods in African American Studies (See AAS 202)**

**SOC 203 Introduction to Urban Studies (See URB 201)**

**SOC 210 Urban Sociology: The City and Social Change in the Americas (also LAS 210 / URB 210 / LAO 210)**   Fall SA
By taking a comparative approach, this course examines the role of social, economic, and political factors in the emergence and transformation of modern cities in the United States and selected areas of Latin America. The class considers the city in its dual image: both as a center of progress and as a redoubt of social problems, especially poverty. Special attention is given to spatial processes that have resulted in the aggregation and desegregation of populations differentiated by social class and race. Two lectures, one preceptorial. *P. Fernández-Kelly*

**SOC 211 Sociology of Religion**   Not offered this year SA
Classical and contemporary theories of the relations between religion and society, with emphasis on the dynamics of religious traditions in modern societies: secularization, religion and political legitimation, sources of individual
meaning and transcendence, rituals and moral obligations, religious movements, and contemporary trends in American religion. Two lectures, one preceptorial. Staff

SOC 214 Creativity, Innovation, and Society Not offered this year SA
An exploration of how creative activities are shaped by larger social configurations. The course first decodes the culture of creativity by examining how society thinks about creativity (and its opposite). How do the varying cultural meanings related to creativity reflect social change? Then it examines the social processes and consequences of innovation from a sociological point of view. Under what social conditions does innovation emerge? How do innovations reshape society and culture? Two lectures, one preceptorial.
Staff

SOC 221 Inequality: Class, Race, and Gender (also AAS 221 / GSS 221 ) Not offered this year SA
Inequalities in property, power, and prestige examined for their effects on life chances and lifestyles. Primary focus on socioeconomic classes in modern societies. Special attention to the role of religious, racial, and ethnic factors. Comparisons of different systems of stratification in the world today. Two lectures, one preceptorial. Staff

SOC 222 The Sociology of Crime and Punishment Not offered this year SA
This course seeks to provide a sociological account of crime and punishment. Why do people commit crime? How should we respond to crime? Has crime policy changed over the past several decades? What are the consequences of recent crime policy? Through classic and contemporary sociological research, policy analysis, and media coverage, the themes of crime and punishment in contemporary society are explored. Two lectures, one preceptorial. Staff

SOC 225 Sex, Sexuality, and Gender (also GSS 225 ) Not offered this year SA
This course focuses on the many ways gender differences are created, diminished, and reinforced in society. Students will learn how sexuality and gender categories are socially constructed concepts that vary across the life course (childhood, adolescence, adulthood) and different social settings (media and public discourse, schools, work, family, other countries, the policy arena, and the scientific academy). A variety of theoretical perspectives will be examined including sociobiological, micro- and social-psychological, and social-structural. Two lectures, one preceptorial. Staff

SOC 227 Race and Ethnicity (also URB 227 ) Fall SA
An introduction to the sociological study of race and ethnicity which begins by encouraging students to exercise some critical distance from the core concepts of race and ethnicity. Topics will include comparative racism, immigration, the experiences of the second generation, whiteness, the culture of poverty debate, slums and ghettos, and the debate over the "underclass." Two lectures, one preceptorial. P.
Fernández-Kelly

SOC 240 Families Not offered this year SA
Three main questions will be considered: (1) How "natural" is the family institution? (2) How essential is it? and (3) How well is it working in current American society? Comparative perspective on the analysis of childhood and society, marriage and divorce, and main contemporary trends. Proposed alternatives to the family and future developments. Two lectures, one preceptorial. Staff
SOC 248 Modern Mexican Society (also LAS 248) Not offered this year SA
An introduction to the social, political, and economic organization of modern Mexico. The course traces the evolution of Mexico's fundamental institutions from their birth after the Mexican Revolution of 1910, through their flowering during the 1950s and 1960s, to changes in the neoliberal era of the 1980s and 1990s. The course ends with a consideration of Mexico's current position as a partner in the North American Free Trade Agreement. Two lectures, one preceptorial. D. Massey

SOC 250 The Western Way of War Fall HA
A historical and analytical overview of war focusing on the origins and consequences of organized violence, the experience of battle, the creation and behavior of warriors, and the future of such conflicts. Two lectures, one preceptorial. M. Centeno

SOC 300 Claims and Evidence in Sociology Fall SA
This mandatory course for concentrators is intended to provide the groundwork for understanding sociological arguments, evidence, research, and writing. It provides students with the opportunity to try their hand at interpreting and evaluating arguments in the sociological literature and constructing their own arguments for a sociological study. Two lectures, one preceptorial. Staff

SOC 301 Sociological Research Methods Not offered this year QR
An overview of the research process in social science, including techniques of sampling, methods of data collection, principles of measurement, problems of inference and proof, basic methods of data analysis, and ethical considerations. Two lectures, one preceptorial. M. Frye

SOC 302 Sociological Theory Spring SA
Systematic survey of the principal concepts underlying all sociological description and explanation/prediction, with special attention to the different ways these concepts are employed in the four currently leading groups of theories, namely, structural functionalism, exchange theory, conflict theory, and symbolic interactionism. Two lectures, one preceptorial. P. Fernández-Kelly

SOC 305 Introduction to Quantitative Social Science (See POL 345)

SOC 308 Communism and Beyond: China and Russia (also RES 308 / EAS 308) Fall SA
A review of the stages of communism, including reform and dismantling. Comparisons of social classes and ethnic groups under the old system and their readiness for recent changes. Treatment of workers, farmers, intellectuals, officials, and new entrepreneurs. Comparative approach to China, Russia, and other countries formed from the Soviet Union. Two lectures, one preceptorial. D. Kaple

SOC 309 Topics in the Sociology of Latin America (also LAS 309) Not offered this year SA
A study of selected topics of current interest in the sociology of Latin America. The specific subject matter will vary from year to year, reflecting the changing interests of both faculty and students. Two lectures, one preceptorial. Staff

SOC 310 Gender and Development in the Americas (also LAS 310 / GSS 312) Not offered this year SA
An examination of gender as an integral component of socioeconomic development in advanced and less developed countries, with a focus on the United States and selected areas of Latin America. Special attention will be given to
processes of industrial restructuring on a global scale that have increased the participation of women in the formal labor force. An understanding of the relationship between gender inequality and social order will be a central object of inquiry. Two lectures, one preceptorial. Staff

SOC 312 Race and Public Policy (See WWS 331)

SOC 325 Latino Politics in the U.S. (See POL 333)

SOC 328 Population, Society and Public Policy (See WWS 330)

SOC 338 The Sociology of Latinos in the U.S. (also LAS 338) Not offered this year SA Using detailed studies of four major centers (San Antonio, Los Angeles, Miami, and New York), this course will analyze the historical and contemporary experience of several Spanish-speaking populations. Discussion will focus on two questions: (a) Are there common experiences or characteristics that justify the categorization of these varied groups under a single ethnicity? and (b) What racial, class, and gender divisions exist within these groups? Two lectures, one preceptorial. M. Tienda

SOC 340 God of Many Faces: Comparative Perspectives on Migration and Religion (also REL 390) Not offered this year SA By using examples from the United States, Asia, Europe, and Latin America, this course employs a comparative approach to investigating religion as a source of strength among immigrants -- including exiles and refugees -- as they undertake perilous journeys. Key questions addressed include: How does religion transform (and how is it transformed by) the immigrant experience? How is religion used to combat stereotypes? Are there differences between the ways men and women or dominant groups and racial minorities understand religion? Two lectures, one preceptorial. P. Fernández-Kelly

SOC 341 Latinos in American Life and Culture (See LAO 200)

SOC 342 Organizations: Management, Bureaucracy, and Work Not offered this year SA Classical and contemporary theories of organizations as collective tools, as cultural systems, and as actors in changing environments. Research on problems of innovation and survival, authority, and control in business firms, public bureaucracies, and voluntary associations. Special emphasis on the historical development of managerial ideologies in the U.S. Two lectures, one preceptorial. Staff

SOC 344 Communications, Culture, and Society Not offered this year SA An introduction to the study of communications media. Topics include: growth and impact of literacy, printing, telecommunications, and broadcasting; communications and the modern state (for example, secrecy, surveillance, intelligence); organization, control, and effects of the media; cross-national differences in communications policy and institutions; impact of computers and electronic communication. Two lectures, one preceptorial. P. Starr

SOC 345 Money, Work, and Social Life Fall SA The course offers a sociological account of production, consumption, distribution, and transfer of assets. Examining different sectors of the economy from corporations and finance to households, immigrants, welfare, and illegal
markets, we explore how in all areas of economic life people are creating, maintaining, symbolizing, and transforming meaningful social relations. Economic life, from this perspective, is as social as religion, family, or education. Two lectures, one preceptorial. *V. Zelizer*

**SOC 351 Introduction to Population Problems (See ECO 339)**

**SOC 353 Information Technology and Public Policy (See WWS 351)**

**SOC 361 Culture, Power, and Inequality (also GSS 361) Not offered this year SA**

An introduction to theories of symbolism, ideology, and belief. Approaches to the analysis and comparison of cultural patterns. Emphasis on the social sources of new idea systems, the role of ideology in social movements, and the social effects of cultural change. Comparisons of competing idea systems in contemporary culture. Two lectures, one preceptorial. *Staff*

**SOC 363 Religion in the United States Not offered this year SA**

Sociological investigations of religion in the United States since 1950. Patterns and variations in religious organization and expression. Social scientific methods of conducting research on religion, including surveys, interviews, and participant observation. Topics include demographics of religious involvement, trends, individual religious orientations, ethnicity and religion, and religious diversity. Two lectures, one preceptorial. *R. Wuthnow*

**SOC 364 Sociology of Medicine (also CHV 364) Not offered this year SA**

This course uses "the sociological imagination" to explore the role and meaning of medicine in modern U.S. society. Topics include sociocultural definitions of health and illness, the sick role, the doctor-patient relationship, the social determinants of health, the role of medicine in keeping society healthy, the education and socialization of health care professionals, and the social control function of medicine. Consideration of current bioethical dilemmas from a sociological perspective. Two lectures, one preceptorial. *E. Armstrong*

**SOC 365 Health, Society, and Politics Not offered this year SA**

Introduction to the sociology, history, and politics of health care. Topics include the social response to disease (including epidemics); the development and organization of the medical profession, hospitals, public health, and health insurance; and the contemporary politics of health policy in comparative perspective. Two lectures, one preceptorial. *P. Starr*

**SOC 368 Special Topics in Sociology Not offered this year SA**

The subject matter of this course varies from year to year. Typical topics are sociology of the environment and sociology of law. Two lectures, one preceptorial. *Staff*
The Program in South Asian Studies, under the auspices of the Princeton Institute for International and Regional Studies, offers students the methodological and theoretical tools to study the political, economic, social, religious, literary, and cultural institutions of the region with particular focus on the modern history of India and Pakistan.

Hindi, Urdu, and Sanskrit. The Program in South Asian Studies offers a four-term sequence of language instruction in Hindi, Urdu, and Sanskrit. Completion of all four terms of a language will satisfy the University language requirement. All language instruction is offered with an emphasis on gaining knowledge of the cultural context of South Asia, with Hindi and Urdu instruction focusing on speaking, reading, and writing, and Sanskrit instruction focusing on reading and interpreting a variety of traditional literary genres. The program encourages students to take advantage of intensive summer language programs and of the numerous opportunities to study or travel in South Asia, including a semester or year abroad. For more information, contact the Office of International Programs.

Admission to the Program

Students concentrating in any department may enter the certificate program with permission from the director. A student normally enters the program at the end of the sophomore year, although entrance in the fall of the junior year is not precluded. Students in the departments of anthropology, history, politics, religion, sociology, comparative literature, or the Woodrow Wilson School of Public and International Affairs may find that their studies mesh particularly well with the requirements of the program.

Concentrators in the Woodrow Wilson School will select South Asia as a field of concentration.

Program of Study

To obtain a certificate of proficiency, students must complete the normal requirements in their department of concentration as well as the following requirements of the program:

1. Four semesters of Hindi, Urdu, or Sanskrit, or demonstrated proficiency in one of these or another South Asian language through a program examination. See the program director to discuss using a language other than Hindi, Urdu or Sanskrit to fulfill the program's language requirement.
2. At least four courses on South Asia in any of the following departments: anthropology, comparative literature, economics, history, near eastern studies, politics, religion, the Woodrow Wilson School of Public and International Affairs, or the Program in South Asian Studies. Please note: No more than two courses in any one department may be used to count toward the certificate of proficiency, and only one course of the four may be taken as P/D/F.

3. A senior thesis written in the student's department of concentration with a significant South Asian component. If there is no possibility for South Asian content in the senior thesis, students must write a separate piece of independent work focusing on South Asia; please consult with the program director.

Certificate of Proficiency

Students who complete the requirements of the program with satisfactory standing receive a certificate of proficiency in South Asian studies upon graduation.

Courses

HIN 101 Elementary Hindi and Urdu I (also URD 101) Fall
This proficiency-based course in Hindi-Urdu allows students to acquire linguistic skills in culturally authentic contexts. Equal emphasis is placed on Hindi and Urdu, including writing systems, vocabulary, and culture. The course will focus on using language for genuine communication through a variety of activities. By the end of the course, students will be able to read and write both Hindi and Urdu scripts and communicate in a culturally appropriate manner. All classes will be interactive. No credit is given for HIN 101/URD 101 unless followed by HIN 102/URD 102. R. Phillips

HIN 102 Elementary Hindi and Urdu II (also URD 102) Spring
This course provides the second semester of training in Hindi and Urdu, allowing students to acquire linguistic skills in culturally authentic contexts. Equal emphasis is placed on both Hindi and Urdu, including writing systems, vocabulary, and culture. Course will focus on using language for genuine communication. Students will be able to read and write both Hindi and Urdu scripts, communicate in social situations, and narrate in all three time frames: past, present and future. Classes are interactive. R. Phillips

HIN 105 Intermediate Hindi I Fall
Building on HIN 102, this course will focus on expanding Hindi vocabulary, mastering more complex grammatical structures and acquiring idiomatic expressions. There will be an equal emphasis on all skills (speaking, listening, reading, and writing). Aspects of the target language culture will be integrated with instruction. Activities will be conducted in Hindi and classes will be interactive. R. Phillips

HIN 107 Intermediate Hindi II Spring
Continuing from HIN 105, the course refines and expands previously acquired linguistic skills in culturally authentic contexts. Focus on expanding vocabulary, mastering complex grammatical structures and idiomatic expressions. Use of authentic Hindi materials from print and electronic media, films, and folk literature. Equal emphasis on all skills (speaking, listening, reading, and writing). Activities are conducted in Hindi and classes are interactive. R. Phillips
SAN 101 Elementary Sanskrit I  Fall
An introduction to classical Sanskrit grammar and vocabulary, as well as Devanagari script, pronunciation, and phonological change (sandhi). Students will begin to read simple Sanskrit prose and verse. No credit is given for SAN 101 unless followed by SAN 102. Staff

SAN 105 Intermediate Sanskrit I  Fall
Strengthens classical Sanskrit grammar and vocabulary and builds knowledge of South Asian religion and culture through reading selections from Sanskrit Epics and Puranas. Staff

SAS 217 Peoples and Cultures of South Asia (See ANT 339)

SAS 281 Buddhist Philosophy (See REL 281)

SAS 306 Creating the Universe: Buddhist Science, Ritual, and Art (See REL 306)

SAS 337 Social Change in Contemporary India (See ANT 337)

SAS 340 Popular Trends in South Asian Literature (also COM 322)  Fall LA
This course introduces students to the richness and diversity of South Asian literature produced in vernacular languages and in English. Texts represent major themes and popular trends in the 20th and 21st century; and we discuss them in historical and literary contexts. Topics include cultural renaissance and nationalism; progressive-Marxist literary movement; modernist and experimental literature; feminist, dalit (oppressed castes), and diaspora literature; and various postmodern and contemporary literary trends. F. Farooqui

URD 105 Intermediate Urdu I
The course is a continuation of HIN-URD 102, concentrating on Urdu. Students beginning with intermediate proficiency in either Urdu or Hindi will be brought to an advanced level in Urdu in all four skills: reading, writing, speaking, and listening. Urdu script will be introduced and emphasis will be placed on strengthening literacy skills. Cultural aspects will be integrated with instruction. Activities will be conducted in Urdu and classes will be interactive. F. Farooqui

URD 107 Intermediate Urdu II
This continuing proficiency-based course refines and expands previously acquired linguistic skills in culturally authentic contexts. Focus is on expanding vocabulary, mastering more complex grammatical structures, and acquiring idiomatic expressions. Use of authentic Urdu materials from print and electronic media, literature, and films. Equal emphasis on all skills (speaking, listening, reading, and writing). Various aspects of the target language culture will be integrated with instruction. Activities will be conducted in Urdu and classes will be interactive. F. Farooqui
Department of Spanish and Portuguese

Chair
Pedro Meira Monteiro

Departmental Representative
Bruno M. Carvalho

Director of Graduate Studies
Rachel L. Price

Professor
Marina S. Brownlee, also Comparative Literature
Rubén Gallo
Angel G. Loureiro
Pedro Meira Monteiro
Gabriela Nouzeilles

Associate Professor
Bruno M. Carvalho
Germán Labrador Méndez
Rachel L. Price

Assistant Professor
Javier Guerrero
Nicole Legnani

Senior Lecturer
Alberto Bruzos Moro
Nicola T. Cooney

Lecturer
Dunia Catalina Méndez-Vallejo
Sylvia Zetterstrand

Associated Faculty
Jeremy I. Adelman, History
João G. Biehl, Anthropology
Eduardo L. Cadava, English
Douglas S. Massey, Woodrow Wilson School
Irene V. Small, Art and Archaeology

Information and Departmental Plan of Study

More than half a billion people across five continents speak Spanish or Portuguese as their first language, and in the United States, with more than 38 million Spanish speakers, the Hispanic legacy is embedded in myriad aspects of American politics, arts, and culture. Our community of scholars studies and highlights the importance and influence of the Spanish, Latin American, and Luso-Brazilian histories, cultures, and languages in the Americas, Europe, Africa, and Asia, from the Middle Ages and the Renaissance to our globalized present.

Our department is a critical pillar of Princeton's commitment to internationalization and scholarly excellence. We encourage and facilitate interdisciplinary work, and our faculty are active in many other departments and programs on campus, including the Program in Latin American Studies, French and Italian, Latino Studies, Media and Modernity, the School of Architecture, Comparative Literature, Renaissance Studies, History, Art and Archaeology, the Art Museum, and the Environmental Institute.

Our mission is to help Princeton students become successful global citizens, ready to face the challenges posed by an increasingly cosmopolitan and multilingual professional world. With this general purpose in mind, we offer a full range of language courses, advanced seminars on literature and culture, translation workshops and the opportunity for independent study. With the support and guidance of our talented faculty, students are able to study not only the Spanish and Portuguese languages, but also the literatures, the visual arts, the music, the urban cultures, as well as the complex political and social histories of the Hispanic and Luso-Brazilian worlds.
Students become familiar with renowned writers such as Miguel de Cervantes and Jorge Luis Borges, Nobel Prize laureates Gabriela Mistral, José Saramago, and Mario Vargas Llosa; influential artists such as the painters Diego Velázquez, Pablo Picasso, and Frida Kahlo, the architect Oscar Niemeyer, contemporary musicians Caetano Veloso, Gotan Project, and Calle 13; as well as international filmmakers such as Luis Buñuel, Pedro Almodóvar, and Alfonso Cuarón. To experience cultural and linguistic immersion, our students also have the opportunity to study abroad with our popular summer programs in Argentina, Brazil, and Spain, or with other approved international programs.

Our majors and certificates provide students with the high linguistic proficiency, the cross-cultural literacy, and the critical and analytical skills that are key for careers in the humanities, government, international relations, international business, education, law, medicine, and social services today. They also enable students interested in the environment to communicate effectively when doing research or volunteering in Spanish- or Portuguese-speaking regions. Our courses serve as passports for living and working in more than thirty countries, including some of the fastest growing economies in the world.

**Advanced Placement**

A language Advanced Placement Examination score of 5 or SAT Subject Test score of at least 760 is required to satisfy the A.B. foreign language requirement at entrance, or for admission to a 200-level course.

**Prerequisites**

The normal requirement for admission to the department is successful completion of two 200-level courses in Spanish or one 200-level course in Portuguese.

**Early Concentration**

Qualified students are encouraged to decide on their concentration as early as possible in their sophomore year. In this way they can benefit from departmental advising on course selection and on the possibility of spending a semester or the whole junior year abroad.

**Program of Study**

All concentrators are strongly advised to include one advanced language course (SPA 207, SPA 207S, or SPA 307 for Spanish; POR 207S, POR 208, or POR 209 for Portuguese) in their subject(s) of concentration. All Spanish concentrators must take one course in pre-1800 literature. University regulations limit to 12 the number of departmental courses allowed to each student in his or her concentration.

**Tracks.** Departmental courses cover a wide array of literary, cultural, social, historical, and political topics. Students are, therefore, able to pursue courses of study that are almost tailor-made to their own individual interests.

The department offers four different tracks for concentrators:

Track 1: Concentration in one language, literature and cultures (Spanish or Portuguese). Requires a minimum of five upper-division courses in the language of concentration.
Track 2: Concentration in two languages, literature and cultures (Spanish and Portuguese; or Spanish/Portuguese and another language). Requires a combination of five upper-division courses in Spanish or Portuguese and three upper-division courses in the second language.

Track 3: Concentration in Spanish or Portuguese with another related field (e.g. Urban Studies, Architecture, Global Health and Health Policy, Environmental Studies, Humanistic Studies, Sociology, European Studies, International Studies, Latino Studies, Latin American Studies, Comparative Literature, History, Politics, Anthropology). Requires a combination of five upper-division courses in Spanish or Portuguese and three upper-division courses in the secondary field.

Track 4: Concentration in Spanish or Portuguese with the creative arts (e.g. creative writing, theater, visual arts, translation). Requires a combination of five upper-division courses in Spanish or Portuguese and three upper-division courses in the creative arts.

Any track in the concentration in Spanish and/or Portuguese Literature and Cultures requires a minimum of eight upper-division courses, at least five of which must be in the language of concentration. With the approval of the departmental representative, up to three cognate courses in other departments can be counted towards the concentration. Up to three courses taken during a semester abroad may be approved towards the concentration. Freshman seminars on topics related to the area of concentration may be counted towards the required eight upper-division courses.

**Language Programs.** Students who wish to continue a language begun in secondary school must have their proficiency measured either by a College Board score for admission (see Advanced Placement above) or by the department's placement test administered online during the summer before course registration.

Placement will depend on previous training and proficiency.

*Spanish Language Program.* The normal program for beginners seeking a basic mastery of Spanish is the sequence 101, 102, 107, which satisfies the University's language requirement.

Students with advanced placement in Spanish will be placed in either 103 or 105, and will proceed respectively to 107 or 108 to satisfy the University language requirement. They may also be placed directly into 108. Students who have successfully completed 107 may not take 108.

Course credit in 101-102, 103, 107 or 108 is also available through approved summer courses abroad (see Study and Work Abroad below). When asking for summer credit, students must take the departmental placement test to prove they have passed beyond the level. Funding may be available for selected and committed students.

Students who want to receive summer credit for a Spanish language course, or have questions concerning placement and summer study, should contact Catalina Méndez Vallejo, acting co-director of the Spanish Language Program.

*Portuguese Language Program.* The sequence for beginners seeking a basic mastery of Portuguese is 101, 102, 109. The sequence for students who have a previous knowledge of a Romance language is 108, 109, which also satisfies the University's language requirement. POR 108 is designed for, but not limited to, students who have already fulfilled the language requirement in Spanish, French, or Italian. Students are encouraged to contact an instructor of Portuguese to find out whether they qualify to take 108. POR 110 is an intensive one-semester course and may not be used to fulfill the language requirement.
For questions concerning placement and summer study, please contact the director of the Portuguese language program.

**Independent Work**

Junior Papers. Students should discuss as soon as possible their area of interest with the departmental representative in order to find the most appropriate advisers for the junior papers (JPs). By the end of September (first JP), and by mid-February (second JP), all juniors should have contacted their advisers to discuss a plan of work. The first JP (fall semester) should be about 4,000 words, and the second JP (spring semester) should be between 5,000 and 8,000 words. Both JPs may be written in English, in which case a three-page summary in the target language must be provided. Or, the JPs can be written in the target language in which case a summary is not needed. Include the Princeton University pledge on all papers.

Students following two languages are encouraged to write one JP in each of the languages of concentration.

Senior Thesis. Students should select a senior thesis adviser by the end of September at the latest. The senior thesis is normally written in English, and should be between 15,000 and 20,000 words. Topics chosen in the past have ranged over the whole field of Spanish and Portuguese studies, from linguistic problems and literary techniques through close textual analysis to thematic and ideological studies. Students primarily interested in culture and civilization have written on art, political and economic issues, education, and a variety of social questions. The senior thesis is a major commitment of a student's time and energy, and the most important yardstick for choosing a topic is willingness to spend many hours on a particular set of texts or problems.

Resources are available to assist students with the costs of senior thesis research, including, when appropriate, travel abroad. The best time to use them is the summer preceding the senior year.

**Senior Departmental Examination**

The senior departmental/comprehensive exam will consist of an oral presentation of the thesis. It will be followed by questions regarding the thesis content and bibliography, as well as questions related to the course work done by the student in the department.

**Study and Work Abroad**

The department strongly encourages its concentrators to spend as much time as they can in any country where their language(s) of concentration is (are) spoken. There are many ways of doing this within the four-year undergraduate degree: through study abroad for one or two semesters; through summer study abroad; and through a summer internship abroad. All students must visit the The Louis A. Simpson *60 International Building, to become acquainted with the administrative procedures related to study abroad.

Junior Semester/Junior Year Abroad. Students planning to spend a semester or their whole junior year abroad should seek advice from the departmental representative and from relevant faculty in choosing a suitable program of study. Further assistance is available from the Office of International Programs. Departmental and University approval of programs abroad is required.
Grades awarded by foreign institutions for courses that are recognized in lieu of Princeton courses are not included in the consideration of departmental honors.

Students who study abroad are not exempted from independent work requirements. If necessary, the department will make arrangements to find a JP adviser in the location where the student spends the semester or year abroad or will indicate a department adviser who will be in contact with the student throughout the term or year abroad.

Approved courses taken abroad in one semester will normally count for up to three departmental courses. Students must complete the program abroad to the standards required by the foreign institution.

Summer Language Study. All students interested in languages are encouraged to study abroad during the summer in one of the programs recommended by the department and the Office of International Programs. The Department of Spanish and Portuguese has summer programs in Toledo, Spain, and Buenos Aires, Argentina for students with intermediate and advanced knowledge of Spanish, and a summer program in Rio de Janeiro, Brazil, for students with intermediate to advanced knowledge of Portuguese. The department offers a number of scholarships to attend those programs, as well as to attend other language programs in Spanish- and Portuguese-speaking countries.

Summer Work Abroad. Information about placements and internships abroad may be obtained from the Office of International Programs.

Certificate in Language and Culture

Admission. The program is open to all undergraduates in all departments. Ordinarily, students concentrating in language and literature departments, including comparative literature, will be eligible for the certificate in language and culture provided that: (a) the linguistic base for the language and culture certificate is different from the linguistic base of the concentration; and (b) the work required for the language and culture certificate does not duplicate the requirements of the concentration. Students pursuing area studies certificates may earn the certificate in language and culture provided that: (a) the courses they elect to satisfy the requirements of the area studies program are different from those they elect to satisfy the requirements of the language and culture certificate program (in agreement with the Program in Latin American Studies, one course can be used toward both a certificate in Spanish and Portuguese and a certificate from the Program in Latin American Studies); and (b) they submit a piece of independent work in addition to the independent work that satisfies the requirements of the area studies program.

Application forms are available on the department's Web page. Completed forms are submitted during the senior year. A separate application must be completed for each language in which a certificate will be pursued.

Plan of Study. The certificate in language and culture is available in Spanish and Portuguese and involves satisfactory completion of the following course requirements:

Spanish:
1. Four upper-level courses (beyond SPA 209), at least three of which must be 300-level (or higher) departmental courses in the Spanish language, literature, or culture. The department strongly recommends SPA 222, 224, or 227 as an entryway into the certificate program. Courses must be taken for a letter grade, no Pass/D/Fail or Audit. At the discretion of the departmental representative, students who study abroad during the academic year may count one pre-approved course per semester abroad toward the certificate. One Princeton summer abroad
course offered through the department would also count. Two pre-approved courses in a summer program abroad other than Princeton's can count for one course toward the certificate.

In no case, however, can more than two courses taken abroad count toward the certificate. Any upper-level Spanish course taught in English will require all written work to be completed in Spanish in order to count toward the certificate.

2. Independent work. During their senior year, students must write a paper on a topic agreed upon with the departmental representative. The paper must be written in Spanish and be at least 6,000 words in length. This paper must be an extension of a paper written for one of the 300-level courses used toward the certificate. Please contact the departmental representative by e-mail in the fall semester of your senior year for approval of the topic. An extra 300-level (or higher) departmental Spanish course may be substituted for the independent work.

3. Students interested in earning a certificate in another department's program and in Spanish may earn both certificates provided that: (a) different courses are used to fulfill the requirements for each certificate (with the exception of PLAS; see above); and (b) the student produces two different pieces of independent work.

Portuguese:

1. Three 300-level (or higher) departmental courses in the Portuguese language, literature, or culture. Courses must be taken for a letter grade, no Pass/D/Fail or Audit. At the discretion of the departmental representative, students who study abroad during the academic year may count one pre-approved course per semester abroad toward the certificate. One Princeton summer abroad course offered through the department would also count. Two pre-approved courses in a summer program abroad other than Princeton's can count for one course toward the certificate. In no case, however, can more than two courses taken abroad count toward the certificate. Any 300- or 400-level Portuguese course taught in English will require all written work to be completed in Portuguese in order to count toward the certificate. With the approval of the departmental representative, two 200-level courses in Portuguese literature or culture may count as one departmental.

2. Independent work. During their senior year, students must write a new paper on a topic agreed upon with the departmental representative. The paper must be written in Portuguese and be approximately 6,000 words in length. This paper must be an extension of a paper written for one of the courses used toward the certificate. Please contact the departmental representative by e-mail in the fall semester of your senior year for approval of the topic. An extra 300-level (or higher) departmental Portuguese course may be substituted for the independent work.

3. Students interested in earning a certificate in another department's program and in Portuguese may earn both certificates provided that: (a) different courses are used to fulfill the requirements for each certificate (with the exception of PLAS; see above); and (b) the student produces two different pieces of independent work.

Courses

POR 101 Introduction to Portuguese I  Fall
Students will be taught the fundamental skills of oral comprehension, speaking, reading and writing, while gaining exposure to the Portuguese-speaking world through the media, literature, film and the music of Brazil, Portugal and Lusophone Africa. No credit is given for POR 101 unless followed by POR 102. L.

Gonçalves
POR 102 Introduction to Portuguese II Spring
A continuation of POR 101. Students will continue to develop skills of oral/aural comprehension, speaking, reading and writing, while gaining further exposure to the Portuguese-speaking world through the media, literature, film and music of Brazil, Portugal and Lusophone Africa. Students who successfully complete POR 102 will place into POR 109. L. Gonçalves

POR 109 Intermediate Portuguese Fall/Spring
Students will continue to develop their language skills, especially those of comprehension and written and oral expression through grammar study, readings, film, music, and other activities. Students will read and discuss one novel in Portuguese and will gain further exposure to the cultures of the Portuguese-speaking world. Three classes. Prerequisite: POR 108 or instructor's permission. A. de Castro Melloni

POR 110 Intensive Portuguese Fall/Spring
An intensive course designed for students who have fulfilled the language requirement in Spanish or another Romance language. Knowledge of one of these languages provides the basis for the accelerated learning of Portuguese. This intensive one-semester course teaches fundamental communication skills of comprehension, speaking, reading, and writing and provides some exposure to cultural aspects of the Portuguese-speaking world. Two 90-minute classes. A. de Castro Melloni

POR 208 Journeys in Portuguese: Studies in Language and Culture Fall/Spring
Designed as a journey through the Portuguese-speaking world, this course seeks to present the Portuguese language in context by exploring historical, social, political, and cultural aspects of Brazil, Portugal, Portuguese-speaking Africa and Asia through media, literature, film, music, and other activities. Students will increase their fluency and accuracy in both written and spoken Portuguese, broadening their vocabulary and mastery of syntax through textual analysis, discussions, oral presentations, and grammar review. Two 90-minute classes. Prerequisite: 109 or instructor's permission. N. Cooney

POR 209 Portuguese Cultural Themes
An advanced language and culture course looking at a variety of themes pertaining to the contemporary Portuguese-speaking world. Discussions and compositions expand knowledge of grammar and increase fluency in written and spoken Portuguese, providing a solid foundation for further study of literature and culture. Prerequisite: POR 208 or instructor's permission. Two 90-minute classes. Staff

POR 221 Introduction to the Literature and Culture of the Portuguese-Speaking World (also LAS 223 ) LA
Through readings of selected texts and audiovisual materials, this course introduces students to the diverse cultures of the Portuguese-speaking world. Discussions focus on Portugal's expansion during early modern times, and the spread of the Portuguese language in the Americas, Asia, and Africa. Contemporary issues in several geographic areas will be approached comparatively. Prerequisite: POR 208 or instructor's permission. Two 90-minute classes. Staff

POR 300 Luso-Afro-Brazilian Literary Traditions (also LAS 315 ) LA
This course focuses on works that have been key for shaping the literary tradition of the Portuguese language, from colonial to postcolonial times. Discussions will focus on the intersections between literature, social change, identity, and history in Brazil, Portugal, and Lusophone Africa. Prerequisite: POR 208 or instructor's permission. Two 90-minute classes. Staff
POR 301 Modern Brazilian Literature and Culture (also LAS 303) LA
A study of 19th- to 21st-century Brazilian texts with the aim of defining the place of Brazilian literature and culture within the context of Latin America and beyond. To include writers like Machado de Assis, Oswald de Andrade, Guimarães Rosa, Drummond, João Cabral, Clarice Lispector, and Caetano Veloso. Prerequisite: POR 208 or instructor's permission. Two 90-minute classes. Staff

POR 304 Topics in Brazilian Cultural and Social History (also LAS 311) LA
Through the analysis of literary texts, films, and music, the course will consider cultural responses to the construction of a Brazilian national identity. Possible topics include the Brazilian modernist tradition; contemporary culture and media; the city and literature; poetry and song. Prerequisites: POR 208 or instructor's permission. Two 90-minute classes. Staff

POR 319 Brazilian Cinema (also LAS 319/ VIS 346) LA
An introduction to the richness of Brazilian film, this course explores major cinematic movements: from the Cinema Novo, to critically acclaimed documentaries and more recent commercial successes like City of God. Recurrent and emerging trends will be discussed (e.g., the destruction of the Amazon, urban violence, literary adaptation, musical expressions). Prerequisite: POR 208 or instructor's permission. One three-hour class. B. Carvalho

SPA 101 Beginner's Spanish I Fall
An integrated approach to develop the skills of listening, speaking, reading, and writing Spanish in a cultural context to foster cultural awareness of the Spanish-speaking world. Class activities are devoted to acquiring and developing communicative and cultural competence through aural/oral practice, reading strategies, vocabulary acquisition, and language production. Audiovisual and other media resources are included. Five classes. No credit is given for SPA 101 unless followed by SPA 102. A. Merino

SPA 102 Beginner's Spanish II Spring
A continuation of SPA 101. The course continues to stress oral/aural practice with added emphasis on reading and communicative writing strategies. Students will read and analyze literary and cultural texts. Increased expression will be fostered through composition editing, videos, music, and film commentaries. Audiovisual and other media resources are included. Five classes. Prerequisite: SPA 101. The next course in this sequence is SPA 107. A. Merino

SPA 103 Intensive Beginner's and Intermediate Spanish Fall
An intensive course that combines 101 and 102 in one semester. Designed for students who have previously studied Spanish. An integrated approach that emphasizes developing and reinforcing language skills. Students will be introduced to various cultural aspects of the Spanish-speaking world through literary readings, videos, music, and films. Audiovisual and other media resources are included. Five classes. Prerequisites: satisfactory score on Princeton Spanish placement test and instructor's permission. Followed by SPA 107. L. Spino-Seijas

SPA 105 Intermediate Spanish Fall
Specially designed for students with a good foundation in Spanish. Class activities reinforce language skills through aural/oral practice, grammar review, vocabulary acquisition, reading, editing, composition, oral presentations, and discussion of contemporary Spanish short stories, music, and films. Three classes. Prerequisites: a satisfactory score on the Princeton Spanish placement test. Normally followed by 108. N. Cervantes Pérez
SPA 107 Intermediate/Advanced Spanish  Fall/Spring
Designed for students who have successfully completed SPA 102 or SPA 103. An integrated approach to increase comprehension, and oral and written expression. Class activities reinforce language skills through aural/oral practice, grammar review, vocabulary acquisition, reading, editing compositions, oral presentations, and discussion. Students will develop their reading comprehension, oral proficiency, and writing skills through various multimedia activities. Five classes. Prerequisite: SPA 101-102 or SPA 103.
A. Holgado-Lage

SPA 108 Advanced Spanish  Fall/Spring
An intensive course designed to prepare students to enter 200-level courses, with an emphasis on reading, speaking, and writing. The course is aimed at developing advanced language skills through frequent writing exercises, oral presentations, discussions of current events, literary texts, music, and film. Three classes. Prerequisite: 105 or satisfactory score on the Princeton Spanish placement test. M. Bores Martinez

SPA 207 Studies in Spanish Language and Style  Fall/Spring
An advanced course in Spanish composition and conversation designed to give students increased fluency and expertise in written and verbal Spanish skills. Extensive review of grammar and vocabulary through written and oral exercises. Course material includes literary texts, news-related publications, and films.
Three classes. Prerequisite: SPA 107 or SPA 108 or equivalent AP/SAT score. M. Bono

SPA 209 Spanish Language and Culture through Cinema  Fall/Spring
Designed to enhance oral and written skills in Spanish while increasing familiarity with Hispanic cultures through cinema. Language skills development is connected to the content of films and will be combined with in-class debates on cultural topics and writing of compositions. Two 90-minute classes. Prerequisite: SPA 107 or SPA 108 or equivalent AP/SAT score. G. Bilbao Terreros

SPA 221 Introduction to Medieval and Early Modern Spanish Cultures LA
Major developments in Spanish literature and civilization from the Muslim conquest to the 17th century. Beliefs and attitudes underlying the rise of the Spanish empire and the ways in which the interaction (convivencia) of Christians, Jews, and Muslims brought about the cultural differentiation of Spain within the European context. Two 90-minute classes. Prerequisite: 207 or higher, or instructor's permission. M. Brownlee, R. Surtz

SPA 222 Introduction to Latin American Cultures (also LAS 222 / LAO 222 )  Fall LA
Introduction to modern Latin American cultural and literary traditions with emphasis on the political uses of writing and art, national identity vis-à-vis popular and indigenous groups, memory and representation, the definition of modernity, and trans-American dialogues. The course may focus on national foundational fictions, the literary and artistic avant-gardes of the 1920s and 1960s, Mexican and Peruvian indigenismo, and memory art and cinema. Two 90-minute classes. Prerequisite: SPA 207 or higher, or instructor's permission. Strongly recommended before 300-level courses. M. Nouzeilles

SPA 224 Hispanic Studies: Introduction to Cultural Analysis  Fall LA
An introduction to textual analysis and interpretation of Hispanic literatures. The course will be organized on discussions of various genre (narrative, poetry, drama, essay). Readings will include authors from early and modern periods from Spain and Latin America, such as Garcilaso de la Vega, Cervantes, Calderón de la Barca, Miguel de
Unamuno, García Lorca, Sor Juana, José Hernández, Rubén Darío, Jorge Luis Borges, Mario Vargas Llosa, and Margo Glantz. Popular music and film will also be studied. Two 90-minute classes. Prerequisite: 107 or 108, or instructor's permission. 

M. Loureiro

SPA 227 Contemporary Issues in Spain (also EPS 227 / URB 237 ) LA
This course will focus on current political, social, and cultural issues in Latin America and/or Spain, including social movements, new artistic developments, economic changes, environmental debates, globalization and culture, politics of memory, immigration and cultural conflicts, nationalist movements, etc. Each semester, the course will focus on one of two particular regions and countries, such as the Southern Cone, the Andean region, Central America, Brazil, Mexico and the borderlands, Spain, etc. This course will also strengthen the students' conversational skills through team discussion and oral presentations. G. Labrador Méndez

SPA 300 The Literature and Culture of Spain and Colonial Latin America: Medieval, Renaissance, and Baroque (also LAS 300 ) LA
Through selected texts from Spain and colonial Latin America, the course will explore the formation of a literary tradition in Spanish. The main objective is to foster comparative studies within literatures and cultures of the Spanish-speaking world so as to identify points of contact and differentiation currently defining this field of studies. Two lectures, one preceptorial. Prerequisite: one 200-level Spanish course.

Staff

SPA 301 Topics in Spanish Literature of the Golden Age LA
Poetry, prose, and drama of the Golden Age. Readings might include the works of authors such as Garcilaso, Saint Theresa, Saint John of the Cross, Góngora, Quevedo, Lope de Vega, and Calderón. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission. Staff

SPA 302 Medieval Spanish Literature LA
Spanish literature and culture from the early Middle Ages to the beginning of the 16th century. Emphasis on both literary works (most read in modernized versions) and original documents. Special attention will be given to medieval Spain's pluralistic society of Christians, Muslims, and Jews. Prerequisite: a 200-level course in Spanish or instructor's permission. Two 90-minute seminars. Staff

SPA 303 Spanish Literature and Culture: Modern Spain 1700-2000 LA
Key literary works are analyzed in relation to main cultural, political, and social currents in Spain in the last three centuries. The course combines analysis of specific texts with a panoramic view of the complex articulation of cultural forces that have led to the present configuration of contemporary Spain. Prerequisite: one 200-level Spanish course or instructor's permission. Two 90-minute classes. G. Labrador Méndez

SPA 305 Topics in Spanish Civilization of the Golden Age LA
Selected literary forms and themes in relation to the major historical, social, and cultural currents of the Golden Age. Possible topics include the function of the theater in the absolutist state; the Inquisition and the literature of alienation; the impact of the Counter-Reformation on artistic activity; the image of woman in literature. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission. Staff
SPA 306 Cervantes and His Age (also COM 315 ) LA
Since 1605, *Don Quixote* has elicited passionate reactions: Faulkner read it once a year, as some read the Bible, while Malraux saw it as the most meaningful book for survivors of concentration camps. *Quixote* has been construed in disparate ways, from debating good and bad reading and writing, to mocking the medieval world view; from exploring the serious impact of the printing press, to benevolently satirizing the conquistadors; from being a study of deviant social behavior and the nature of madness, to a meditation on human sexuality and ageing. One lecture, two precepts. Prerequisite: a 200-level Spanish course or equivalent. *M. Brownlee*

SPA 307 Advanced Spanish Language and Style Fall/Spring LA
An advanced language course which develops and reinforces accuracy and fluency in both writing and speaking Spanish. Students will learn to identify linguistic features that characterize different genres, as well as social and cultural factors that aid in the interpretation and understanding of different texts and types of speech. The course also aims at providing the tools for discourse analysis, raising awareness of the social and ideological values that permeate discursive practices, and developing autonomy and proficiency as an advanced learner of Spanish language. Three classes. Prerequisite: One 200-level SPA course. *D. Méndez Vallejo*

SPA 309 Translation: Cultures in Context LA
An introduction to the study and practice of translation, this course provides students with an awareness of the complex tasks involved in translating written materials from one cultural context to another. The cultural encounter between the Hispanic and the Anglo-Saxon will be explored through the translation of increasingly difficult texts--newspaper articles, interviews, economic reports, and scientific articles. Through the examination of the students' own translations, the course will study the process of cultural exchange between Spanish and English. Prerequisite: 307. One three-hour seminar. *Staff*

SPA 312 The Dramatic Expression of the Golden Age LA
A survey of the major forms of Spanish drama of the Golden Age, including plays by Lope de Vega, Tirso de Molina, and Calderón. Emphasis on the development of the theater in relation to the rise of the absolutist state, the Counter-Reformation, and the impact of the Inquisition on Spanish society. Prerequisite: a 200-level Spanish course. Two 90-minute classes. *M. Brownlee*

SPA 317 Topics in the Cultural Expression of Protest and Dissent in Spain LA
Topics may include the literature of non-Castilian cultures in the Peninsula; the nonconformist drama of Galdós, Unamuno, Valle-Inclán, and García Lorca; the artist against the state (poets, essayists, and novelists under the Franco regime); the commitments of the avant-garde. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission. *Staff*

SPA 319 Topics in Cinema and Culture Fall LA
Major cinematic movements in Latin America and/or Spain: their influence and their relationship to literary and cultural issues. Possible topics include: the art of adaptation of narrative to film or Spanish surrealism. Two 90-minute seminars. Prerequisite: 207 or instructor's permission. *M. Loureiro*

SPA 320 Modern Spanish Fiction LA
The development of the novel and short story, as art forms, from 19th-century realism to the avant-garde of the 1920s and 1930s. An analysis of literary problems and their historical background, drawing on the works of Galdós,
Clarín, Unamuno, Baroja, Valle-Inclán, Miró, and others. Prerequisite: a 200-level Spanish course or equivalent. M. Loureiro

SPA 321 Topics in the Intellectual History of Modern and Contemporary Spain (also LAS 321)
LA
Special attention to its European context. Course may focus on a few important essayists (such as Ortega, Unamuno, d'Ors, and Zambrano) or may trace the development of an influential idea (such as the function of art, the individual and the masses) or map the characteristics of a certain period. One three-hour seminar. Prerequisite: a 200-level Spanish course or equivalent. Staff

SPA 326 Modern Spanish Poetry LA
Poetry from the late 19th century to the Spanish Civil War, considering modernismo and the generations of '98 and '27 in relation to European symbolism and the avant-garde. One three hour seminar. Prerequisite: a 200-level Spanish course or equivalent. G. Labrador Méndez

SPA 331 Modern Latin American Fiction (also LAS 331)
LA
Major themes, forms, and techniques in Latin American novels and short stories. Close analysis of texts by Borges, Rulfo, García Márquez, Bolaño, Vallejo, and others. Consideration will be given to historical contexts and contemporary ideological currents. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission. Staff

SPA 332 Modern Latin American Poetry (also LAS 332)
LA
An introduction to the major poets and poetic trends in modern Latin America and the Caribbean, with emphasis on Martí, Dario, Huidobro, Vallejo, Mistral, Neruda, Palés Matos, Borges, and Saer. Special attention also to the rich oral traditions represented by popular genres such as boleros, tango, nueva canción and rock, and particularly the work of Silvio Rodríguez, Violeta Parra, Rubén Blades, Tite Curet Alonso, and Charly García available in audio recordings or videos. Two 90-minute seminars. Prerequisite: a 200-level Spanish course or equivalent. Staff

SPA 342 Topics in Latin American Modernity (also LAS 342)
LA
The development of cultural patterns and literary forms in Spanish America since the late 19th century. Topics may include: the importance of oral traditions and popular music in forging identities; the literary and ideological import of modernismo, travel literature in the 19th century; and the avant-garde movements of the 1920s. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission. Staff

SPA 343 The Invention of Latin American Traditions (also LAS 343)
LA
Fundamental texts of Spanish American literature from colonial times to the present. In a given semester the course could focus on works by Garcilaso, Sor Juana Inés de la Cruz, Sarmiento, José Hernandez, Martí, Borges, Mariátegui, Palés Matos, Henríquez Ureña, or Lezama Lima. Two 90-minute seminars. Prerequisite: a 200-level Spanish course or instructor's permission. Staff

SPA 344 Literature and Society in Early Latin America (also LAS 344)
LA
This seminar studies literary, legal, and historical writings in relation to such topics as imperialism and colonialism, the image of the "Indian," cultural identities, and rhetoric and politics, from the writings of Columbus and the cartographic imagination to the formation of the new criollo culture in the vice-regal city. Texts from the following authors will be carefully analyzed: Cortés, Cabeza de Vaca, Las Casas, Garcilaso de la Vega, Huaman Poma, and Sor Juana Inés de la Cruz. Two 90-minute seminars.
SPA 345 Topics in Latin American Literature and Ideology (also LAS 345) LA
Latin American and Caribbean thought from 1800 to the present, focusing on the conflicting cultural and ideological assumptions of liberalism and nationalism. Topics might include slavery and literature, the writing of history, the intellectuals and power, or the writings of some major figures such as Bolivar, Hostos, Martí, Mariátegui, Fernando Ortiz, or Paz. Two 90-minute seminars. Prerequisite: a 200-level Spanish course or instructor's permission.

SPA 346 Modern Latin American Fiction in Translation (also COM 346 / LAS 364) LA
Readings and discussion of authors such as Machado de Assis, Cortázar, Liscpector, García Márquez, Vargas Llosa, and Puig, considered in relation to the cultures of Latin America and to trends of modern European and American fiction. Does not count as a departmental course for Spanish majors unless readings and papers are done in Spanish. Three hour lecture. Prerequisite: a 200-level Spanish course or instructor's permission.

SPA 348 Fictions and Communities in the Andes (also LAS 348) Not offered this year LA
How is the complexity of the Andes imagined or resolved in its literatures? This seminar will study the plurality of narrations and communities that constitute the Andean world, focusing primarily on Peru and two of its major intellectual movements in the 20th century: the indigenismo and the criollo urban literature. Aspects of the Afro-Peruvian narratives will also be studied. Major authors discussed include: Ricardo Palma, Clorinda Matto, González Prada, Mariátegui, Arguedas, Vargas Llosa, Bryce, Ribeyro, Gregorio Martínez. Conducted in Spanish. Two 90-minute seminars. Prerequisite: a 200-level Spanish course or instructor's permission.

SPA 350 Topics in Latin American Cultural Studies (also LAS 349) Fall LA
A course focusing on elements of Latin American culture that left a strong mark on the history, literature, and arts of the region. Recent topics include the representation of Che Guevara in novels, film, and photography; the literary response to Tango in Argentina; the impact of the invention of radio in avantgarde poetry. The course will emphasize the connections between history, literature, arts, and visual culture of the region. Two 90-minute seminars. Prerequisite: a 200-level Spanish course or instructor's permission.

SPA 351 Topics in the Culture of Cities (also LAS 347) Fall LA
An overview of the cultural production and history of major cities in the Spanish- and Portuguese-speaking worlds. Possible topics include Mexico City, Barcelona, São Paulo, Buenos Aires, Havana, and Madrid. The course will examine the representation of the city in literature (poetry and prose), film, painting, photography, and music. Discussions will focus on how historical events determine the possibilities of representation. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission.

SPA 352 Topics in the Politics of Writing and Difference (also LAS 356) LA
A course analyzing various Latin American literary and written traditions produced by, in dialogue with, or on behalf of subjects who have an ambiguous relationship with dominant forms of written expression, for example: indigenous people, black people, and women. Special attention will be given to slave narratives, testimonio, autobiography, and the indigenista novel. Two 90-minute classes. Prerequisite: a 200-level Spanish course or instructor's permission.
SPA 353 Topics in Gender and Representation (also COM 354 / LAS 353 ) LA
An examination of the relationship between gender and genre, between the author's experience as a gendered subject, and experiments with literary form. Topics might include women's writing, gay literature, and the aesthetics of camp. Discussions will emphasize the link between experimental forms of writing and the experience of history as a gendered subject. Two 90-minute classes. Prerequisite: a 200level Spanish course or instructor's permission. Staff

SPA 380 Translation Workshop: Spanish to English (also TRA 380 ) Spring LA
This workshop-style course will focus on developing the student's skills in translating short texts from Spanish into English. Each week one or two students will present their translations from a selection of poems and short stories by writers like Octavio Paz, Carlos Fuentes, Elena Poniatowska, Julio Cortázar, and many others. Students will also read theoretical texts about translation. Several professional translators will visit the class during the semester and present examples from their own work to the class. Prerequisite: reading knowledge of Spanish. One three-hour seminar. Staff

SPA 381 Topics in the Theory of Translation Not offered this year LA
An overview of recent debates about the practice of translation with special emphasis on how these ideas have been applied in translations of literary works by poets, novelists, and thinkers like Octavio Paz, Alfonso Reyes, Jorge Luis Borges, José Lezama Lima, and José Ortega y Gasset. Readings include essays on translation by Walter Benjamin, Vladimir Nabokov, Georges Steiner, and Lawrence Venutti. Students will be asked to translate a literary text from Spanish to English. Prerequisite: 307. One three-hour seminar. Staff

SPA 401 Topics in Hispanic Culture (Europe and America) (also LAS 428 ) LA
Possible topics might include: modernity, empire, and colonialism, European travel literature in Latin America, the encounter of Latin America, and North American cultural traditions. One three-hour seminar. Prerequisite: a 300-level Spanish course or instructor's permission. Staff
Program in Statistics and Machine Learning

Director
Kosuke Imai

Executive Committee
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Jianqing Fan, Operations Research and Financial Engineering
Kosuke Imai, Politics
John D. Storey, Lewis-Sigler Institute for Integrative Genomics

Associated Faculty
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Yacine Ait-Sahalia, Economics
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Elad Hazan, Computer Science
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Samory K. Kpotufe, Operations Research and Financial Engineering
Sanjeev R. Kulkarni, Electrical Engineering
Han Liu, Operations Research and Financial Engineering

Sits with Committee
Germán Rodriguez, Population Research

Information and Departmental Plan of Study

The Program in Statistics and Machine Learning is offered by the Center for Statistics and Machine Learning. The program is designed for students, concentrating in any department, who have a strong interest in data analysis and its application across disciplines. Statistics and machine learning -- the academic disciplines centered around developing and understanding data analysis tools -- play an essential role in various scientific fields including biology, engineering, and the social sciences. This new field of "data science" is interdisciplinary, merging contributions from computer science and statistics, and addressing numerous applied problems. Examples of data analysis problems include analyzing massive quantities of text and images, modeling cell-biological processes, pricing financial assets, evaluating the efficacy of public policy programs, and forecasting election outcomes. In addition to its importance in scientific research and policy making, the study of data analysis comes with its own theoretical challenges, such as
the development of methods and algorithms for making reliable inferences from high-dimensional and heterogeneous
data. This program provides students with a set of tools required for addressing these emerging challenges. Through
the program, students will learn basic theoretical frameworks and apply statistics and machine learning methods to
many problems of interest.

**Admission to the Program**

Students are admitted to the program after they have chosen a concentration, generally by the beginning of their junior
year. At that time, students must have prepared a tentative plan and timeline for completing all of the requirements of
the program, including required courses and independent work (as outlined below), as well as any prerequisites for
the selected courses. For enrollment or questions contact smlcert@princeton.edu.

**Program of Study**

Students are required to take a total of five courses and earn at least a B- for each course: one of the "Foundations of
Statistics" courses, one of the "Foundations of Machine Learning" courses, and three elective courses. With all
necessary permissions, advanced students may also take approved graduate-level courses. Students may count at
most two courses from another degree program (departmental concentration or another certificate program) towards
this certificate program.

Students are also required to complete a thesis or at least one term of independent work in their junior or senior year
on a topic that makes substantial application or study of machine learning or statistics. This work may be used to
satisfy the requirements of both the program and the student's department of concentration. All work will be
reviewed by the Statistics and Machine Learning certificate committee. At the end of academic each year, there will
be a public poster session at which students are required to present their work to each other, to other students, and to
the faculty.

Finally, students are encouraged to attend the statistics and machine learning colloquia on campus,
including the CSML Seminar Series.

**Courses Fundamentals of Statistics - one of the following courses**

ECO 202 Statistics & Data Analysis for Economics
EEB/MOL 355 Introduction to Statistics for Biology
ORF 245 Fundamentals of Statistics
POL 345/SOC 305 Intro to Quantitative Social Science
PSY 251 Quantitative Methods
WWS 200 Statistics for Social Science

**Fundamentals of Machine Learning - one of the following courses**

COS 424/SML 302 Fundamentals of Machine Learning
ORF 350 Analysis of Big Data
Three of the following courses (including those above, with permission) Data Science
POL 245 Visualizing Data
SML 201 Introduction to Data Science

Machine Learning
COS 402 Machine Learning and Artificial Intelligence
ELE 477 Kernel-Based Machine Learning
ORF 418 Optimal Learning

Theory
MAT 385 Probability Theory
ORF 309 Probability and Stochastic Systems
ORF 363 Computing and Optimization

Applications
AST 303 Observing and Modeling the Universe
CEE 460 Risk Analysis
ECO 302 Econometrics
ECO 312 Econometrics: A Mathematical Approach
ECO 313 Econometric Applications
ELE 480/NEU 480/PSY 480 fMRI Decoding: Reading Minds Using Brain Scans
GEO 422 Data, Models, and Uncertainty in the Natural Sciences
ORF 405 Regression and Applied Time Series
POL 346 Applied Quantitative Analysis

Certificate of Proficiency
Students who fulfill the program requirements receive a certificate upon graduation.

Courses

SML 101 Reasoning with Data QR
Data-driven decision-making, research discovery, and technology development are everywhere. It is now more important than ever for individuals to understand how data are used for these purposes. This course will introduce the student to how statistical reasoning and methods are used to learn from and leverage modern data. The emphasis will be on concepts and strategies for learning from data, rather than on sophisticated mathematics. Students will be exposed to the basics of statistics, machine learning, and data science through real world problems and applications. Students will also analyze data sets using the computer. Staff

SML 201 Introduction to Data Science QR
This course provides an introduction to the burgeoning field of data science, which is primarily concerned with data-driven discovery and utilizing data as a research and technology development tool. We cover approaches and techniques for obtaining, organizing, exploring, and analyzing data, as well as creating tools based on data. Elements of statistics, machine learning, and statistical computing form the basis of the course content. We consider applications in the natural sciences, social sciences, and engineering. Staff

SML 302 Fundamentals of Machine Learning (See COS 424)
The Program in Sustainable Energy is designed for Princeton undergraduate students who are interested in pursuing careers or graduate education in the area of sustainable energy science and technology to achieve:

1. An understanding of current energy resources, carriers, end users, technologies, and their impact on climate and environment.

2. The ability to quantitatively analyze, design, and develop innovative energy systems and technologies that support sustainable economic growth, energy security, biological diversity, and environmental harmony for life on Earth.
3. An understanding of Earth, global climate, and environmental change from the perspective of engineering, technology, economics, and policy.

The future of societies, the global economy, and the global environment depend on collaborative research into renewable energy, alternative fuels, advanced energy conversion and storage systems, technology transfer to developing countries, and prudent judgment on policies to support sustainable energy technology. Innovations and inventions require multidisciplinary approaches and entrepreneurship, as well as grounding in theory and practice, in topics that are not covered by a single department. This certificate program offers an integrated set of core and elective courses, introducing students to fundamental concepts, providing depth in specific fields of interest, gaining laboratory and site visit experiences, and setting the stage for further work in the field. Students are encouraged to expand their experience through summer internships with companies, government agencies, national and university laboratories.

Admission to the Program

The program is open to sophomores, juniors, and seniors who have a satisfactory background in engineering and science. Normally, students should have successfully completed MAT 103, MAT 104, PHY 103, and PHY 104 (or their equivalents, including AP equivalents). Students who have slightly different preparation should consult with the program director to discuss eligibility. A student planning to earn the program certificate should complete the online Student Profile at the program website as early as possible, and no later than the mid-point of the fall term of his or her junior year. Application for admission is made to the Program Committee. Upon acceptance to the program, the program director will assign a program adviser to the student to assist in planning a program of study, research, and off-campus internship.

Program of Study

A concentrator in this program must satisfy both program and departmental requirements. The program for each student is worked out by the student and his or her departmental adviser. The program requirements are as follows:

1. All students must take six courses, including two core courses and four elective courses. The two core courses must be taken by choosing one from the Introduction to Energy Technology category (A1) and the other one from the Introduction to Climate Change and Geo-environmental Science category (A2), respectively. Depending on the student's interest and background, the four elective courses should be taken with at least one from a different category (B1 and B2). In case the listed courses are not offered, students need to consult the program director for an alternative course. To qualify for the certificate, a minimum grade average of B- in the six program courses, and an independent work project or senior thesis, is required. In some cases, an elective course that fulfills a certificate program requirement can also meet a regular departmental requirement. If a student is enrolled in more than one certificate program, there may be no more than three overlapping courses between the Sustainable Energy program and any other program. Core Courses (one from each category -- A1 and A2)

A1. Introduction to Energy Technology

MAE 228 Energy Technologies in the 21st Century (also EGR/CBE/ENE 228)
MAE 328 Energy for a Greenhouse-Constrained World (also EGR/ENV/ENE 328)

Note: Students who do not have a thermodynamics background should choose MAE 228. Students who have completed Thermodynamics (MAE 221 or CBE 246) are encouraged to take MAE 328.
A2. Introduction to Climate Change and Geo-environmental Science

CEE 304 Environmental Engineering and Energy (also ENE 304/ENV 300)
CEE 334 Global Environmental Issues (also WWS 452/ENV 334/ENE 334)
EEB 417A, 417B Ecosystems and Global Change (also ENV 417A, 417B)
ENE 202 Designing Sustainable Systems (also ARC 208/EGR208/ENV 206)

Elective Courses and Subject Areas (four courses with at least one from a different subject area -- B1 and B2)

B1. Energy Science and Technology (Fossil energy, non-fossil and renewable energy, energy conversion and storage systems and technologies)
AST 309 Science and Technology of Nuclear Energy: Fission and Fusion (also MAE 309/PHY 309)
CBE 335 The Energy Water Nexus (also MAE 338/ENV 335/ENE 335)
CBE 341 Mass, Momentum, and Energy Transport or MAE 423 (also ENE 423) Heat Transfer
CBE 421 Catalytic Chemistry (also CHM 421/ENE 421)
CBE 441 Chemical Reaction Engineering
CEE 304 Environmental Engineering and Energy (also ENE 304/ENV 300)
CEE 305 Environmental Fluid Mechanics (also GEO 375/ENE 305), or CEE 306 Hydrology, or MAE 222;
Mechanics of Fluids (also CEE 208), or MAE 335 Fluid Dynamics (Only one of these courses may be taken to satisfy a B1 requirement)
CEE 471 Introduction to Water Pollution Technology (also GEO/URB 471)
CEE 477 Engineering Design for Sustainable Development (also ENE 477)
ELE 441/442 Solid State Physics I, II (also ENE 441, 442)
ELE 557 Solar Cells: Physics, Materials, and Technology (also ENE 557)
ENE 267 Materials for Energy Technologies and Efficiency (also MSE 287/CEE 267)
ENE 418 Fundamentals of Biofuels (also CBE 418)
ENE 431 Solar Energy Conversion (also ELE 431/ENV 431/EGR 431)
MAE 424 Energy Storage Systems (also ENE 424)
MAE 426 Rocket and Air-Breathing Propulsion
MAE 427 Energy Conversion and the Environment: Transportation Applications (also ENE 427) MAE 531 Combustion

B2. Environmental Science and Geoscience (Earth science, climate, environment, ecosystems, policy and economic assessments of carbon capture and storage technology) CEE 207 Introduction to Environmental Engineering (also ENV 207)
CEE 304 Environmental Engineering and Energy (also ENE 304/ENV 300)
CEE 311 Global Air Pollution (also CHM 311/GEO 311/ENE 311)
CEE 334 Global Environmental Issues (also WWS 452/ENV 334/ENE 334)
CHM 333 Oil to Ozone: Chemistry of the Environment (also ENV 333/GEO 333)
EEB 417A, B Ecosystems and Global Change (also ENV 417A, B)
ELE 547C Selected Topics in Solid-State Electronics
ENV 201A, B Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy
ENV 302 Practical Models for Environmental Systems (also CEE 302/EEB 302)
ENV 531 Topics in Energy and the Environment (also GEO 531/CEE 583)
GEO 203 Fundamentals of Solid Earth Science (also ENE 203)
GEO 425 Introduction to Ocean Physics for Climate (also MAE 425)
ORF 474 Special Topics in Operations Research and Financial Engineering
WWS 306 Environmental Economics (also ECO 329/ENV 319)
WWS 350 The Environment: Science and Policy (also ENV 350)

2. A senior independent work project or thesis whose topic is relevant to the program and acceptable to the Program Committee must be completed. The project or thesis title and abstract need to be presented to and approved by the program director. In addition, a minimum grade of B- for the project or thesis is required to qualify for the certificate.

3. Close collaboration with faculty is expected. Program students are expected to demonstrate strong academic performance. Program courses may not be taken on a pass/D/fail basis unless that is the only grading alternative for the course.

4. For the program enrollment, students must fill out the Student Profile form on the program website. It is especially important to assure that requirements for the certificate will be met by the end of the senior year.

Certificate of Proficiency

Students who fulfill all program requirements will receive a certificate of proficiency in sustainable energy upon graduation.

Seminars on Energy and the Environment. Seminars on energy and environment are announced to all students registered in this program. Advanced students are encouraged to attend regularly scheduled departmental and Princeton Environmental Institute seminars to further enrich their understanding of the field.

Undergraduate Independent Research Projects. Undergraduate projects usually are undertaken for independent work or senior thesis credit, and opportunities exist for summer and work-study projects. These projects typically last for one or two academic terms, although they may extend over greater periods of time. Students work closely with faculty and staff members in academic departments and University associated laboratories such as the Princeton Plasma Physics Laboratory (PPPL), and they have access to sophisticated computers and experimental facilities while conducting their independent research.

Undergraduate Off-Campus Experiences and Internships. Students are encouraged to expand their experience through site visits and to summer internships with companies, government agencies, national and university laboratories (e.g., PPPL). The energy-technology core course will provide several off-campus site visit experiences to power generation stations, a fusion laboratory, and energy research labs on campus.
The Program in Teacher Preparation is an interdepartmental course of study for undergraduates and is composed of a unique mix of coursework, seminars, laboratory experience, field work, and practice teaching. The program, approved by the New Jersey Department of Education and by the Council for the Accreditation of Educator Preparation (CAEP), allows students to explore teaching as a career option and to become fully prepared and certified to teach successfully at the middle and secondary levels within the regular framework of a Princeton A.B. or B.S.E. Participants can earn certification in art, English, mathematics, music, the sciences, social studies, and world languages.

Upon successful completion of the program requirements, students receive a certificate in teacher preparation from the University and may apply for a Certificate of Eligibility with Advanced Standing for teaching in public schools. The certificate is transferable to other states through reciprocity agreements. Independent schools, as a rule, do not require certification in order to secure a teaching position. However, independent school directors have become increasingly interested in teacher candidates who are fully prepared and certified within a liberal arts curriculum.

In accordance with Title II federal regulations for reporting pass rates in teacher licensing examinations, the Program in Teacher Preparation reported a 100 percent pass rate in the 2013-14 cohort.

Admission to the Program

Students are encouraged to apply during the freshman or sophomore year to allow adequate time for scheduling required courses, but applications are also accepted from third and fourth year students and alumni. Admission is based on academic standing, evidence of interest in teaching, personal interview, and the successful completion of the Introductory Practicum.

Program Requirements

General Education Requirements. The New Jersey Department of Education requires that students preparing to teach complete courses in a variety of academic disciplines within the liberal arts and sciences curriculum. A course is required in each of the following areas: fine arts, humanities, mathematics, science, social science, and technology. Courses taken to fulfill the University distribution requirements will cover all of these areas except for fine arts.

Teaching Area Requirements. Teaching area requirements normally correspond to departmental concentration requirements. A minimum of eight courses related to the area of certification are required, with three of the eight
courses at the advanced level (300 or 400 level). With careful choice of elective courses it is possible to be certified in one field while concentrating in another.

**Professional Education Requirements.** In addition to the general education and teaching area requirements, the professional education sequence includes the following:

*Introductory Practicum.* Participation in three one-hour seminar sessions and a six-hour observation in a school. Three brief written assignments and selected readings are also required. The Introductory Practicum is designed as an independent study to accommodate the student and the instructor’s schedules.

*Educational Psychology* (PSY 307) or an approved alternate course, usually completed during the year prior to practice teaching.

*Seminar on Student Learning and Methods for Teaching* (TPP 301). TPP 301 is usually completed the semester prior to practice teaching.

*Site-Based Field Experience.* A 30-hour observation in a school and the preparation of two lessons done in cooperation with a classroom teacher. (The field experience is completed concurrently with PSY 307, or alternate, and TPP 301.)

*Seminar on Education - Theory and Practice* (TPP 401). TPP 401 is taken concurrently with Practice Teaching (TPP 402).

*Practice Teaching* (TPP 402). TPP 402 is a 12-week assignment as a student teacher completed during the senior year (if done prior to the fall of 2018) or during an additional ninth semester (see The Practice Teaching Option below).

The above course requirements are subject to change, pending regulations approved by the New Jersey State Department of Education. Currently, students are required to complete a single semester of student teaching during senior year or in a semester after graduation. Beginning in the fall of 2018, students will be required to complete 175 additional clinical hours prior to the full semester of practice teaching. The full semester of student teaching must be done in a semester after graduation to accommodate the new requirements. In addition, students will be required to successfully pass a performance assessment (edTPA) in order to earn a New Jersey teaching license beginning in the 2017-18 academic year.

**Program Options**

*The Reduced Course Load Option.* Students who choose to do their practice teaching in either the fall or spring semester of their senior year, prior to the fall of 2018, have the option of reducing by one, the number of courses taken in that semester so as to devote full time to TPP 401 and TPP 402. This option requires that students complete 26 courses prior to the senior year. The arrangement does not alter distribution, departmental, or language requirements, nor does it reduce the total number of courses required for graduation. Students wishing to select this option must secure the approval of a program staff member and the appropriate academic dean.
The Practice Teaching Option (PTO). Program participants who find that they are unable to schedule TPP 401 and TPP 402 in a semester of their senior year can take those courses in a term after graduating or in a term during a one-year leave of absence between the junior and senior years. There is a modest tuition charge for the extra semester, and students are responsible for their own room and board. Students considering this option should discuss their plans with a member of the program staff, since special arrangements are required. Financial aid is available to eligible students.

Preparation for Independent School Teaching. Students not enrolled in the program who are seeking preparation for teaching in independent schools may enroll in PSY 307 or TPP 301 provided space is available. Students considering this option should contact the program office and schedule an appointment with a staff member prior to registration.

Certificate of Proficiency

Students who fulfill all program requirements receive a certificate of proficiency in teacher preparation upon graduation.

Placement. The program also provides placement services for all Princeton students and alumni seeking teaching and administrative positions in elementary and secondary schools, both public and private.

Courses

TPP 301 Seminar on Student Learning and Methods for Teaching Fall/Spring SA
A study of essential dimensions of learning and teaching, including learner characteristics and needs, organization and structure of educational institutions, development of curriculum and instructional goals, preparation of evaluation and assessment, and design of subject/level specific methodologies and classroom management techniques. Required course work includes 18 hours of site-based field experience and evening laboratory sessions. T. Kent, C. Campisano, K. Nolan

TPP 401 Seminar on Education-Theory and Practice Fall/Spring
The Seminar on Education-Theory and Practice is designed to intersect with and compliment Practice Teaching (TPP 402). Students will read and reflect on multiple sources of educational research and reflect on how to best integrate theory and practice in the reality of their school setting. Students investigate the processes of curriculum development and implementation, develop learning goals and lesson plans, and learn strategies for measuring student learning by applying both formative and summative assessments. Prerequisite: permission from the Director of Teacher Certification. Students enroll in the seminar concurrently with TPP 402. A. Catena

TPP 402 Practice Teaching Fall/Spring
Supervised practice teaching (a minimum of 12 weeks) in a middle or secondary school. Teaching is done under the supervision of an accomplished teacher and a program staff member who regularly observes and discusses the student's practice teaching. Students gain firsthand experience in developing teaching strategies, planning and differentiating instruction, assessing student learning, and classroom management.
Must be taken concurrently with 401. A. Catena, T. Wilson, J. Klugman
One would be hard-pressed to find any aspect of society today that is not influenced by evolving technology in a significant way. Similarly, technology does not develop in a vacuum; by virtue of its applied nature, it is shaped by the needs and desires of individuals and the societies in which they live. Society and technology co-evolve, so that you cannot fully understand one without knowing something about the other. This cross-disciplinary certificate program is targeted to students, both engineers/scientists and humanists/social-scientists, who are interested in exploring this intersection in depth. Graduates who earn this certificate will be effective contributors to the shaping, development and deployment of technological solutions for the benefit of society.

The intersection of technology and society is broad touching on a wide range of technologies and on a variety of societal issues and concerns. To ensure depth, individual programs of study are offered along two technology tracks: Information Technology and Energy.

The Information Technology track is offered in partnership between the Keller Center and the Center for Information Technology Policy. Information technology (IT) broadly covers the computation and communication technologies that permeate virtually all aspects of corporate and social activity. The products and services enabled by it have had a major impact on the world economy and on social interactions. As we look to the future, emerging technologies in IT continue to address critical societal challenges such as economic development, health care, politics, education, productivity, government and social organization. At the same time, these technologies raise new challenges in security, law enforcement, privacy, economic stability and justice.

The Energy track is offered in partnership between the Keller Center and the Andlinger Center for Energy and the Environment. Provision and use of energy and natural resources in a sustainable way is the single biggest challenge for Americans and citizens of the world to preserve the planet for future generations. Our economic and national security as well as our overall ability to thrive as a society depends on fulfilling these foundational responsibilities. Population growth and the increasing desire of those who live in developing countries to live on par with those in
developed countries are causing unprecedented demands for energy. How to meet these needs while protecting the environment is one of the most pressing challenges of our times. These problems are complex and intertwined, involving not only a need for advances in science and engineering, but also requiring changes in human behavior, economic analyses, and thoughtful policy.

Admission to the Program

Students are admitted to the program once they have chosen their field of concentration and consulted with the program director, who will assign them an adviser. Normally, students will have completed the program's core course prior to seeking admission.

Program of Study

The program provides a focus on technology (Information Technology or Energy) and society. An introductory gateway course Technology and Society (EGR/HIS/SOC 277) provides exposure to a broad set of issues at the intersection of technology and society. Following the introductory course, students study both the technological and societal aspects, which is critical to acquiring a good understanding of the disciplinary aspects of both sides of the issues that come up at this intersection. On the technology side, there is a rich set of courses in IT and Energy areas that have been designed to be accessible to all students on campus and that place the technical material in a broader application context. Similarly, on the societal side, technology issues are part of important courses in several departments such as Sociology and the Woodrow Wilson School. Finally, students need to conduct research on a specific issue through a one-term project with a subsequent written component (junior paper/thesis component) as well as a presentation at a program symposium.

Program Requirements

The following requirements need to be satisfied to earn the program certificate: core course, two technology courses, two societal courses, one breadth course, one-term independent research project, present project/thesis to the program students and faculty at an annual symposium. Pass/D/Fail policy: Students may use no more than one course taken on a Pass/D/Fail basis to satisfy program requirements.

Core Course. Technology and Society (EGR 277/HIS 277/SOC 277). This course provides students with the intellectual tools needed to approach the rest of the program -- a "set of lenses" that will help them view the issues being addressed in their work. Ideally, this course will be taken before the other required courses.

Technology and Society Courses (4 courses). This course requirement is intended to provide an understanding of the technology and societal aspects through a discipline-based study of both sides. Students must select either the Information Technology track or the Energy track and take the technology and societal courses from the respective list of courses.

Technology Courses. Each student is required to take two technology courses from a list that includes the courses below. These courses are mostly drawn from a set that includes courses specifically designed for a wider campus audience (no prerequisites). An advanced/one-time-only course may be used to replace one or both of these courses with the permission of the program adviser.
Technology Courses for Information Technology track:

APC 524/MAE 506/AST 506 – Software Engineering for Scientific Computing
COS 109/EGR 109 – Computers in Our World
COS 126 – General Computer Science (may be taken instead of COS 109)
COS 402 – Machine Learning and Artificial Intelligence
COS 424/SML 302 – Fundamentals of Machine Learning (previously entitled: Interacting with Data)
COS 429 – Computer Vision
COS 432 – Information Security
COS 433/MAT 473 – Cryptography
COS 435 – Information Retrieval, Discovery, and Delivery
COS 445 – Networks, Economics and Computing
COS 455/MOL 455 – Introduction to Genomics and Computational Molecular Biology
COS 461 – Computer Networks
COS 597E – Advanced Topics in Computer Science – Bitcoin and Cryptocurrency Technologies (one time course – fall 2014)
COS 597G – Advanced Topics in Computer Science – Surveillance and Countermeasures
COS 598B – Advanced Topics in Computer Science – Privacy Technologies
COS 598D – Advanced Topics in Computer Science – Analytics and Systems of Big Data
ELE 201 – Information and Signals (may be taken instead of ELE 222)
ELE 222a/b/EGR 222a/b – The Computing Age
ELE 381/COS 381 – Networks: Friends, Money, and Bytes
ELE 386/EGR 386 – Cyber Security
ELE 470 – Smartphone Security and Architecture
ELE 477 – Kernel-Based Machine Learning
ELE 535 – Machine Learning and Pattern Recognition
ELE 538 – Special Topics in Information Sciences and Systems – Information Theoretic Security
ELE 574 – Security and Privacy in Computing and Communications
ELE 580/COS 580 – Advanced Topics in Computer Engineering: Trustworthy
MAE 345 – Robotics and Intelligent Systems
ORF 350 – Analysis of Big Data
ORF 401 – Electronic Commerce
ORF 411 – Operations and Information Engineering
ORF 467 – Transportation Systems Analysis
SML 101 – Reasoning with Data
SML 201 – Introduction to Data Science
TRA 301/COS 401/LIN 304 – Introduction to Machine Translation
Technology Courses for Energy track:

CEE 207/ENV 207 Introduction to Environmental Engineering
CEE 304/ENE 304/ENV 300 Environmental Engineering and Energy
CEE 305/GEO 375/ENE 305 Environmental Fluid Mechanics
CEE 311/CHM 311/GEO 311/ENE 311 Global Air Pollution
CEE 334/WWS 452/ENV 334/ENE 334 Global Environmental Issues
CEE 477/ENE 477 Engineering Design for Sustainable Development
CEE 490/ENE 490 Mathematical Modeling of Energy and Environmental Systems
CHM 333/ENV 333/GEO 333 Oil to Ozone: Chemistry of the Environment
EGR 194 An Introduction to Engineering
EGR 251, 351, 451 Engineering Projects in Community Service (EPICS)
ENE 202/ARC 208/ EGR 208/ENV 206 Designing Sustainable Systems
ENE 267/MSE 287/CEE 267 Materials for Energy Technologies and Efficiency
ENE 431/ELE 431/ENV 431/EGR 431 Solar Energy Conversion
ENV 302/CEE 302/EEB 302 Practical Models for Environmental Systems
FRS (Freshman Seminar) 159 Science, Technology, and Public Policy
MAE 228/EGR 228/CBE 228/ENE 228 Energy Technologies for the 21st Century
MAE 328/EGR 328/ENV 328/ENE 328 Energy for a Greenhouse-Constrained World
ORF 455 Energy and Commodities Markets
ORF 474 Special Topics in Operations Research and Financial Engineering

Societal Courses. Each student is required to take two societal courses from a list that includes the courses below. An advanced/one-time-only course may be used to replace one or both of these courses with the permission of the program adviser.

Societal Courses for Information Technology track:

COS 448/EGR 448 – Innovating Across Technology, Business, & Marketplaces
COS 495/EGR 495/WWS 495 – Special Topics in Computer Science – Information Technology, Law and Policy, (one time course, spring 2014) (The title for this course number changes. Please see previous years for approved titles.)
COS 496/HLS 496/ART 496 – Special Topics in Computer Science – Modeling the Past – Digital Tech, and Excavations in Polis, Cyprus (The title for this course number changes. Please see previous years for approved titles.)
COS 586/WWS 586F* – Topics in STEP: Information Technology and Public Policy
COS 598F – Advanced Topics in Computer Science – Internet Law and Policy (one time course, spring 2015)
ECO 326 – Economics of the Internet: The Digital Revolution
FRS 122 – Connection and Communication in the Digital Bazaar
GER 517/MOD 517/ART 517/COM 519 – Modernism and Modernity – Aesthetics of Surveillance
HIS 278 – Digital, Spatial, Visual, and Oral Histories
HUM 346/ENG 349 – Introduction to Digital Humanities
JRN 400 – The Media in America – What to Read and Believe in the Digital Age
JRN 452 – Digital Journalism – Writing about Digital Culture
MSE 407 – Communicating Science and Technology in the Modern World
POL 332 – Topics in American Statesmanship – Science, Technology, and the American Way
POL 341 – Experimental Methods in Politics
POL 478/COS 478* – Politics in the Age of Digital Media (spring 2016 one time course)
PSY 214 – Human Identity in the Age of Neuroscience and Information Technology
PSY 322/ORF 322 – Human Machine Interaction
SOC 204 – Social Networks
SOC 214 – Creativity, Innovation, and Society
SOC 344 – Communications, Culture, and Society
SOC 346 – Sociology of the Cubicle: Work, Technology, and Organization
SOC 357* – Sociology of Technology (can also count as a breadth societal course)
SOC 409*/COS 409 – Critical Approaches to Human Computer Interaction
SOC 596 – Computational Social Science (half credit course)
WRI 121/122 – Technology and Culture
WRI 149/150 – Fans and Consumer Culture
WWS 351/SOC 353/COS 351 – Information Technology and Public Policy (formerly WWS 451)
WWS 402e – Cyber Security: Attacks and Consequences (one time course, spring 2015)
WWS 403(1) – The Social and Economic Effects of Current Technological Change (This title only for 403. Please notify Laura Cumminings-Abdo, the program manager, to have this course added manually as a RSC to your records.)
WWS 357 – Cybersecurity Law, Technology and Policy
WWS 528D* – Topics in Domestic Policy Analysis – Public Management in the Age of Digital Technology, (may be one time course spring 2016)

Societal Courses for Energy track:

ANT 314 /ENE 314/AFS 314 The Anthropology of Development
AMS 364/ENV 365 Environmental and Social Crisis
CHV 321/ENV 321/WWS 371 Ethical and Scientific Issues in Environmental Policy
CHV 472/POL 472 Ethical Dilemmas in a Global Society
COS 448/EGR 448 Innovating Across Technology, Business, and Marketplaces
ENV 305 Topics in Environmental Studies
ENV 306 Topics in Environmental Studies
HIS 295 Making America: Technology and History in the United States
HIS 431/ENV 433 Comparative Environmental History
HIS 507 Environmental History
MSE 407 Communicating Science and Technology in the Modern World
SOC 357 Sociology of Technology
URB 201/WWS 201/SOC 203/ARC 207 Introduction to Urban Studies
WWS 306/ECO 329/ENV 319 Environmental Economics
WWS 350 The Environment: Science and Policy
WWS 353/MAE 353 Science & Global Security
WWS 373/CHV 373 Welfare, Economics, & Climate Change and Mitigation Policy
Breadth Course. In addition to the technology and society courses, each student is required to take one course that combines technology and society in an area outside their chosen track. For engineering/science students this should be based in the societal disciplines, and for humanities and social science students this should be based in the science/technology disciplines. Students must select either the Information Technology track or the Energy track and take the technology or societal breadth course from the respective list of courses.

Representative Technology Courses for Information Technology track:

- APC 199/MAT 199 – Math Alive
- ARC 374 – Computational Design
- CBE 260/EGR 260 – Ethics and Technology: Engineering in the Real World
- CEE 102B/EGR 102B/MAE 102B – Engineering in the Modern World
- CHM 440 – Drug Discovery in the Genomics Era
- ENE 202/ARC 208/EGR 208/ENV 206 – Designing Sustainable Systems – Applying the Science of Sustainability to Address Global Change
- ENE 308/MAE 308 – Engineering the Climate: Technical & Policy Challenges
- ENE 414 – Renewable Energy Systems
- ENV 360* – Biotech Plants and Animals: Frankenfood or Important Innovations?
- ENV 407 – Africa's Food and Conservation Challenge
- MAE 228/EGR 228/CBE 228/ENE 228 – Energy Technologies for the 21st Century
- MAE 244*/EGR 244 – Introduction to Biomedical Innovation and Global Health
- MAE 328/EGR 328/ENV 328/ENE 328 – Energy for a Greenhouse-Constrained World
- MAE 354 – Unmaking the Bomb: The Science & Technology of Nuclear Nonproliferation, Disarmament, and Verification
- MAE 445/EGR 445 – Entrepreneurial Engineering
- MOL 205 – Genes, Health, and Society
- NEU 537/MOL 537/PSY 517 – Computational Neuroscience and Computing Networks WWS
- 353/MAE 353 – Science and Global Security: From Nuclear Weapons to Cyber warfare

Representative Technology Courses for Energy track:

- APC 199/MAT 199 Math Alive
- ARC 203 Introduction to Architectural Thinking
- CBE 260/EGR 260 Ethics and Technology: Engineering in the Real World
- CEE 102A,B/EGR 102A,B/MAE 102A,B Engineering in the Modern World
- CEE 262B/ARC 262B/EGR 262B/URB 262B Structures and the Urban Environment
- COS 109/EGR 109 Computers in Our World
- COS 126/EGR 126 General Computer Science: An Interdisciplinary Approach
- EEB 211/MOL 211 Life on Earth: Chaos and Clockwork of Biological Design PHY 115A/STC 115A or PHY 115B/STC 115B Physics for Future Leaders
Representative Societal Courses for Information Technology track:

AMS 399/HIS 399 – In the Groove: Technology and Music in American History, From Edison to the iPod
ANT 344 – Science, Technology & Culture
ANT 356 – Technologies of Communication
CBE 260/EGR 260 – Ethics and Technology: Engineering in the Real World (changed to a BSC beginning fall 2016)
CEE 102A/EGR 102A/MAE 102A – Engineering in the Modern World
CHV 331/WWS 372 – Ethics and Public Health
ECO 332 – Economics of Health and Health Care
EGR 390/CEE 390 – Innovation in Practice: Pathways and People
EGR 392 – Creativity, Innovation, and Design
EGR 482 – Innovation through Empathic Design
EGR 488 – Designing Ventures to Change the World
EGR 491/ELE 491 – High-Tech Entrepreneurship
EGR 492* – Radical Innovation in Global Markets
EGR 494 – Leadership Development for Business
EGR 495 – Special Topics in Entrepreneurship (The title for this course number changes. Please see previous semesters for approved titles.)
EGR 497 – Entrepreneurial Leadership
EGR 498/GHP 498 – Special Topics in Social Entrepreneurship – Ventures to Address Global Challenges (Fall 2015)
ENV 304/ECO 328/EEB 304/WWS 455 – Disease Ecology, Economics, and Policy
ENV 316 – Climate Science and Communication
GER 211 - Introduction to Media Theory
GHP 350/WWS 380/ANT 380 – Critical Perspectives in Global Health
GHP 404 – Science, Society, and Health Policy
HIS 292 – Science in the Modern World
HIS 295 – Making America: Technology and History in the United States
HIS 391 – History of Contemporary Science
HIS 398 – Technologies and Their Societies: Historical Perspectives
ITA 320/COM 378 – Cybernetics, Literary Ghosts and the Italian Way
NES 266*/ENV 266 – Oil, Energy and The Middle East
POL 341 – Experimental Methods in Politics
SOC 346* – Sociology of the Cubicle: Work, Technology, and Organization
SOC 356* – Sociology of Science (one time course, spring 2013)
SOC 357* – Sociology of Technology (can also be counted as a required societal course)
STC 349 – Science Journalism/Writing About Science (changed to be a BSC, April 2016)
WWS 354 – Modern Genetics and Public Policy

Representative Societal Courses for Energy track:

ANT 344 Science, Technology and Culture
EGR 200 Creativity, Innovation, and Design
EGR 201 Fundamentals of Entrepreneurship
EGR 491/ELE 491 High-Tech Entrepreneurship
EGR 492 Radical Innovation in Global Markets
EGR 494 Leadership Development for Business
EGR 495 Special Topics in Entrepreneurship
ENV 201A,B/STC 201A,B Fundamentals of Environmental Studies: Population, Land Use, Biodiversity, and Energy
FRE 338/COM 332/ENV 338 The Literature of Environmental Disaster
HIS 398 Technologies and Their Societies: Historical Perspectives
NES 201/HIS 223 Introduction to the Middle East
POL 351/WWS 311 The Politics of Development
WWS 333/SOC 326 Law, Institutions and Public Policy
WWS 334/JRN 334 Media and Public Policy
WWS 340/PSY 321 The Psychology of Decision Making and Judgment

Annual Symposium. Students are required to present their projects/theses to the program students and faculty at an annual symposium. This provides a mechanism for shared learning as well as for developing the common themes across the program.

Independent Work

All students are required to undertake a one-term independent research project in IT or Energy and society. For A.B. students, this includes a junior paper. This may be substituted by a significant component in their senior thesis (at least a chapter). It is expected that some of these projects/theses will be jointly supervised by faculty members across the University divisions. The project/thesis component requires preapproval of the student's program adviser.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in technology and society upon graduation.
Program in Theater

Director
Jane Cox

Executive Committee
Michael W. Cadden, Lewis Center for the Arts
Jeffrey K. Eugenides, Lewis Center for the Arts, Creative Writing
Su Friedrich, Lewis Center for the Arts, Visual Arts
Judith Hamera, Lewis Center for the Arts, Dance
Brian E. Herrera, Lewis Center for the Arts
Jhumpa Lahiri, Lewis Center for the Arts, Creative Writing
Deana Lawson, Lewis Center for the Arts, Visual Arts
Susan Marshall, Lewis Center for the Arts, Dance
Paul B. Muldoon, Lewis Center for the Arts, Creative Writing
Kirstin Valdez Quade, Lewis Center for the Arts, Creative Writing
James Richardson, Lewis Center for the Arts, Creative Writing
Joseph S. Scanlan, Lewis Center for the Arts, Visual Arts
Tracy K. Smith, Lewis Center for the Arts, Creative Writing
Susan Wheeler, Lewis Center for the Arts, Creative Writing

Professor
Jeffrey Whetstone, Lewis Center for the Arts, Visual Arts
Edmund V. White, Lewis Center for the Arts, Creative Writing
Stacy E. Wolf, Lewis Center for the Arts

Assistant Professor
Brian E. Herrera, also Lewis Center for the Arts

Senior Lecturer
Michael W. Cadden, also Lewis Center for the Arts
Jane Cox, also Lewis Center for the Arts

Lecturer
Suzanne Agins
Elena Araoz
Robert N. Sandberg

Visiting Lecturer with Rank of Professor
John M. Doyle

Visiting Lecturer
Fintan O'Toole

The Program in Theater, part of the Lewis Center for the Arts, allows students to work with professional artists and critics, as well as with scholars in the area of performance studies, to familiarize themselves with the nature of practical work in theater and the role theater has played and continues to play in various cultures at various times. The program offers courses in playwriting, acting, directing, design, dramaturgy, performance history, and criticism. The program also offers a full season of theatrical productions, under the supervision of professional artists and technicians, in order to allow students to bring the kinds of talents they develop in class to a wider audience. Visiting guest artists often offer workshops in their specialties, as well as directing students in productions or designing program shows.
Program courses are open to all undergraduates interested in exploring the art of theater, but the program also offers the kinds of courses and co-curricular activities that will allow the student, upon graduation, to move into the best graduate conservatories to pursue advanced training.

Students looking for an opportunity to incorporate their theatrical studies into their concentrations might want to consider the Theater and Performance Studies track in the Department of English or Area D in the Department of Comparative Literature, but certificate students usually come from the full range of concentrations the University has to offer.

**Admission to the Program**

Students wishing to receive a certificate register online, typically during the sophomore or beginning of the junior year.

**Program of Study**

Requirements for the Certificate in Theater:

1) Coursework:

A total of five courses in the Program in Theater. At least three must be studio courses chosen from offerings in acting, directing, playwriting, design, and dramaturgy. It is assumed that in one of these three or four courses, the student will have significant experience in performance.

At least one course in dramatic literature, performance history, performance studies, or criticism. Up to two courses in this area may be used toward the five-course requirement.

2) Senior Independent work:

This work might take the form of a studio project, such as the direction of a major production, the performance of a major role, the writing of a play, or the design or dramaturgy of a production, under the supervision of our faculty and professional staff either in our senior thesis season, independently, or in conjunction with another campus-producing organization.

Students may elect to do an independent performance studies project approved by and under the supervision of Program in Theater faculty.

If the student's department permits, he or she might choose to complete one part of the departmental independent work (senior thesis) on a topic approved by the Program in Theater faculty dealing with some facet of theater in relation to that department's subject matter. This independent work could take the form of a textual, cultural, or theoretical study; or it may be a combination of research and practical work supervised by the program faculty and the student's department.
3) A certain number of hours of technical work on theater productions staged by the program. These hours should be completed by the end of junior year.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in theater upon graduation.

**Advanced Creative Work.** The Program in Theater offers certificate students with the appropriate course background the opportunity to do advanced creative work under the supervision of its faculty and staff. This work usually takes the form of a practical project, such as the writing of a play, the direction or design of a major production, or the study and performance of a major role. These projects may be pursued as extracurricular activities, or, as is more regularly the case, they may be used to fulfill the requirement for independent work in the certificate program. With permission of the student's department of concentration, such projects may also satisfy one of the requirements for independent work in the department, in which case it must consist of or be accompanied by written work, such as a scholarly or critical evaluation.

Students wishing to do their senior creative independent work through the Program in Theater must submit a proposal in the spring of junior year. Students must have completed at least half of the technical work requirement to be eligible to submit a proposal.

**Productions.** The season of theatrical productions is comprised of senior thesis shows and one piece selected by the program and a guest director. The mission of the season is to support our students' exploration and development as theater artists. We expect our students to take intellectual and creative risks, and we respect the right of the student and the artist to experiment and risk failing. We believe that an atmosphere of generosity and inclusion best supports creative growth.

Students do not have to be earning a certificate to participate in productions.

**Course Information.** Courses are open to students pursuing work in any department, whether or not the student plans to earn the certificate. Introductory courses in the program, whether at the 200 or 300 level, usually have no prerequisites and fulfill the distribution requirement in Literature and the Arts (LA). Other 300 or 400 level courses require applications and/or interviews. 200 level courses have Pass/D/Fail option; selected 300 and 400 level courses are Pass/D/Fail only; all other courses in the program are letter graded.

**Related Courses.** Various departments offer courses in dramatic literature, many in English and some in foreign languages. A list of such courses may be found on the program website. Additional topics are taught in seminars whose titles change yearly. For current descriptions, see listings under the appropriate departments.

**Courses**

**THR 201 Beginning Studies in Acting: Scene Study**

Fall/Spring LA

Designed to guide students in developing roles and exploring texts and characters. Work will begin with exercises and proceed to consideration of scenes, short sections of plays, and specific roles. *S. Agins*
THR 205 Introductory Playwriting Fall LA
A workshop on the fundamentals of writing plays. Emphasis will be on solving problems of structure, plot development, and character through various writing exercises and theater improvisations. Ongoing work of students and instructor is read and discussed. Staff

THR 211 French Theater Workshop (See FRE 211)

THR 237 Comedy (See COM 237)

THR 252 Introduction to Performance Art and New Music Theater (See MUS 252)

THR 300 Acting, Being, Doing, and Making: Introduction to Performance Studies (also COM 359 / ENG 373 / ANT 359 ) Not offered this year LA
The place of performance--for example, Greek tragedy, Noh drama, modern dance, opera, performance art, crossdressing--within the social, political, cultural, and religious structures it has served. Perspectives from theater and dance history, classical and contemporary theory, and ancient and modern practice. Prerequisite: fulfillment of writing requirement. Two 90-minute seminars. J. Dolan, S. Wolf

THR 301 Intermediate Studies in Acting: Scene Study II Fall LA
A continuation and extension of 201. Prerequisite: 201. M. Nelson

THR 303 Ethnographic Playwriting (also AMS 330 / SOC 350 ) Fall LA
This course delves into a collaborative, ethnographic approach to making theater. We will read, watch and discuss the work of subculture theorists, theater-makers and other artists and thinkers, all of whom use staged conversations as the basis for characters, scenes and entire works. We will hash out ethics and responsibilities for those of us who engage communities outside our own. What does it mean to take responsibility for someone else's words, write them down, and give them back? What is it like to put the words of a stranger in your mouth? Finally, we will make theatrical material using this approach for an end of semester showing. Staff

THR 304 Christopher Durang: My Life in Art Fall LA
This course will focus on the lifetime achievement of one of the nation's greatest playwrights, Christopher Durang, who will be participating in the class as the inaugural Roger S. Berlind '52 Playwright-in-Residence. We'll focus on Durang's writing and rehearsal process, the writers who have meant most to him, the joys and pains of theatrical collaboration, and the perils of writing comedy with a satiric edge. M. Cadden, C. Durang

THR 305 Playwriting II: Intermediate Playwriting Spring LA
A continuation of work begun in Introductory Playwriting, focusing on the writing of a major play. Prerequisite: 205. Staff

THR 311 Intermediate Studies in Acting: Creating Character and Text Not offered this year LA Creation of an original theater piece in collaboration with a guest artist, leading to a public performance. Will include improvisations, exercises, study of dramatic texts, and scene study. Special attention will be given to the creation of character, both in dramatic texts and in improvisation. Prerequisite: 201. Staff
THR 314 Creating Collaborative Theater (also VIS 314) Spring LA
How are directors and actors the co-authors of a live performance, and how can anyone contribute text to a work that seeks its own unified vision? How can design play as integral a role as text? This class is open to people who are seasoned performers, writers, directors, composers, filmmakers and designers, as well as those who appreciate a good risk and are willing to take one now. Over the semester, we will work together to make something new, look at examples from theater and other disciplines of real collaborations and partnerships, and present in-progress what we have at the end of the semester. A. Landsman

THR 315 Shakespeare and Performance (See ENG 315)

THR 317 Costume Design (also VIS 372) Fall LA
An exploration of the various aspects of costume design. Emphasis will depend to some degree on instructor's area of interest and/or student interest. Studio projects will be designed to coincide with other theater and dance courses and currently scheduled productions. Critical discussion will explore the relationship between dramatic texts and design ideas. Two three-hour seminars or studio sessions. A. Yavich

THR 318 Lighting Design (also VIS 318) Spring LA
An introduction to the art and craft of lighting design for the stage and an exploration of light as a medium for expression. Students will develop an ability to observe lighting in the world and on the stage; to learn to make lighting choices based on text, space, research, and their own responses; to practice being creative, responsive and communicative under pressure and in company; to prepare well to create under pressure using the designer's visual toolbox; and to play well with others-working creatively and communicating with directors, writers, performers, fellow designers, the crew and others. J. Cox

THR 323 The Arts of Urban Transition (See DAN 310)

THR 326 Criticism Workshop (also ENG 314) Not offered this year LA
A workshop devoted to the development of the student's critical sensibility. Through extensive in-class analysis of their own reviews of professional theater and dance productions and through the study of past and present models, students will learn what makes a good critic of the performing arts. One three-hour seminar. Staff

THR 330 Special Topics in Performance Practice (also ENG 336 / MTD 330 / MUS 328) Fall LA A special topics course designed to build upon and/or enhance existing program courses, taking into consideration the strengths and interests of program concentrators and the availability of appropriate instructors. Topics, prerequisites, and formats will vary from year to year. Staff

THR 331 Special Topics in Performance History and Theory (also COM 311) Spring LA Designed to provide students with an opportunity to study theater and/or dance from a historical or theoretical perspective. Topics, prerequisites, and formats will vary from year to year. Staff

THR 338 Verse in Shows: Poetry on Stage, 405 B.C.E.-2015 A.D. (See ENG 384)

THR 341 Acting and Directing in Musical Theater Spring LA
A practical, hands-on introduction to acting and directing in musical theater. The course will require students to prepare songs and scenes from selected musicals with an eye to how best to approach the particular challenges the scene presents. J. Rando
THR 343 Some Contemporary Shakespearean Afterlives (also ENG 304 / HUM 343) Fall LA
2016 marks the 400th anniversary of Shakespeare's death. In conjunction with an exhibition at the University Art Museum, this course will largely focus on Shakespeare's "afterlives" since WWII. Although his reputation rests on his work, Shakespeare was invented in the 18th century as something beyond a "mere" playwright. We'll take a brief look at the start of this phenomenon with the 1623 Folio and David Garrick's Stratford Jubilee in 1769, then study some recent manifestations in theater, film, fiction, dance, television, comic books, actor autobiographies, and Shakespearean institutions and festivals from many nations and cultures. M. Cadden

THR 355 20th Century Non-Conformist Russian Theatre (See SLA 242)

THR 356 The Human Comedy of Anton Chekhov Off and On Stage (In English Translation) (See SLA 357)

THR 358 Queer Boyhoods (See GSS 316)

THR 368 Jewish Identity and Performance in the US (See ENG 410)

THR 373 Gender, Sexuality, and Contemporary U.S. Theatre and Performance (See GSS 363)

THR 374 Sex on Stage (See GSS 315)

THR 376 Curious Aesthetics: Twentieth-Century American Musical Theatre (See ENG 376)

THR 380 World Drama (See ENG 380)

THR 381 Pushkin's Eugene Onegin (Petersburg 1823-31/Moscow 1936/Princeton 2012) (See SLA 381)

THR 382 International Theatre: Plays and Politics (See ENG 382)

THR 400 Theatrical Design Studio (also VIS 400) Fall LA
This course is designed to endow students with the conceptual and practical skills to design productions in the theater program and to support them in making technical decisions, as well as in collaborating with the rest of the creative team and the technical staff. The course will combine an exploration of visual storytelling and creative collaboration with a grounding in the practical and communicative skills necessary to create the physical world of a production. This course is also appropriate for directors interested in working with design on a departmental production. J. Cox

THR 401 Advanced Studies in Acting: Scene Study and Style Not offered this year LA Questions of historical style, poetic stage language, and various methods of contemporary nonrealistic acting. Prerequisite: 301 or 311. Staff

THR 408 Women in American Theater: Doing Gender, Race, Sexuality Onstage and Off (See ENG 408)
THR 411 Directing Workshop Fall LA
Special directing assignments will be made for each student, whose work will be analyzed by the instructor and other members of the workshop. Students will be aided in their preparations by the instructor; they will also study the spectrum of responsibilities and forms of research involved in directing plays of different styles. Prerequisite: 201. Staff

THR 443 Topics in Drama (See ENG 409)

THR 451 Theater Rehearsal and Performance Spring LA
This course provides students with a rigorous and challenging experience of creating theater under nearprofessional circumstances. A professional director, design team, and stage manager, as well as two weeks of performances in the Berlind Theatre, are key components. It involves an extensive rehearsal period and a concentrated tech week, often requiring more time and focus than a typical student-produced production might. For the first time, students cast in the show, or those who take on major production roles (such as Assistant Stage Manager, Assistant Designer, or Assistant Director), will receive course credit. Staff

THR 494 Princeton Atelier (See ATL 494)

THR 498 Princeton Atelier (See ATL 498)
Program in Translation and Intercultural Communication

**Director**
David M. Bellos

**Executive Committee**
David M. Bellos, French and Italian, Comparative Literature
Denis Feeney, Classics
Rubén Gallo, Spanish and Portuguese
Michael D. Gordin, History
Thomas W. Hare, Comparative Literature
Daniel Heller-Roazen, Comparative Literature
Joshua T. Katz, Classics
Martin Kern, East Asian Studies

Alan W. Patten, Politics
Eileen A. Reeves, Comparative Literature, ex officio
Kim Lane Scheppele, Woodrow Wilson School, University Center for Human Values, Sociology
Esther H. Schor, English
Nigel Smith, English

**Associated Faculty**
Sandra L. Bermann, Comparative Literature

**Sits with Committee**
Christiane D. Fellbaum, Computer Science

Issues of translation and intercultural communication arise everywhere in the contemporary world: in literary texts, on the Internet, in television and film, in business, in science, and in questions of human rights. How does one translate the language of a poem? How does one translate a legal system or concepts such as democracy, or happiness, or scapegoat, or hero from one culture and language to another? How does the brain perform translation? What are the languages of artificial intelligence? How do we translate meanings across disciplinary as well as international borders--from genomics to dance, from philosophy to film?

The Program in Translation and Intercultural Communication, an affiliate of the Princeton Institute for International and Regional Studies, seeks to allow students to develop skills in language use and in the understanding of cultural and disciplinary difference. Translation across languages allows access to issues of intercultural differences, and the program will encourage its students to think about the complexity of communicating across cultures, nations, and linguistic borders. For this reason, all students in the program must have proficiency in a language other than English, and must also spend time living in a country where that language is spoken.

Though the program takes linguistic translation as its base, and has a strong international flavor, it also encourages students to study other forms of discourse, the languages of different scholarly disciplines, for example, and seeks to foster lively debate among the humanities, the natural and social sciences, and the arts.

**Admission to the Program**

In order to enter the program, a student should normally have completed at least two courses at the 200 level or above in a language other than English.

Students seeking admission to the program should contact the program manager.

**Program of Study**

All students enrolled in the certificate program are required to successfully complete the following program requirements. Each student's specific course of study must be approved by the program director:
1. The program's two core courses: TRA 200 Thinking Translation: Language Transfer and Cultural Communication and TRA 400 Senior Seminar in Translation and Intercultural Communication.

2. Four courses at the 200 level or above from at least two of the following three categories:

a) Upper-level courses focusing on translation into and/or from a foreign language (examples include: SPA 380, FRE 407, ARA 308, and CWR 306)

b) Courses that contribute to an understanding of some aspect of translation (may be found in disciplines such as linguistics, psychology, philosophy, anthropology, history, comparative literature, etc.)

c) Any course listed or cross-listed by the Program in Translation and Intercultural Communication (with the exception of TRA 200 and TRA 400)

Courses outside these categories that contribute to an understanding of intercultural and interlingual communication may be substituted at the discretion of the program director.


4. Senior Thesis. Students in the program will write a senior thesis that incorporates issues of translation in one or more of its several senses. In departments where this option presents a difficulty, a student may petition to have another piece of independent work meet the requirement. Such projects may be completed, for instance, during a summer stay abroad.

Study and Work Abroad

Students wishing to achieve a certificate in the program will spend a year, a semester, or six weeks of the summer in a Princeton-approved course of study or internship program in an area where the chosen non-English language of proficiency is spoken.

Certificate of Proficiency

Students who fulfill all requirements for the program will receive a certificate of proficiency in translation and intercultural communication upon graduation.

Courses

TRA 200 Thinking Translation: Language Transfer and Cultural Communication (also COM 209 / HUM 209)

Fall LA

An introduction to a wide range of issues arising in the many acts of translation that constitute the modern world. Built on a central thread of reflection about translating between languages--What is a language? What is meaning? What is meant by "equivalence"?--the course looks at issues in international relations, anthropology, artificial intelligence, cinema studies, literature, law, etc., that involve the boundaries of interlingual translation and
intercultural communication to acquire a better understanding of the problems and practices of translation in the modern world. One lecture, one preceptorial. *D. Bellos*

**TRA 208 Origins and Nature of English Vocabulary (See CLA 208)**

**TRA 210 Introduction to Spanish-English Translation (See SPA 210)**

**TRA 301 Introduction to Machine Translation (also COS 401 / LIN 304 )**  Spring

With increased globalization, the need to communicate across linguistic barriers is constantly rising. There is a range of software and services in the marketplace that provide translation from one human language to another at varying degrees of sophistication and complexity. In this course, you will learn the inner workings of machine translation technology and gain the experience of building a simple machine translation system for a few language pairs. Students are required to have programming experience or should have completed COS 126. TRA 200 is recommended and may be taken simultaneously. One lecture, *S. Bangalore*

**TRA 303 Bilingualism (See LIN 308)**

**TRA 351 Great Books from Little Languages (See COM 351)**

**TRA 357 Literature, Culture, and Politics (See FRE 357)**

**TRA 380 Translation Workshop: Spanish to English (See SPA 380)**

**TRA 400 Senior Seminar in Translation and Intercultural Communication (also COM 409)  Fall LA**

A required course for students taking the certificate in Translation and Intercultural Communication but open to all who are interested in translation in any of its aspects, that is, in movements between languages of any sort. Readings will focus on recent contributions to the emerging discipline of Translation Studies across a wide spectrum of thematic fields (science, law, anthropology, literature, etc.). The seminar will incorporate the individual experiences of the students in their contact with different disciplines and idioms and, where relevant, in developing their senior theses. Prerequisite TRA 200. One three-hour seminar. *D. Bellos*

**TRA 402 Radical Poetics, Radical Translation (See COM 402)**

**TRA 407 Prose Translation (See FRE 407)**
University Center for Human Values

**Director**
Melissa S. Lane

**Executive Committee**
Charles R. Beitz, Politics
Sandra L. Bermann, Comparative Literature
Marc Fleurbaey, also Woodrow Wilson School
Johann D. Frick, also Philosophy
Eric S. Gregory, Religion
Elizabeth Harman, also Philosophy
Melissa S. Lane, Politics
Stephen J. Macedo, also Politics
Jan-Werner Müller, Politics
Alan W. Patten, Politics
Philip N. Pettit, also Politics
Kim Lane Scheppele, also Woodrow Wilson School, Sociology
Peter A. Singer
Michael A. Smith, Philosophy
Anna B. Stilz, Politics

**Faculty**
Christopher L. Eisgruber, also Woodrow Wilson School
Marc Fleurbaey, also Woodrow Wilson School
Johann D. Frick, also Philosophy
Elizabeth Harman, also Philosophy
Stephen J. Macedo, also Politics
Philip N. Pettit, also Politics
Kim Lane Scheppele, also Woodrow Wilson School, Sociology
Peter A. Singer

**Visiting Professor**
Susan J. Brison, Laurance S. Rockefeller Visiting Professor for Distinguished Teaching

**Lecturer with Rank of Professor**
Peter P. Brooks, also Comparative Literature

**Faculty Associate**
Elizabeth M. Armstrong, Woodrow Wilson School, Sociology
Leora F. Batnitzky, Religion
João G. Biehl, Anthropology
Jonathan D. Cohen, Psychology, Princeton Neuroscience Institute
Alin I. Coman, Psychology, Woodrow Wilson School
Nathaniel D. Daw, Psychology, Princeton Neuroscience Institute
Mitchell Duneier, Sociology
Nick Feamster, Computer Science
Susan T. Fiske, Psychology, Woodrow Wilson School
Paul Frymer, Politics
Daniel Garber, Philosophy
Sheldon M. Garon, History, East Asian Studies
Sophie G. Gee, English
Robert P. George, Politics
Eddie S. Glaude Jr., Religion, African American Studies
Gilbert H. Harman, Philosophy
Hendrik A. Hartog, History
Brooke A. Holmes, Classics
Desmond D. Jagmohan, Politics
Mark Johnston, Philosophy
Thomas P. Kelly, Philosophy
Robert O. Keohane, Woodrow Wilson School
Joshua I. Kotin, English
Ilyana Kuziemko, Economics
David R. Leheny, East Asian Studies
Thomas C. Leonard, Economics
Sarah-Jane Leslie, Philosophy
Douglas S. Massey, Woodrow Wilson School, Sociology
Anne McClintock, Gender and Sexuality Studies
Sarah E. McGrath, Philosophy
Benjamin C. Morison, Philosophy
The University Center for Human Values fosters interdisciplinary study of ethical and evaluative issues in private and public life. One of its activities within the undergraduate curriculum is to cosponsor courses with departments and programs. The center encourages students to supplement their disciplinary concentrations with a set of these courses, which address fundamental questions about the meaning and value of human life and the ethical relationships of individuals and societies. The University Center for Human Values is also the home for the undergraduate certificate Program in Values and Public Life, which focuses on modes of inquiry into important ethical issues in public life.

The University Center for Human Values assists faculty members in developing new courses and revising existing courses, supplements the offerings of the freshman seminars program, and sponsors occasional lectures and colloquiums on human values to which students, along with faculty and other members of the Princeton University community, are invited. The center awards senior thesis prizes to seniors who have written outstanding theses in the area of ethics and human values. Departments are invited to nominate their best thesis in this area.

The center was created in 1990 with an endowment by Laurance S. Rockefeller ’32.

The undergraduate courses listed below, some of which are sponsored or cosponsored by the center, examine issues involving human values from a variety of disciplinary perspectives.

Freshman Seminars in the Residential Colleges. Each year the University Center for Human Values sponsors several freshman seminars in the residential colleges. For a list of the current seminars, please check the freshman seminars website.

For information about courses relevant to the study of human values, visit the center's website.

Courses

CHV 202 Introduction to Moral Philosophy (See PHI 202)
CHV 212 The Psychology of Moral Behavior (See PSY 212)
CHV 213 The Psychology of Morality and Politics (See PSY 213)
CHV 214 The Other Side of Rome (See CLA 214)
CHV 244 Greek Politics in Practice and Theory (See CLA 244)
CHV 255 From Pandora to Psychopathy: Evil from Antiquity to the Present (See CLA 255)
CHV 261 Christian Ethics and Modern Society (See REL 261)
CHV 301 Ethics and Public Policy (See WWS 370)
CHV 306 Democratic Theory (See POL 306)
CHV 307 The Just Society (See POL 307)
CHV 309 Political Philosophy (See PHI 309)

CHV 310 Practical Ethics (also PHI 385) Not offered this year EM
Should we share our wealth with people who will otherwise die from poverty-related causes? Is abortion wrong? Does a human embryo have a greater claim to protection than a chimpanzee? Are we justified in eating animals? Can the traditional doctrine of the sanctity of human life be defended? When should a nation go to war? And why should we act ethically, anyway? Students will be encouraged to question their own ethical beliefs on these and other issues, and in the process to explore the extent to which reason and argument can play a role in everyday ethical decision-making. P. Singer

CHV 311 Systematic Ethics (See PHI 307)
CHV 313 Global Justice (See POL 313)
CHV 315 Philosophy of Mind (See PHI 315)
CHV 318 Social Philosophy (See PHI 316)
CHV 319 Normative Ethics (See PHI 319)

CHV 330 Greek Law and Legal Practice (See CLA 330)

CHV 332 Ethics and Pathologies of Attachment (also PHI 347) Spring EM
This course will examine issues at the intersection of emotional attachment, ethics and agency theory. In particular, we will consider whether and how disordered attachment orientations might bear on questions concerning the moral agency and ethical treatment of members of certain clinical populations, including psychopaths and those who suffer from (certain forms of) addiction. In exploring these issues, we will engage with recent literature on moral responsibility, autonomous agency, and bioethical approaches to understanding the nature and treatment of the aforementioned pathologies. M. Wonderly

CHV 335 Greek Ethical Theory (See PHI 335)

CHV 345 Ethics and Economics (See ECO 385)

CHV 362 Stolen Years: Youth under the Nazis in World War II (See COM 362)

CHV 363 Non-Cognitivism in Ethics (See PHI 362)

CHV 364 Sociology of Medicine (See SOC 364)

CHV 374 Philosophy of Randomness and Extreme Risk (See PHI 374)

CHV 380 Explaining Values (See PHI 380)

CHV 392 Sex and Ethics (See PHI 392)

CHV 403 Architecture and Democracy (See POL 403)

CHV 405 The Sociology of Law (See SOC 405)

CHV 416 Moral Conflicts in Public and Private Life (See POL 416)

CHV 464 The Political Pact (See POL 464)

CHV 470 Comparative Constitutional Law (See WWS 421)
The Program in Urban Studies is an interdepartmental plan of study for undergraduates that offers an interdisciplinary framework for the study of cities, metropolitan regions, and urban and suburban landscapes. With courses in diverse departments including anthropology, art and archaeology, history, African American Studies, English, Latin American Studies, Spanish and Portuguese languages and cultures, civil and environmental engineering, energy studies, sociology, politics, theater and Princeton Environmental Institute along with the School of Architecture and the Woodrow Wilson School of Public and International Affairs, the program encourages students to think about metropolitan centers in all their complexity as physical spaces; social, cultural, political, and economic nexuses; and historical artifacts.

In addition, students are advised about opportunities to acquire field experience in urban settings through the Community-Based Learning Initiative (CBLI) and other programs. Those students with appropriate background and training are also encouraged to study and conceptualize cities via a comparative, international perspective, using the resources of Princeton's area studies and international programs.
Each fall, certificate students are invited to be part of the Urban Studies Student Advisory Board. This student board serves in an advisory capacity to help shape the future of the program and the future of urban studies at Princeton University.

**Admission to the Program**

The Program in Urban Studies is open to all undergraduate students, regardless of discipline. Students apply for admission by filling out the application on the Urban Studies website and arranging an interview with the director of the program. Students are accepted into the program on the basis of interest and a coherent academic plan. Students are asked to propose a tentative course of study in their application.

**Program of Study**

As soon as possible after applying for admission to the program, students should meet with the program director or with an Urban Studies faculty advisor to establish an approved course of study. Every student is encouraged to take one or both of the program's core courses, URB 200 and/or URB 201, as soon as possible, although it can be taken at any time. URB 200 is typically offered in the fall and URB 201 is offered during the spring term each year. Please refer to the Registrar's Course Offerings website for the detailed course descriptions of the fall course (offered by Professor Douglas Massey), and the spring course (offered by Professor Christine Boyer).

Along with URB 200 or URB 201, which students must pass with a grade of "B" or above, students must complete three electives: one from social sciences; one from humanities; and one from engineering or the natural sciences. Students may take either core course URB 200 or URB 201 as the course requirement. The course not taken as the course requirement may be taken as an elective toward the certificate. A list of approved electives can be found on the Urban Studies website http://urbanstudies.princeton.edu/. The electives are drawn from departments and programs across the University. Courses not on the approved list may be used as electives with the approval of the Urban Studies Director. However, each selected course must contain substantial urban content to fulfill the requirements of the certificate program.

These courses must be in addition to course work taken to fulfill the requirements of the student's department of concentration, although they may be used to fulfill distribution requirements. Students can double count one of the three electives toward their major and the certificate which is monitored in TigerHub. To be counted toward the certificate, all courses must be taken for a grade. Course overlap with another certificate program is permitted. While urban studies students' senior theses are written in their home departments, their work must contain an urban component, approved by the program director. A faculty member from the student's home department serves as the primary advisor and first reader. Students' urban studies advisors selected from the program's associated faculty list provide additional consultation and layer of expertise as they write their thesis and think about potentially urban-related careers. The thesis title and abstract must be sent to the program director for final approval. The program provides additional support for independent student research through offering methods workshops, and through a May thesis colloquium.

**Certificate of Proficiency**

Students who fulfill the requirements of the program receive a certificate of proficiency in urban studies upon graduation.
Courses

**URB 200 Urbanism and Urban Policy (also WWS 210 / SOC 200 ) SA**
Introduces students to social scientific thinking on cities and urbanism and then builds on this base to consider and evaluate various approaches to urban policy. *D. Massey*

**URB 201 Introduction to Urban Studies (also WWS 201 / SOC 203 / ARC 207 ) Spring SA**
This course will examine different crises confronting cities in the 21st century. Topics will range from immigration, to terrorism, shrinking population, traffic congestion, pollution, energy crisis, housing needs, water wars, race riots, extreme weather conditions, war and urban operations. The range of cities will include Los Angles, New Orleans, Paris, Logos, Caracas, Havana, New York, Hong Kong, and Baghdad among others. *M. Boyer*

**URB 202 Documentary Film and the City (also HIS 202 / HUM 202 / VIS 200 ) LA**
This seminar uses film to explore the social and political issues facing the post-industrial American city and examines how films employ different documentary methodologies. Students will apply these techniques hands-on, collaborating on short explorations of housing issues in Trenton. They will learn how to establish a relationship with a subject, gather observational footage, conduct interviews, and weave narrative in a visual medium. The goal of the course is to give students not only a greater understanding of urban history and the challenges cities face today but also a foundation in the practical and theoretical issues of documentary. *P. Carson*

**URB 210 Urban Sociology: The City and Social Change in the Americas (See SOC 210)**

**URB 227 Race and Ethnicity (See SOC 227)**

**URB 237 Contemporary Issues in Spain (See SPA 227)**

**URB 262A Structures and the Urban Environment (See CEE 262A)**

**URB 262B Structures and the Urban Environment (See CEE 262B)**

**URB 300 Urban Studies Research Seminar (also HUM 300 / ARC 300 / WWS 392 ) EC**
This interdisciplinary seminar introduces research methods in urban studies. We will focus on some of the ways in which researchers make sense of cities, including various aspects of urban experience, culture, history, theory, form, and policy. Students will use the analytical frameworks covered in the course to develop their own research projects with the goal of developing more dynamic junior papers and senior theses. *B. Carvalho, A. Shkuda*

**URB 306 Urban Modernism and Its Discontents (See POR 306)**

**URB 310 The Arts of Urban Transition (See DAN 310)**

**URB 327 Latino Global Cities (See SPA 327)**
URB 385 Mapping Gentrification (also SOC 385 / HUM 385 / ARC 385) SA
This seminar introduces the study of gentrification, with a focus on mapping projects using GIS (Geographic Information Systems) software. Readings, films, and site visits will situate the topic, as the course examines how racial landscapes of gentrification, culture and politics have been influenced by and helped drive urban change. Tutorials in ArcGIS will allow students to convert observations of urban life into fresh data and work with existing datasets. Learn to read maps critically, undertake multifaceted spatial analysis, and master new cartographic practices associated with emerging scholarship in the Digital and Urban Humanities. A. Shkuda

URB 388 Cities and Suburbs in American History (See HIS 388)

URB 403 Architecture and Democracy (See POL 403)

URB 406 Writing and Urban Life (See POR 406)

URB 418 Imagined Cities (See HIS 418)

URB 448 Las Ciudades del Boom: Economic Growth, Urban Life and Architecture in the Latin American City (See ARC 448)

URB 449 Making Sense of the City (See ARC 449)

URB 451 Writing about Cities (See HIS 451)
URB 456 History of New Orleans: Invention & Reinvention in an American City (See HIS 456)

URB 471 Introduction to Water Pollution Technology (See CEE 471)

URB 492 Topics in the Formal Analysis of the Urban Structure (See ARC 492)
The Program in Values and Public Life, an undergraduate interdisciplinary certificate program offered by the University Center for Human Values, focuses on modes of inquiry into important ethical issues in public life. The program helps students develop competence in pursuing such inquiries generally and supports them in applying these intellectual skills to the advanced analysis of one or more related topics. Students attaining the certificate will be equipped to bring informed discussion of values into the public sphere and to integrate a critical value perspective into their future studies and pursuits. The program is open to undergraduates of all disciplines.

Admission to the Program

Admission to the program requires an enrollment essay outlining the student's rationale for completing the certificate, area of interest, and plan for fulfilling the certificate requirements. Students interested in applying to the program are advised to begin to consider their interests and a tentative course of study as early as possible, which they are encouraged to do in consultation with the program director.

Students will be considered for admission upon meeting the following prerequisites: submission of the enrollment essay; submission of the name of an academic referee; and a minimum GPA of 3.0 overall. We strongly recommend completing at least one of the core courses (PHI 202, WWS 370, POL 306, POL 307, or POL 313) by the end of the sophomore year.

Students are normally accepted in the second semester of their sophomore year to enter the program as juniors, and must apply by a deadline announced each spring. In exceptional cases, juniors may be accepted into the program at the Director's discretion. For more information on the Program in Values and Public Life's application process and current deadlines, please visit the program's website.

Program of Study

To qualify for a program certificate, students are required to complete three core courses, two thematic courses, and independent work as described below. No course counted toward the certificate may be taken P/D/F.
Core Courses (3 courses):
Students must take one course out of each of the following three categories: (1) PHI 202 / CHV 202: Introduction to Moral Philosophy; (2) one of the following courses: WWS 370 / CHV 301 / POL 308: Ethics and Public Policy, POL 307 / CHV 307: The Just Society, POL 306 / CHV 306 / PHI 360: Democratic Theory, or POL 313 / CHV 313: Global Justice; (3) a Junior/Senior Seminar in Values and Public Life (topics change from year to year) or, if necessary, another seminar on normative issues approved by the program director.

Thematic Courses (2 courses):
Students must identify an area of focus and take two courses with an explicit values component related to it, chosen by the student in consultation with the program director. Some illustrative focus areas (or "themes") are:

- Bioethics
- Cognitive psychology, ethics, and public policy
- Democracy in theory and practice
- Global justice and human rights
- Constitutionalism and the rule of law
- History of thought about political justice, human rights, or some other core concept in public morality
- Public dilemmas in literature
- Ethics, religion, and theology

Independent Work

Students will write a senior thesis (or, in exceptional circumstances, another substantial piece of independent work) on a normative topic approved by both the director of the program and the normal procedures of the student's department of concentration. The thesis will be written in and according to the department regulations of the student's concentration. Students will be expected to participate in a noncredit bearing senior thesis colloquium convened by the program.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in values and public life studies upon graduation.
The Program in Visual Arts, part of the Lewis Center for the Arts, allows undergraduates to explore visual art and media and develop their creative skills in connection with a liberal arts education. Courses are offered in painting, drawing, graphic design, media, sculpture, photography, filmmaking, and film history and criticism. Studio courses emphasize direct, hands-on art making under the guidance of practicing visual arts professionals.

Most courses in the program are open to all students at Princeton. A few courses are by application only, and a few are reserved for certificate and Program 2 students only. Most courses are letter graded (not pass/D/fail) and may be taken in fulfillment of the distribution requirement in LA (Literature and Arts). Summer courses and study abroad are accepted for Program 2 students, certificate students, and students who have previously completed at least one VIS course. AP credit is not accepted.

For students interested in pursuing a thesis in studio arts, there are two options. The first is Program 2, the concentration offered by the Department of Art and Archaeology and administered by the Program in Visual Arts that focuses on the studio arts. The second option is a visual arts Certificate earned in addition to a student's departmental...
concentration. Students wishing either to study film history and theory may pursue this track within the visual arts certificate program in collaboration with departments that accept a written thesis in film.

**Admission to the Program**

Admission to both Program 2 in art and archaeology and the visual arts certificate program is selective. During the first week following spring break, sophomores submit an application and a portfolio of creative work (or an essay on cinema in the case of those applying for the track in film history and theory) to the Lewis Center for the Arts administrative office. By early April, the admissions committee will notify those students accepted into the program. For specific prerequisites, please see the individual areas below.

**Program of Study**

Program 2: Visual Arts

Program 2 is an intensive studio concentration in the visual arts that culminates in a creative senior thesis. For program requirements, see the Program 2 description under the Department of Art and Archaeology.

**The Visual Arts Certificate**

Overview. A certificate in visual arts will be awarded to students who successfully complete a substantial program of studio work and other requirements, as summarized below, while concentrating in another academic department. Students interested in a certificate in visual arts should submit a portfolio in the spring term of the sophomore year. Students must have completed at least one visual arts studio course before being admitted to the program. One course in Art and Archaeology is also highly recommended.

Course Requirements. A total of seven courses combined from the Program in Visual Arts and the Department of Art and Archaeology, as follows:

a) Three visual arts studio courses, in at least two different media, and at least one 300- or 400-level course.

b) VIS 392 Issues in Contemporary Art. This course is required for all Program 2 and certificate students. The course coincides with admission to the junior studios and concentrates on the history, challenges, and rewards of studio practice. Through readings, discussions, studio critiques, and a culminating exhibition of artist's books, VIS 392 provides the context and the work ethic for each student's independent creative development, as well as beginning to be able to articulate the historical precedents and ambitions of their work.

c) VIS 416 Exhibition Issues and Methods. This course provides a formal structure in which Program 2 and certificate students will study, present, and discuss various ideas, for exhibiting art and the issues those strategies raise.

d) One art and archaeology course in the modern period (19th century to the present).

e) One course that is either a VIS studio course or an ART course covering any period of study.
Junior Independent Work. In the fall, students will be assigned one adviser and will have at least three studio visits with secondary elect advisers chosen from the Program in Visual Arts faculty. Each student is also assigned a studio work space in the Room 401 loft of the Lewis Center. In lieu of writing a fall paper, students will conceive and produce a 32-page artist's book for their fall independent work. The independent work is done in consultation with each student's advisers, their peers, and the director of the program. The advisers' spring term grade for the junior independent work represents an evaluation of the entire year's studio work. The junior independent work is exhibited in a group show at the end of the junior spring term.

Senior Independent Work--The Creative Thesis. In the fall, students enroll in VIS 416 Exhibition Issues and Methods, are assigned a primary adviser, and select a secondary adviser from the Program in Visual Arts faculty. Students are assigned shared, semiprivate studios on the second floor of the Lewis Center. The creative thesis work is done in consultation with each student's advisers, their peers, and the director of the program. Students present their work in an exhibition during the spring term, usually a two-person show with another certificate student or Program 2 student. The grade for the senior independent work represents an evaluation of the entire year's studio work and is the average of two grades: (1) the average of the grades given by the student's advisers and (2) the average of the grades given by the rest of the visual arts faculty who view the senior exhibition.

Track in Film and Video

Students interested in film criticism and analysis may pursue the film history and theory track within the visual arts certificate program while concentrating in another academic department. Requirements for this track are summarized below. To enter this track, students must have the approval of their department of concentration to submit a written critical/historical thesis on a film-related topic. Normally, students in this track must have completed a film production course and a course in film history or theory before being admitted to the program.

The five visual arts courses that students take in the film and video track must include:

a) One course in film/video production (VIS 261, 262, 263, 264)

b) Two courses in film history (any course listed by the Committee for Film Studies) and one visual arts seminar in film theory or history

c) At least two other courses (either in film production or academic courses in film history)

Please note: Three cognates are accepted within the above group. Junior projects and senior theses may be submitted as historical or theoretical essays based either on one of the media or on both media. Where these projects can fulfill the requirements of the visual arts certificate and the student's department of concentration, they will be jointly advised by faculty members from the program and the student's home department. Where the independent work is not completed in conjunction with requirements for the student's home department, the work will be supervised by two faculty members from the Program in Visual Arts.

Certificate of Proficiency

Students who fulfill the requirements of the program receive a certificate of proficiency in visual arts upon graduation.
Courses

VIS 200 Documentary Film and the City (See URB 202)

VIS 201 Drawing I (also ARC 201)  Fall LA
This course approaches drawing as a way of thinking and seeing. Students will be introduced to a range of drawing issues, as well as a variety of media, including charcoal, graphite, ink, and oil stick. Subject matter includes still life, the figure, landscape, and architecture. Representation, abstraction, and working from imagination will be explored. A structured independent project will be completed at the end of the term. Two studio classes, five hours total per week. E. Aschheim

VIS 202 Drawing I (also ARC 202)  Spring LA
This course approaches drawing as a way of thinking and seeing. Students will be introduced to a range of drawing issues, as well as a variety of media, including charcoal, graphite, ink, and oil stick. Subject matter includes still life, the figure, landscape, and architecture. Representation, abstraction, and working from imagination will be explored. A structured independent project will be completed at the end of the term. Two studio classes, five hours total per week. N. Carter, K. Kauper

VIS 203 Painting I (also ARC 327)  Fall LA
An introduction to the materials and methods of painting. The areas to be covered are color and its interaction, the use of form and scale, painting from a model, painting objects with a concern for their mass, and interaction with light. Two three-hour studio classes. K. Kauper

VIS 204 Painting I (also ARC 328)  Spring LA
An introduction to the materials and methods of painting. The areas to be covered are color and its interaction, the use of form and scale, painting from a model, painting objects with a concern for their mass, and interaction with light. Two studio classes, five hours total per week. E. Aschheim

VIS 211 Analog Photography  Fall LA
An introduction to the processes of photography through a series of problems directed toward the handling of light-sensitive material, camera, and printing. Weekly laboratory sessions will explore the critical issues of the medium in relation to both student work and the work of guest photographers. One three-hour class and two hours of independent laboratory. Prerequisite: instructor's permission. D. Oliver

VIS 212 Analog Photography  Spring LA
An introduction to the processes of photography through a series of problems directed toward the handling of light-sensitive material, camera, and printing. Weekly laboratory sessions will explore the critical issues of the medium in relation to both student work and the work of guest photographers. One three-hour class and three hours of independent laboratory. Prerequisite: instructor's permission. D. Oliver, D. Lawson

VIS 213 Digital Photography  Fall/Spring LA
An advanced seminar and lab that explores the aesthetic and theoretical implications of digital technology in relation to photography. The emphasis is on making the photographic print in the digital work space. Class will consist of
both independent and collaborative projects. One two-hour class, one three-hour laboratory. Prerequisites: 211 or 212, or instructor's permission. M. Abeles, D. Lawson

VIS 214 Graphic Design (also ARC 214 / CWR 214)  
Spring LA
This studio course will introduce students to the essential aspects and skills of graphic design, and will analyze and discuss the increasingly vital role that non-verbal, graphic information plays in all areas of professional life, from fine art and book design to social networking and the Internet. Students in the course will explore visual organization through a series of focused, interrelated assignments dealing with composition, page layout, type design, and image. Hands on production will include an array of do-it-yourself printing and distribution technologies, from letterpress and mimeograph to photocopying and websites. A. Chung

VIS 215 Graphic Design: Typography (also CWR 215)  
Spring LA
This studio course introduces students to graphic design with a particular emphasis on typography. Students learn typographic history through lectures that highlight major shifts in print technologies and through their engagement in studio design projects. Class readings provide the raw material for hot metal typesetting in the letterpress print shop, photo-typesetting in the mechanical paste-up studio, and state of the art typesetting and design software in the digital computer lab. Overall, the workshop synthesizes hands-on graphic design skills with aesthetic awareness and a critical vocabulary. D. Reinfurt

VIS 216 Graphic Design: Visual Form  
Fall/Spring LA
This course introduces students to techniques for decoding and creating graphic messages in a variety of media, and delves into issues related to visual literacy through the hands-on making and analysis of graphic form. Graphic design relies on mastering the subtle manipulation of abstract shapes and developing sensitivity to the relationships between them. Students are exposed to graphics from the late 19th-century to the present in slide lectures. Studio assignments and group critique will foster an individual ability to realize sophisticated forms and motivate these towards carrying specific meanings. D. Reinfurt

VIS 217 Graphic Design: Circulation  
Spring LA
The practice of graphic design relies on the existence of networks for distributing multiple copies of identical things. Students in this course will consider the ways in which a graphic design object's characteristics are affected by its ability to be copied and shared, and by the environment in which it is intended to circulate. Through hands-on design projects, readings, and discussions, students will delve into different material forms of distribution - the public newspaper, the community newsletter, the course packet, the PDF - and investigate the particular attributes of each. D. Reinfurt

VIS 219 Art for Everyone  
Fall/Spring LA
This studio class will address the increasing social pressure on art to become more widely distributed, immediately accessible, and democratically produced. For the past fifty years, expanding definitions of what art might be fueled by a greater emphasis on active audience participation have encouraged an atmosphere in which anyone can claim to be an artist. Through studio work in a wide range of graphic and digital media, supported by readings and discussions, this class will take a hands-on approach to the question of whether art by everyone for everyone constitutes a dreamed-of utopia, a universal banality, or a cultural nightmare. F. Backström

VIS 221 Introductory Sculpture  
Fall LA
A studio introduction to sculpture, particularly the study of form, space, and the influence of a wide variety of materials and processes on the visual properties of sculpture. Students will develop an understanding of
contemporary sculpture and a basic technical facility in a variety of materials and processes. Two studio classes, five hours per week. *N. Carter*

**VIS 222 Introductory Sculpture**  
Spring LA  
A studio introduction to sculpture, particularly the study of form, space, and the influence of a wide variety of materials and processes on the visual properties of sculpture. Students will develop an understanding of contemporary sculpture and a basic technical facility in a variety of materials and processes. Two studio classes, five hours per week. *M. Friedman, P. Lins*

**VIS 239 Sound and Place (See MUS 239)**

**VIS 242 Film Genres: The First Five Decades of Cinema**  
Not offered this year LA  
A historical examination of a film genre--e.g., comedy, documentary, detective film (also called film noir). The object of the course will be the understanding of the uniquely cinematic aspects of each genre, studied against the backdrop of parallel literary genres (e.g., comedy from Aristophanes to Beckett; documentary fiction and essays; 19th- and 20th-century detective fiction). One genre will be the topic of the course each year. Two 90-minute classes, one film screening. *P. Sitney*

**VIS 261 How to Make a Film**  
Fall LA  
A film/video course introducing the techniques of shooting and editing digital video. Works of film/video art are analyzed in order to explore the development of, and innovations in, cinematic language. Production is oriented toward film/video as a visual art, including narrative, documentary, and experimental genres. Several short video projects produced during the semester. Two studio classes, five hours per week. Prerequisite: instructor's permission. *K. Sanborn*

**VIS 262 How to Make a Film**  
Spring LA  
A film/video course introducing the techniques of shooting and editing digital video. Works of film/video art are analyzed in order to explore the development of, and innovations in, cinematic language. Production is oriented toward film/video as a visual art, including narrative, documentary, and experimental genres. Several short video projects produced during the semester. Two studio classes, five hours per week. Prerequisite: instructor's permission. *K. Sanborn*

**VIS 263 Documentary Filmmaking**  
Fall LA  
This course will give students an introduction to documentary film and video production, with a special emphasis on the practical challenges of producing films in the real world. Students will learn fundamental filmmaking techniques from a professor with thirteen years experience running her own film production company, as well as a handful of guest professionals in the fields of cinematography, casting, and editing. Production and critique of student work will be augmented by film screenings, readings, and discussion of the effects that practical realities can have on the creative process. *R. Velez*

**VIS 264 Narrative Filmmaking**  
Spring LA  
This studio course will be equal parts directing and screenwriting, with a special emphasis on social issue-driven material. Students will learn how to bring a script to life in collaboration with actors, production crews, and their fellow students. The course will also critically examine a selection of powerful narrative films and analyze their different approaches to visual storytelling. Specific topics covered will be: the basic tenets of film direction, writing for the screen, effective ways to work with actors, the post-production process, and how journalistic research methods can inform the early stages of the filmmaking process. *S. Friedrich*
VIS 300 Body and Object: Making Art that is both Sculpture and Dance LA
Students in VIS 300 will create sculptures that relate directly to the body and compel performance, interaction, and movement. Students in the associated DAN 300 will create dances that are informed by garments, portable objects and props. The two classes will come together periodically to compare notes and consider how context informs perceptions of sculpture as performance and the body as object. A lecture series of prominent choreographers and artists will accompany the courses. One two-hour class and one three-hour class per week; course is open enrollment. M. Friedman

VIS 303 Intermediate Painting Not offered this year LA
This course is designed to allow students to explore more deeply the process and meaning of painting. Students will complete a set of structured assignments and are encouraged to develop an independent direction. Contemporary critical theory is integrated into the course. Two studio classes, five hours per week. Prerequisite: 203, 204 and instructor's permission. E. Aschheim

VIS 304 Intermediate Painting Not offered this year LA
This course is designed to allow students to explore more deeply the process and meaning of painting. Students will complete a set of structured assignments and are encouraged to develop an independent direction. Contemporary critical theory is integrated into the course. Two studio classes, five hours per week. Prerequisite: 203, 204 and instructor's permission. E. Aschheim

VIS 309 Introductory Printmaking Spring LA
An introduction to fundamental techniques of copper plate etching, and relief printing. Assignments focus on applications of various printmaking techniques, while encouraging independent development of subject matter. Critiques will occur throughout the term. Students are encouraged to draw regularly outside of class to cultivate themes and content applicable to their prints. Field trips to the University's museum and the library's graphics collection will complement class work. Two studio classes, five hours per week. D. Heyman

VIS 312 Introduction to Color Photography Not offered this year LA
Theory, processes, and applications of color photography as an artistic medium, exploring camera technique, color film, and darkroom printing methods. Students investigate the formal issues presented by color as an element of the medium and analyze visual content in the broader project of photographic imagemaking. Prerequisite: 211 or 212 and instructor's permission. One three-hour class. J. Lee

VIS 313 Intermediate Photography Fall LA
A continuation of 211 or 212, this course focuses on photo chemistry, printmaking methods, and the view camera. The connections between traditions of art, philosophy, science, and photography will continue to be important. One three-hour class and three hours of independent laboratory. Prerequisites: 211, 212, or equivalent experience and instructor's permission. J. Welling

VIS 314 Creating Collaborative Theater (See THR 314)
VIS 315 Photographic Portraiture: The Practice of Representation  
Fall LA
This course will examine the practical and theoretical issues of photographic portraiture. Photography's pervasiveness has described and defined notions of identity, race, and gender. We will explore the history of the photographic portraiture as well as work of contemporary artists working in a post-modern age where representation and identity are deconstructed. Students will learn technical skills such as large format camera use, studio lighting, and printing. Assignments will explore conceptual strategies, and students will exhibit their work for periodic critique. J. Whetstone

VIS 317 From Script to Screen (also CWR 317)  
Fall LA
This course will focus on the three major phases of cinematic storytelling: story development, principal photography, and post-production. Through class exercises, workshops, guest speakers, and critical evaluations of ongoing projects, students will learn the importance of the script, visual design, subtext, the staging of action, and the value of collaboration, with the goal of developing a more nuanced approach to the nuts and bolts of the entire film production process. Enrolled students will be expected to start class with introductory proficiency in the use of digital cameras, lighting, sound, and editing equipment. Staff

VIS 318 Lighting Design (See THR 318)

VIS 322 Art As Research  
Fall LA
Over the past fifty years, many visual artists have taken up the process and methods of academic research as an impetus for works of art. Through readings, discussions, case studies, and studio projects, students in this class will engage the immediate context of the University as source material for their artworks, and as a means of exploring the effect that research and knowledge production might have on contemporary artistic practice. How does art produce knowledge? How does the knowledge it produces differ from that of other disciplines? In what ways do artists and researchers use similar source material to different ends? F. Backström

VIS 331 Ceramic Sculpture  
Fall LA
This course is designed for students who are interested in learning the fundamentals of working with clay. A wide variety of hand-building techniques will be taught, enabling students to make utilitarian vessels as well as sculptural forms. Students will learn about glazing and colored engobe application methods and how to operate electric and gas kilns. Studio work will be complemented by readings, field trips, and slide presentations. Two studio classes, five hours per week. Prerequisites: VIS 201/202, or VIS 203/204, or VIS 211/212, or VIS 215/216, or VIS 221/222, or VIS 261/VIS 262. A. Welch

VIS 332 Ceramic Sculpture  
Not offered this year LA
This course is designed for students who are interested in learning the fundamentals of working with clay. A wide variety of hand-building techniques will be taught, enabling students to make utilitarian vessels as well as sculptural forms. Students will learn about glazing and colored engobe application methods and how to operate electric and gas kilns. Studio work will be complemented by readings, field trips, and slide presentations. Two studio classes, five hours per week. Prerequisites: VIS 201/202, or VIS 203/204, or VIS 211/212, or VIS 215/216, or VIS 221/222, or VIS 261/VIS 262. A. Welch
VIS 338 World on a Wire: 12 Films, 12 Filmmakers Spring LA
In this course we will encounter the output of some of the most engaging filmmakers working today. No film shown in this course will be more than eighteen months from its world premiere, and each will be accompanied by a Q&A with its director. These up-close discussions will engender such questions as: What are the issues preoccupying filmmakers today? Where are the most fertile grounds for new work? How do original artists navigate funding and distribution? At term's end, students will complete a class with a deeper understanding of contemporary film culture, and more than a few criteria for how to make a place for themselves in it. R. Velez

VIS 339 The New Hollywood Spring LA
This course will examine the so-called "New Hollywood": the films (The Conversation, Badlands, Mean Streets, The Long Goodbye) and filmmakers (Coppola, Malick, Scorsese, Altman) who reinvigorated the Hollywood studio system in the late 1960s, only to be displaced by the blockbuster and "high concept" films that followed. Films of the period will be examined within the context of industrial and cultural history, with special attention paid to the changing dynamics within the American film industry, and to the cultural shifts that these films both responded to and expressed. M. Cramer

VIS 340 Experimental Film Fall LA
A seminar in the experimental or avant-garde film. This course will focus on the role of abstraction dreams, and self-reflexivity in the evolution of the non-commercial, modernist cinema. It will incorporate aspects of painting, poetry, sculpture that have influenced filmmakers working on the edges of the Surrealist, Cubist, Constructivist, Abstract Expressionist, and Minimalist moments in modern art. The reading will be drawn from the theoretical texts of filmmakers, such as Vertov, Leger, Einstein, Deren, Brakhage, Kubelka and Frampton. P. Sitney

VIS 341 Women and Film (See GSS 306)

VIS 342 The Cinema from World War II until the Present (also COM 361) Not offered this year LA
The history of sound and color film produced since World War II. Emphasis on Italian neorealism, French New Wave, American avant-garde, and the accomplishments of such major filmmakers as Bergman, Hitchcock, Bresson, and Antonioni. Modernism in film will be a central consideration. One three-hour class, weekly film screenings. P. Sitney

VIS 343 Major Filmmakers Fall LA
This seminar will treat in depth the work of two or three filmmakers of major importance. Specific subjects will vary. P. Sitney

VIS 344 Special Topics in Film History Not offered this year LA
This seminar will deal in some detail with an aspect of film history, focusing on an important movement or exploring a significant issue. Specific topics and prerequisites will vary. Staff

VIS 345 The Artist at Work (See ART 349)

VIS 346 Brazilian Cinema (See POR 319)
VIS 347 Topics in French Cinema (See FRE 391)

VIS 348 Introduction to Screenwriting: Writing the Short Film (See CWR 348)

VIS 349 Introduction to Screenwriting: Writing for a Global Audience (See CWR 349)

VIS 352 Russian Cinema (See SLA 240)

VIS 353 Ethical Dimensions of Contemporary Russian Cinema (See SLA 316)

VIS 361 Intermediate Video and Film Production Not offered this year LA
A second-level film/video workshop focusing on digital media production. Short works of film/video art will be analyzed in class as a guide to the issues of aesthetic choice, editing structure, and challenging one's audience. Students complete two short videos and a longer final project, and view one film each week outside of class time. Prerequisites: 261 or 262 and instructor's permission. One three-hour seminar. K.
Sanborn

VIS 362 Intermediate Video and Film Production Spring LA
A second-level film/video workshop focusing on digital media production. Short works of film/video art will be analyzed in class as a guide to the issues of aesthetic choice, editing structure, and challenging one's audience. Students complete two short videos and a longer final project, and view one film each week outside of class time. Prerequisites: 261 or 262 and instructor's permission. One three-hour seminar. S.
Friedrich

VIS 372 Costume Design (See THR 317)

VIS 392 Issues in Contemporary Art (also ART 392 ) Fall LA
A required seminar for art and archaeology Program 2 majors and visual arts certificate students emphasizing contemporary art practices and ideas. The course addresses current issues in painting, drawing, sculpture, film, video, and photography, with an emphasis on developing a studio practice. Critiques of students' work, and excursions to artists' studio round out the course. One three-hour seminar. M. Friedman

VIS 400 Theatrical Design Studio (See THR 400)

VIS 403 Painting II Not offered this year LA
A studio course focused on advanced problems in painting practice, including pictorial structure in abstraction and representation, color in relationship to space and light, working process, and materials. This course, although structured, encourages development of independent work. Group critiques will be conducted. Students gain awareness of historical models as well as contemporary art, as they build and analyze the relationship between student work and contemporary painting culture. Two three-hour studio classes. Prerequisites: 303 or 304 and instructor's permission. Staff
VIS 404 Painting II Spring LA
A studio course focused on advanced problems in painting practice, including pictorial structure in abstraction and representation, color in relationship to space and light, working process, and materials. This course, although structured, encourages development of independent work. Group critiques will be conducted. Students gain awareness of historical models as well as contemporary art, as they build and analyze the relationship between student work and contemporary painting culture. Two three-hour studio classes. Prerequisites: 303 or 304 and instructor's permission. P. Lins

VIS 405 Advanced Screenwriting: Writing for Television (See CWR 405)

VIS 406 Special Topics in Screenwriting (See CWR 403)

VIS 411 Advanced Questions in Photography LA
Student-initiated problems in photography will be explored in close working relationship with the instructor. Emphasis will be on integrating practice and critical thought. One three-hour class, three hours of independent laboratory. Prerequisites: VIS 211 or VIS 212; and VIS 313 or VIS 315; or permission of instructor. Staff

VIS 415 Advanced Graphic Design Fall LA
This studio course builds on the skills and concepts of VIS 215 Graphic Design. Advanced Graphic Design is structured around three studio assignments that connect graphic design to other bodies of scientific knowledge, aesthetic experience, and scholarship. Studio work is supplemented by critiques, readings and lectures. Motivated students will refine their approaches to information design and visual problem solving, as well as develop the critical acumen for decoding and producing graphic design in a variety of traditional and electronic media. D. Reinfurt

VIS 416 Exhibition Issues and Methods Fall LA
This seminar will give senior Program 2 concentrators and certificate students in the visual arts a more structured and collegial environment for developing their thesis exhibitions. Over the course of the semester students will research and develop their art, their influences, and their aesthetic underpinnings to be presented as a formal proposal for their thesis project for group discussion. Material choices, exhibition design, and publicity strategies also will be addressed. Assigned readings will support and challenge received ideas of what art is and what the form and content of an art exhibition might entail. P. Lins

VIS 417 Special Topics in Film Production Fall LA
This class will explore the art of storytelling through the aesthetics of film editing. By focusing on the editing process, students will not only learn how to edit their work but also how to better plan the writing, casting, sound design, and shooting of a film to better serve the editing process. Through screenings of award-winning films, informal class discussions with their directors, and exclusive access to raw scenes and footage, students will learn how to conceptualize the entire film production process as well as be introduced to accomplished professionals in the field. Staff

VIS 418 Extraordinary Processes (also CEE 418) Fall STL
This course investigates how extreme amounts of invested time and manual labor are capable of transforming the ordinary into the extraordinary. Fall 2015 will focus on the structural and aesthetic potential of ash wood, a material that is currently being made alarmingly abundant by an invasive beetle that has killed millions of ash trees across the
Midwest that has just arrived in New Jersey. Students will research new and replacement applications for the material based on its sculptural properties, its resiliency, and its high strength to weight ratio. Readings and visiting experts will support in-class research and studio work. *J. Scanlan, S. Adriaenssens*

**VIS 421 Advanced Sculpture**  
Spring LA  
A studio course in which formal problems are raised and explored through a range of materials. The central focus is on analysis and exploration of the nature of sculptural space. Two three-hour studio classes. Prerequisites: 221 or 222 and instructor's permission. *M. Friedman*

**VIS 438 Narrative Film: Working from the Script**  
Spring LA  
A script is only the beginning. Then come the interesting decisions: the actors, the visual style, and the sound design. In this class, each student will be given one segment of a script which they can interpret in any way they choose. Will your part be done as a film noir? A musical? Will it be shot in black and white? Acted in the nude? Reimagined as a documentary? At the end of the term, all the segments will be strung together to make a complete film—a surprising collage of everyone. *S. Friedrich*

**VIS 442 Film Theory (also COM 430 )**  
Not offered this year LA  
An examination of the central texts and abiding issues of the theory of cinema. Properties of the shot as a unit of film construction and its relationship to the space of reality are analyzed. Different kinds of film structures and their theoretical underpinnings are studied. *P. Sitney*

**VIS 443 Topics in Modern Italian Cinema (See ITA 310)**

**VIS 444 Cinema and the Related Arts (also COM 444 )**  
Fall LA  
A seminar examining the ways in which filmmakers have used one of the other arts as part of the self-definition of cinema as an autonomous art. One or two such interactions will be the focus of the course, and will vary by term (e.g., painting, architecture, poetry, narrative fiction). *P. Sitney*

**VIS 445 Fascism in Italian Cinema (See ITA 312)**

**VIS 446 Marxism in Italian Cinema (See ITA 313)**

**VIS 447 Shooting the Enemy in Non-Fiction Cinema (See POR 401)**

**VIS 448 Introduction to Screenwriting: Adaptation (See CWR 448)**

**VIS 462 Advanced Video and Film Production**  
Spring LA  
A third-level film/video course to further develop video production skills. Students have the option of spending the term either creating a single long work or a series of short pieces. Short weekly shooting exercises. Students view one film each week outside of class time. Two studio classes, five hours per week. Prerequisite: 361 or 362 and instructor's permission. *S. Friedrich*
VIS 471 Special Topics in Visual Arts       Fall LA
Advanced work in special areas of the various visual media or in areas where the traditional media intersect (for
example, typography, video, photoprintmaking). Specific topics will change from year to year, and prerequisites will
vary. Staff

VIS 472 Special Topics in Visual Arts       Spring LA
Advanced work in special areas of the various visual media or in areas where the traditional media intersect (for
example, typography, video, photoprintmaking). Specific topics will change from year to year, and prerequisites will
vary. Staff

VIS 497 Princeton Atelier (See ATL 497)

VIS 498 Princeton Atelier (See ATL 498)
Woodrow Wilson School of Public and International Affairs

Dean
Cecilia E. Rouse

Vice Dean
Brandice Canes-Wrone

Departmental Representative
David S. Wilcove

Director of Graduate Studies
Denise L. Mauzerall

Professor
R. Douglas Arnold, Public Affairs, Politics
Gary J. Bass, International Affairs, Politics
Roland Benabou, Public Affairs, Economics
Alan S. Blinder, Economics, Public Affairs
Carles Boix, Public Affairs, Politics
Charles M. Cameron, Public Affairs, Politics
Brandice Canes-Wrone, Public Affairs, Politics
Anne C. Case, Public Affairs, Economics
Miguel A. Centeno, Sociology, International Affairs
Thomas J. Christensen, International Affairs, Politics
Christopher F. Chyba, International Affairs, Astrophysical Sciences
Janet M. Currie, Public Affairs, Economics
Christina Davis, International Affairs, Politics
Jan De Loecker, International Affairs, Economics
Christopher L. Eisgruber, Public Affairs, University Center for Human Values
Edward W. Felten, Computer Science, Public Affairs
Susan T. Fiske, Psychology, Public Affairs Economics
Marc Fleurbaey, Public Affairs, University Center for Human Values
Aaron L. Friedberg, International Affairs, Politics
Noreen J. Goldman, Public Affairs, Demography
Bryan Grenfell, Public Affairs, Ecology and Environmental Biology
Gene M. Grossman, International Affairs, Economics
G. John Ikenberry, International Affairs, Politics
Oleg Itskhoki, International Affairs, Economics
Harold James, History, Public Affairs
Robert O. Keohane, Public and International Affairs
Atul Kohli, International Affairs, Politics
Stephen M. Kotkin, History, International Affairs
Alan B. Krueger, Public Affairs, Economics
David S. Lee, Public Affairs, Economics
John B. Londregan, International Affairs, Politics
Alexandre Mas, Public Affairs, Economics
Douglas S. Massey, Public Affairs, Sociology
Denise L. Mauzerall, Public and International Affairs, Civil and Environmental Engineering
Nolan M. McCarty, Public Affairs, Politics
Sara S. McLanahan, Public Affairs, Sociology
Atif R. Mian, Public Affairs, Economics
Helen V. Milner, International Affairs, Politics
Andrew M. Moravcsik, Politics, International Affairs
Michael Oppenheimer, International Affairs, Geosciences, Princeton Environmental Institute
Elizabeth Levy Paluck, Psychology, Public Affairs
Grigore Pop-Eleches, Public Affairs, Politics
Deborah A. Prentice, Psychology, Public Affairs
Stephen J. Redding, International Affairs, Economics
Uwe E. Reinhardt, Public Affairs, Economics
Richard Rogerson, Public Affairs, Economics
Thomas Romer, Public Affairs, Politics

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Esteban Rossi-Hansberg, International Affairs, Economics
Cecilia E. Rouse, Public Affairs, Economics
Kim Lane Schepple, Public Affairs, University Center of Human Values, Sociology
Eldar B. Shafir, Psychology, Public Affairs
Harold T. Shapiro, Public Affairs, Economics
Jacob N. Shapiro, International Affairs, Politics
Paul E. Starr, Sociology, Public Affairs
Marta Tienda, Public Affairs, Sociology
Shirley M. Tilghman, Molecular Biology, Public Affairs
Keith A. Wailoo, History, Public Affairs
Leonard Wantchekon, Politics, International Affairs
Mark W. Watson, Public Affairs, Economics
Elke U. Weber, Public Affairs, Psychology, Andlinger Center for Energy and the Environment
Jennifer Widner, International Affairs, Politics
David S. Wilcove, Public Affairs, Ecology and Evolutionary Biology, Princeton Environmental Institute

Visiting Professor
Daniel C. Kurtzer, S. Daniel Abraham Visiting Professor in Middle East Policy Studies

Assistant Professor
Alin I. Coman, Public Affairs, Psychology
Will S. Dobbie, Public Affairs, Economics
Adam M. Goldstein, Public Affairs, Sociology
Michal Kolesár, Public Affairs, Economics
Melissa M. Lee, International Affairs, Politics
C. Jessica E. Metcalf, Public Affairs, Ecology and Evolutionary Biology
Benjamin Moll, International Affairs, Economics
Eduardo Morales, International Affairs, Economics
Christopher A. Neilson, Public Affairs, Economics
Rory O. Truex, International Affairs, Politics
Tom S. Vogl, International Affairs, Economics
Keren Yarhi-Milo, International Affairs, Politics

Lecturer with Rank of Professor
Stanley N. Katz, Public and International Affairs
Adel A. Mahmoud, Molecular Biology

Lecturer
Amy Craft, also Economics
Edward Freeland, Public and International Affairs
Jean Baldwin Grossman, Public and International Affairs, Economics
Jeffrey S. Hammer, Public and International Affairs
Nathan Scovronick, Public and International Affairs

Associated Faculty
João Biehl, Anthropology
Markus K. Brunnermeier, Economics
David P. Dobkin, Computer Science
Nick Feamster, Computer Science
Paul Frymer, Politics
Martin I. Gilens, Politics
Alison E. Isenberg, History
Ilyana Kuziemko, Economics
Stacey A. Sinclair, Psychology
Undergraduate Program

The Woodrow Wilson School (WWS) offers a multidisciplinary liberal arts major for students who desire to be engaged in public service and become leaders in the world of public and international affairs. To enable students to acquire the tools, understanding, and habits of mind necessary to pursue policy problems of their choosing, the major is largely self-designed but with the structure and guidance needed for an education that is both broad and deep.

Information and Departmental Plan of Study

The curriculum is founded upon WWS courses, cross-listed with multiple departments, that are relevant to the study of policymaking, policy analysis, and policy evaluation. Students take courses in economics, politics, and either psychology or sociology. One course in ethics and one in science policy are also required. Students enroll in policy seminars in the junior year and write a policy thesis in the senior year.

Majors are required to know or take statistics and must be able to use the basics of single-variable calculus in order to take economics courses and some of the courses in science policy. Students who are concerned about their preparation should consider taking MAT 102. Students are also required to complete one foreign language course beyond the University requirement. In addition, WWS requires study abroad, other cross-cultural experience, or policy-relevant field experience (whether foreign or domestic).

When they designate WWS as their major in the spring of their sophomore year, students will be required to describe their primary policy interests and how their plans for coursework are related to those interests. In particular, students will be asked to select among a list of policy areas designated by WWS or, in the event their interests do not match one of the designated areas, to describe their own area of interest and the coursework that would accompany it. Students will also be asked to describe how they have or plan to meet departmental requirements for additional language study and for cross-cultural or field experience. Each student will then be assigned a faculty course advisor appropriate to their interests and program of study.

For the most updated information on the department plan of study please check the Undergraduate Program website.

Prerequisites

There are four prerequisites for concentrating in the Woodrow Wilson School:

1. A course in Statistics
2. A course in Microeconomics
3. A course in History
4. A course in Politics, Sociology or Psychology

Prerequisites must be completed prior to the beginning of the fall term of the junior year.
All courses taken to meet these prerequisites must be taken on a graded basis (no pass/D/fail). AP courses or courses in which students receive a grade of D may not be used to fulfill prerequisites. Note: A freshman seminar cannot be counted as a prerequisite, and one course cannot be used to fulfill more than one prerequisite.

Prerequisites can be satisfied by the following courses:

One Course in Statistics
WWS 200 Statistics for Social Science
ECO 202 Statistics and Data Analysis for Economics
ECO 302 Econometrics
ECO 312 Econometrics: A Mathematical Approach
ORF 245 Fundamentals of Engineering Statistics
POL 345 Quantitative Analysis in Politics
POL 346 Applied Quantitative Analysis

One Course in Microeconomics
ECO 100 Introduction to Microeconomics
ECO 300 Microeconomic Theory
ECO 310 Microeconomic Theory: A Mathematical Approach
WWS 300 Microeconomic for Public Policy

One History course at any level (designated HIS)
A cross-listed course with a HIS designation may also be used. Courses in the HA distribution area do not qualify unless they are designated HIS. For example, courses in NES or SOC that are in the HA distribution area do not fulfill this requirement unless they are cross-listed with HIS.

One Politics, Sociology or Psychology at any level (designated POL, SOC, or PSY)
Cross-listed courses with these designations can also be used. A course taken to meet the statistics requirement cannot be used to meet this requirement.

All courses that meet prerequisites must be taken before September of the junior year. A summer course or a course taken abroad can be used to meet a WWS prerequisite if the course is certified by the relevant department as equivalent to one of the courses offered at Princeton that would meet the prerequisite and the course is approved for Princeton credit. No more than two prerequisites may be taken over the summer. Any course taken outside of Princeton to meet the statistics prerequisite must also be approved by the WWS Undergraduate Program Office (approval is granted only for special circumstances).

Courses taken at Princeton and used as a prerequisite can also be used to meet either a WWS core requirement (if it is on the list of core requirements) or as a WWS elective (if it is on the electives list).

Core Course Requirements

Prior to graduation, WWS students must complete the core course requirements listed below. All courses used to meet these requirements must be taken at Princeton on a graded basis (no pdf). Courses taken to meet elective requirements cannot be used to fulfill core requirements.
One Course in Microeconomics
WWS 300 Microeconomics for Public Policy
ECO 300 Microeconomic Theory
ECO 310 Microeconomic Theory: A Mathematical Approach

One Course in Politics
POL 220/WWS 310 American Politics
POL 230/WWS 325 Introduction to Comparative Politics
POL 240/WWS 312 International Relations
POL 351/WWS 311 Politics in Developing Countries

One Course in Sociology or Psychology WWS
330 Population and Public Policy
WWS 331 Race and Public Policy
WWS 333/SOC 326 Law, Institutions and Public Policy
WWS 340 The Psychology of Decision-Making and Judgment
WWS 344/PSY 312 The Psychology of Social Influence
AAS 384/PSY 384 Prejudice: Its Causes, Consequences, and Cures

One Course in Science Policy
WWS 350 The Environment: Science and Public Policy
WWS 351 Information Technology and Public Policy
WWS 353 Science and Global Security
WWS 354 Modern Genetics & Public Policy
CEE 334/WWS 452 Global Environmental Issues
ENV 304/WWS 455 Disease, Ecology, Economics and Policy
GEO 366/WWS 451 Climate Change: Scientific Basis, Policy Implications

One Course in Ethics
WWS 370 Ethics and Public Policy
POL 307 Systematic Ethics
POL 313 Global Justice
CHV 310/PHI 385 Practical Ethics
PHI 307/CHV 311 Systematic Ethics
PHI 309/CHV 309 Political Philosophy
PHI 319/CHV 319 Normative Ethics
REL261/CHV 261 Christian Ethics and Modern Society

Elective Courses

Each student must complete four electives on a graded basis (no pdf) from a list issued by WWS.
No more than three electives can be courses listed or cross-listed by the same department. Methodology courses that are on the electives list and all WWS courses will be exempt, but cross-listings on WWS courses will count.

Up to three elective courses can be taken in semester-long study abroad programs. Electives taken at Princeton must be taken on a graded basis. Summer courses may not be used as electives.

**Independent Work**

To satisfy the junior independent work requirement, each student must complete one policy task force and one policy research seminar in the junior year. The policy research seminar will include a methods laboratory and will also count as a course.

In the task forces, a small group of juniors works together with a faculty director, one or two seniors, and, often, a graduate student toward proposing solutions to current problems in public and international affairs. Each junior conducts research on a topic carefully chosen to shed light on the larger problem that is central to the group. The principal collective product is a final report with policy recommendations, drafted after debates among the entire group.

In the policy research seminars, a faculty member supervises a small group of students similarly engaged in research on a specific topic in public and international affairs. Students also participate in a methods lab designed to teach them methods for quantitative and qualitative research. An important aim of all of the elements of the research seminar is to prepare students for their senior thesis work.

Each student must complete a senior thesis that clearly articulates a research question about a significant public policy issue and draws conclusions that contribute to the debate on that issue.

**Senior Departmental Examination**

The Woodrow Wilson School senior comprehensive examination is an oral defense of the senior thesis that also tests the student's ability to integrate the senior thesis with coursework.

**Study Abroad**

Any concentrator may study abroad in one of the WWS overseas programs in the first or second semester of the junior year. In recent years, WWS has had programs at the University of Oxford, the Institute of Political and Social Sciences in Paris, the University of Cape Town in South Africa, and several other locations around the world. At each site, students enroll in coursework at the host university and take a WWS task force in place of a task force in Princeton.

**Cross-Cultural or Field Experience Requirement**

Prior to the second semester of the senior year, each student must have completed a requirement for approved cross-cultural or field experience. The requirement may be satisfied in a number of ways, including but not limited to semester study abroad, summer study abroad, summer language study abroad, policy-relevant summer jobs abroad, ROTC training, senior thesis research in the field, extended service in an underserved community, or an internship.
involving public policy work in a nonprofit, government, or international agency such as the United Nations, the World Bank, the US Congress, or a state or federal agency.

Summer study, language study, or thesis research must be done for at least four weeks to qualify (please note that to meet the WWS language requirement, below, with a new foreign language, eight weeks of summer study is required). Internships, jobs, or community service must be for at least six consecutive weeks or 240 hours.

Cross-cultural or field experience gained during the freshman or sophomore year or as a participant in the Bridge Year Program may count toward this requirement. To meet this requirement, all past or proposed work must be approved by the WWS Undergraduate Program Office.

Language Requirement

WWS majors must complete at least one foreign language course beyond the current University requirement. This may be done by:

(1) taking an additional course (200 or 300 level) in the language used to meet the University requirement. Either a language course or a course taught in the foreign language may be used; or

(2) taking a course at least at the 102 level in a language other than the one used to fulfill the University foreign language requirement.

Courses used to meet this requirement may be taken at Princeton or elsewhere; all courses must be taken on a graded basis.

When they declare their concentration, students who are bilingual may apply to WWS to have this requirement waived.

The program awards several scholarships each year to students from any department for travel and living expenses related to senior thesis research in public policy. The school also awards several scholarships to Woodrow Wilson School students participating in public policy internships. For additional information please consult the WWS Undergraduate Program website.

Courses

**WWS 200 Statistics for Social Science**  
Spring QR  
An introduction to probability theory and statistical methods especially as they relate to public policy. The course will consist of a brief introduction to probability theory as well as various topics in statistics and how they can be used in the public policy realm. Subject areas will include random variables, sampling, descriptive statistics, distributions, estimation, hypothesis testing, and introduction to the regression model. The data sources will be actual examples taken from the public policy realm. Stata, a general purpose statistical programming package will be used to perform the statistical analysis.  
*G. Lord*

**WWS 201 Introduction to Urban Studies (See URB 201)**
WWS 300 Microeconomics for Public Policy  Spring SA
Microeconomics is the study of how people and societies confront scarcity. This course, taught at the intermediate level, focuses on markets as a mechanism for dealing with scarcity, and uses examples that cast light on public policy issues. Two lectures, one preceptorial. Prerequisite: ECO 100. C. Krainin

WWS 301 International Trade (also ECO 352)  Fall SA
Examination of the causes and economic consequences of international trade in goods and services, investment and migration. Stress on the possibility of aggregate national gains from trade, and the distributional conflicts generated by trade. Analysis of policies regarding these issues from the perspective of economics and political economy. Two lectures, one preceptorial. Prerequisites: WWS 100 or ECO 300 or ECO 310. S. Weyerbrock

WWS 306 Environmental Economics (also ECO 329 / ENV 319)  Fall SA
An introduction to the use of economics in thinking about and dealing with environmental issues. Stress on economic externalities and the problem of dealing with them as instances of organizing gains from trade. Applications to a wide variety of problems, among them air pollution (including, importantly, global climate change), water pollution, solid waste and hazardous substances management, species preservation, and population policy. S. Brunnermeier

WWS 307 Public Economics (also ECO 349)  Fall SA
Evaluation of public policies in terms of economic efficiency and equity. The course will examine the conditions that lead to efficient markets and those that lead to market failure, as well as the implications for government policy. It will discuss both existing and proposed public policies in a number of areas, including education, health care, poverty, financial markets, the environment, and industrial development. Prerequisites: Economics 100 and 101, or instructor's permission. Two lectures, one preceptorial. E. Bogan

WWS 310 American Politics (See POL 220)

WWS 311 The Politics of Development (See POL 351)

WWS 312 International Relations (See POL 240)

WWS 315 Grand Strategy (also POL 393)  Spring SA
Military strategy was defined by Clausewitz as the use of battle to achieve the objectives of war. Grand strategy is broader, encompassing the attempted use by political leaders of financial economic, and diplomatic, as well as military, power to achieve their objectives in peacetime and in war. This seminar will examine the theory and practice of grand strategy both to illuminate how relations among city-states, empires, kingdoms and nation states have evolved over the centuries and also to identify some common challenges that have confronted all who seek to make and execute grand strategy, from Pericles to Barack Obama. A. Friedberg, G. Ikenberry

WWS 317 International Relations of East Asia (also POL 389 / EAS 462)  Spring SA
This course will concentrate on the Cold War and post Cold War international relations of East Asia. In the first two weeks we will cover general theoretical approaches to international relations and a brief historical backdrop of Western and Japanese imperialism in the region. In the following weeks, we will discuss the interaction between changes in the broader international system and changes in international relations in the East Asian region. The
course will finish with discussion of implications of events and trends since the end of the Cold War. Two lectures, one preceptorial. *Staff*

**WWS 323 Chinese Politics (See POL 362)**

**WWS 325 Introduction to Comparative Politics (See POL 230)**

**WWS 330 Population, Society and Public Policy (also SOC 328)**  
*Not offered this year SA* This course focuses on the causes and consequences of population change and the policy levers used to regulate demographic behavior and outcomes. In addition to basic demographic concepts, measures and data, we will address questions such as: What is the carrying capacity of the planet? Why has fertility declined in some countries but not others? How does population growth influence the environment? What does population aging portend for social security solvency? Can countries regulate international migration? Why does China have so many male births? Is marriage obsolete? Is urban life good or bad for your health? *M. Tienda*

**WWS 331 Race and Public Policy (also SOC 312 / AAS 317)**  
*Spring SA*  
Analyzes the historical construction of race as a concept in American society, how and why this concept was institutionalized publicly and privately in various arenas of U.S. public life at different historical junctures, and the progress that has been made in dismantling racialized institutions since the civil rights era. One three-hour seminar. *D. Massey*

**WWS 332 Quantitative Analysis for Public Policy**  
*Not offered this year QR*  
The course will review the principal methods of data analysis and applied statistics used in political, economic, psychological, and policy research, including multiple regression, analysis of variance, and nonparametric methods. These methods will be introduced in the context of case studies that will incorporate research design, data collection, data management, exploratory and inferential analyses, and the presentation of results. Two lectures, one preceptorial. *Staff*

**WWS 334 Media and Public Policy (also JRN 334)**  
*Spring SA*  
Introduction to communications policy and law, covering such topics as freedom of the press and the development of journalism; intellectual property; regulation of telecommunications, broadcasting, and cable; and policy challenges raised by the Internet and the globalization of the media. *P. Starr*

**WWS 340 The Psychology of Decision Making and Judgment (also PSY 321)**  
*Fall EC*  
An introduction to the logic of decision making and reasoning under uncertainty. Focus on psychological mechanisms that govern choice and judgment and on characteristic errors found in intuitive judgment and choice. Discussion of divergence from the model of rational agent often assumed in social science theory and economics. Rules governing pleasure, pain, and well-being provide background for analysis of the rationality of some individual choices and for the evaluation of general policies that affect human welfare. Prerequisite: introductory statistics for social science or instructor's permission. *E. Shafir*

**WWS 350 The Environment: Science and Policy (also ENV 350)**  
*Spring STN*  
This course examines a set of critical environmental issues including population growth, ozone layer depletion, climate change, loss of biodiversity and ecosystem services and depletion of global fisheries. It provides an
overview of the scientific basis for these problems and examines past, present and possible future policy responses.

*D. Wilcove, M. Oppenheimer*

**WWS 351 Information Technology and Public Policy (also SOC 353 / COS 351)** Not offered this year SA

New technologies have changed the way we communicate with each other and learn about our world. They have also raised public policy dilemmas in every area they touch: communications, regulation, privacy, national security, intellectual property and many others. This course is predicated on the belief that we can only productively address the social and policy dimensions of the Internet if we understand the technology behind the Internet; the social-science concepts and research that illuminate the likely effects of policy options; and tradeoffs among fundamental values that different policy options imply. Two ninety-minute seminars. *P. DiMaggio, E. Felten*

**WWS 353 Science and Global Security: From Nuclear Weapons to Cyberwarfare (also MAE 353)** Spring STN

This course will provide students with a basic technical understanding of some of the critical technologies that are relevant to national and global security and will equip students with the skills to better assess the challenge of developing effective policies to manage such technologies. Case studies will inter alia include nuclear weapons and their proliferation, nuclear and radiological terrorism, space weapons, biosecurity and cyberware. Two lectures. *A. Glaser*

**WWS 355 Infection: Biology, Burden, Policy (See MOL 425)**

**WWS 363 Public Leadership and Public Policy in the U.S. (also POL 463)** Not offered this year SA

Considers the intellectual (ethical and legal) frameworks for making leadership decisions on major public issues in the United States, as well as the operational frameworks for effective and responsible public leadership. Students review historical cases from federal and state government, discuss the policy decisions made in each case, and examine the decision-making processes in view of these frameworks. Two 90-minute seminars. *N. Scovronick*

**WWS 370 Ethics and Public Policy (also POL 308 / CHV 301)** Fall EM

This course examines basic ethical controversies in public life. What rights do persons have at the beginning and end of life? Do people have moral claims to unequal economic rewards or is economic distribution properly subject to political design for the sake of social justice? Do we have significant moral obligations to distant others? Other possible topics include toleration (including the rights of religious and cultural minorities), racial and gender equity, and just war. Two lectures, one preceptorial. *S. Macedo*

**WWS 380 Critical Perspectives in Global Health (See GHP 350)**

**WWS 381 Epidemiology: an ecological and evolutionary perspective (See GHP 351)**

**WWS 385 Civil Society and Public Policy (also AMS 350)** Fall SA

Civil society is the arena of voluntary organizations (churches, social welfare organizations, sporting clubs) and communal activity. Scholars now tell us that such voluntary and cooperative activities create "social capital"--a stock of mutual trust that forms the glue that holds society together. The course will be devoted to the study of the history of these concepts, and to the analysis of their application to the United
States and other societies. This will be an interdisciplinary effort, embracing history, philosophy, anthropology, sociology, and other disciplines. One three-hour seminar. S. Katz

WWS 386 Race and the American Legal Process: Emancipation to the Voting Rights Act (See AAS 362)

WWS 389 Race, Drugs, and Drug Policy in America (See HIS 393)

WWS 401 Policy Seminars Fall
Open only to students enrolled in the school. (See description above.) Juniors who are concentrators in the school must register for the policy task force as "Junior Independent Work." Certificate students and seniors should register for WWS 401 or 402 as a course rather than junior independent work. Staff

WWS 402 Policy Seminars Spring
Open only to students enrolled in the school. Juniors who are concentrators in the school must register for the policy task force as "Junior Independent Work." Certificate students and seniors should register for 401 or 402 as a course rather than junior independent work. Staff

WWS 406 Issues in Environmental and Natural Resource Economics (also ECO 429 ) Not offered this year SA
Course introduces use of economics in understanding both the sources of and the remedies to environmental and resource allocation problems. It emphasizes the reoccurrence of economic phenomenon like public goods, externalities, market failure and imperfect information. Students learn about the design and evaluation of environmental policy instruments, the political economy of environmental policy, and the valuation of environmental and natural resource services. These concepts are illustrated in a variety of applications from domestic pollution of air, water and land to international issues such as global warming and sustainable development. S. Brunnermeier

WWS 420 International Institutions and Law (also POL 444 ) Fall SA
This course will focus on the continual tension between international law and international politics. It will examine the impact of this tension on issues of intervention and also on other issues of substantive importance, including environmental protection, trade, human rights, laws of war applicable to the "war on terror," and crimes of state. The course will also discuss recent developments affecting international institutions and recent changes in international law, such as the changing conception of "sovereignty." One three-hour seminar. R. Keohane

WWS 421 Comparative Constitutional Law (also POL 479 / CHV 470 ) Not offered this year SA
This course will introduce students to the variety of forms of constitutional government and the way that human rights are understood and enforced by courts around the world. We will trace the emergence of a global constitutional culture and focus more directly on the constitutions of South Africa, India, Germany, France, Hungary, Israel and Canada. We will give primary emphasis to the rights provisions in national constitutions, but will also take transnational constitutional regimes through examining decisions of the European Courts of Human Rights. Two ninety-minute seminars. K. Scheppele

WWS 451 Climate Change: Impacts, Adaptation, Policy (See GEO 366)
WWS 452 Global Environmental Issues (See CEE 334)
WWS 455 Disease Ecology, Economics, and Policy (See ENV 304)

WWS 466 Financial History (also HIS 467) Not offered this year HA

The course examines the history of financial innovation and its consequences. It examines the evolution of trading practices, bills of exchange, government bonds, equities, banking activity, derivatives markets, and securitization. How do these evolve in particular state or national settings, how are the practices regulated, how do they relate to broader development? What happens as financial instruments are traded across state boundaries, and how does an international financial order evolve? What are the effects of international capital mobility? How is resulting conflict and instability managed, on both a national and international level? H. James