NORTHWESTERN

Undergraduate Catalog 2013–14

Northwestern on the Web

www.northwestern.edu
The University's home page

www.registrar.northwestern.edu/courses/undergraduate_catalog.html
The latest version of the *Undergraduate Catalog*

www.registrar.northwestern.edu
Information about services of the Office of the Registrar

www.northwestern.edu/caesar
CAESAR, students' gateway to web-based registration and personal academic information

www.northwestern.edu/studentaffairs
The Division of Student Affairs, providing programs and services for Northwestern's diverse students

http://nulink.northwestern.edu
NULink, the student home page

www.planitpurple.northwestern.edu
The University's online calendar of events

www.ugadm.northwestern.edu
The Office of Undergraduate Admission

www.northwestern.edu/sfs
Student Financial Services, where students access their personal accounts along with general financial information

http://undergradaid.northwestern.edu
The Office of Undergraduate Financial Aid

www.scholars.northwestern.edu
Information about the faculty of each school

www.northwestern.edu/careers
University Career Services for students and alumni

www.northwestern.edu/fellowships
The Office of Fellowships, a help in searching for national and international fellowship competitions

Email webmaster@northwestern.edu with questions about the Northwestern website.

Northwestern University does not discriminate or permit discrimination by any member of its community against any individual on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, parental status, marital status, age, disability, citizenship, veteran status, genetic information, or any other classification protected by law in matters of admissions, employment, housing, or services or in the educational programs or activities it operates. Any alleged violations of this policy or questions regarding the law with respect to nondiscrimination should be directed to Director of Equal Opportunity and Access, 720 University Place, Evanston, Illinois 60208-1147, phone 847-491-7458; Office of the Provost, Rebecca Crown Center, Evanston, Illinois 60208-1101.

Harassment, whether verbal, physical, or visual, that is based on any of these characteristics is a form of discrimination. This includes harassing conduct affecting tangible job benefits, interfering unreasonably with an individual's academic or work performance, or creating what a reasonable person would perceive is an intimidating, hostile, or offensive environment. Prohibited sex discrimination includes sexual harassment and sexual violence.

While Northwestern University is committed to the principles of free inquiry and free expression, discrimination and harassment identified in this policy are neither legally protected expression nor the proper exercise of academic freedom.

© 2013 Northwestern University. All rights reserved.
Produced by University Relations. 8-13/1.2M/MG-HC/1436-1

NORTHWESTERN

Undergraduate Catalog 2013–14

This catalog for the academic year beginning September 1, 2013, contains University regulations and information about the programs and courses offered by the Judd A. and Marjorie Weinberg College of Arts and Sciences; School of Communication; School of Education and Social Policy; Robert R. McCormick School of Engineering and Applied Science; Medill School of Journalism, Media, Integrated Marketing Communications; and Henry and Leigh Bienen School of Music and about cross-school undergraduate programs. Failure to read this catalog does not excuse a student from knowing and complying with its content.

Northwestern University reserves the right to change without notice any statement in this catalog concerning, but not limited to, rules, policies, tuition, fees, curricula, and courses. In exceptional circumstances, Northwestern University reserves the right, at its sole discretion, to waive any documentation normally required for admission. It also reserves the right to admit or deny a student admission whenever it believes that it has sufficient evidence for the decision.

Contents

Academic Calendar **4**

The University **6**
A Historical Overview 6
The Undergraduate Experience 6
Student Demographics 7
Campuses and Schools 7

Undergraduate Education **10**
Admission 10
Application and Testing Deadlines 12
Financial Aid 14
Financial Regulations 16
Undergraduate Registration Requirement 17
Academic Regulations 18
Honors and Prizes 23
Special Academic Opportunities 23

Key to Course Numbers **26**

Cross-School Options **27**
School-Based Options for All Undergraduates 27
Dual Bachelor's Degree Programs 28
- Liberal Arts and Engineering 28
- Liberal Arts and Music 28
- Engineering and Music 28
- Journalism and Music 29

Graduate and Medical School Collaborations 29
- Accelerated Master's Programs 29
- Honors Program in Medical Education 29
- Undergraduate Premedical Scholars Program 30

Kellogg Certificates for Undergraduates 30
Additional Options 31
- News Innovation 31
- Leadership 31
- Study of the Environment 31
- Sustainability and Energy 32
- Transportation and Logistics 32
- Writing Arts 33

Military Programs 33

Weinberg College of Arts and Sciences **35**
Academic Policies 35
Academic Options 38
Student Resources 40
Freshman Seminars 40
General Liberal Arts 41
African American Studies 41
African Studies 44
American Studies 46
Anthropology 46
Art History 51
Art Theory and Practice 54
Asian American Studies 55
Asian Languages and Cultures 57
Asian Studies 59
Biological Sciences 60
Business Institutions 63
Chemistry 64
Chicago Field Studies 68
Classics 69
Cognitive Science 72
Comparative Literary Studies 73
Computer Science 76
Critical Theory 77
Earth and Planetary Sciences 78
Economics 81
English 84
Environmental Policy and Culture 88
Environmental Sciences 88
Ethics and Civic Life 90
French and Italian 90
Gender and Sexuality Studies 95
Geography 97
German 98
Global Health Studies 103
History 104
Humanities 109
Integrated Science 110
International Studies 111
Jewish Studies 112
Latina and Latino Studies 114
Latin American and Caribbean Studies 115
Legal Studies 116
Linguistics 117
Materials Science 119
Mathematical Methods in the Social Sciences 120
Mathematics 121
Middle East and North African Studies 127
Philosophy 128
Physics and Astronomy 132
Political Science 135
Psychology 140
Religious Studies 143

Science in Human Culture 146
Slavic Languages and Literatures 147
Sociology 150
Spanish and Portuguese 154
Statistics 159
Urban Studies 161
Writing Program 161

School of Communication 162
Academic Policies 162
Academic Options 163
Student Resources 164
Introductory, Related, and Interdepartmental Courses 166
Communication Sciences and Disorders 166
Communication Studies 170
Performance Studies 174
Radio/Television/Film 175
Film and Media Studies 176
Sound Design 176
Theatre 178
Music Theatre 180
Dance 184

School of Education and Social Policy 187
Academic Policies 187
Academic Options 188
Student Resources 189
Nonsecondary Teaching Programs 189
Common Course Work 190
Human Development and Psychological Services 191
Learning and Organizational Change 192
Social Policy 193
Secondary Teaching 194
SESP Programs for All Northwestern Students 198

McCormick School of Engineering and Applied Science 199
Academic Policies 199
Academic Options 202
Student Resources 204
General Engineering 205
Biomedical Engineering 206
Chemical Engineering 209
Civil and Environmental Engineering 211
Electrical Engineering and Computer Science 216
Engineering Sciences and Applied Mathematics 225
Industrial Engineering and Management Sciences 226
Manufacturing and Design Engineering 229
Materials Science and Engineering 231
Mechanical Engineering 234

Medill School of Journalism, Media, Integrated Marketing Communications 239
Academic Policies 239
Academic Options 241
Student Resources 241
Journalism 242
Integrated Marketing Communications 245

Bienen School of Music 248
Academic Policies 248
Academic Options 250
Student Resources 251
Interdepartmental Courses for Music Majors 251
Music Studies 252
Composition and Music Technology 252
Music Education 254
Musicology 256
Music Theory and Cognition 258
Music Performance 259
Conducting and Ensembles 259
Jazz 259
Piano 260
String Instruments 261
Voice and Opera 262
Winds and Percussion Instruments 262
Music Studies for Nonmajors 263

For More Information inside back cover

This catalog can be searched online at www.registrar.northwestern.edu/courses/undergrad_catalog.html. For information about faculty, please see the Northwestern Scholars website at www.scholars.northwestern.edu and the websites of individual schools.

Academic Calendar 2013–14

Fall Quarter 2013

September

1	Sunday	Tuition due
13	Friday	Returning student registration ends 5 p.m.
16	Monday	Wildcat Welcome (orientation) begins
20	Friday	New student registration day
24	Tuesday	Classes begin 8 a.m. Start of late registration, change of registration (drop/add) period
30	Monday	Last day to add a class or change a section, change to or from part-time status with tuition adjustment, or receive a tuition refund; no tuition reductions for dropped or swapped courses after this date

October

11	Friday	Last day to change to or from P/N grading option

November

1	Friday	Last day to drop a class or withdraw for the quarter
4	Monday	Preregistration for winter quarter begins
11	Monday	Registration for winter quarter begins
27	Wednesday	Thanksgiving break begins 6 p.m.
28	Thursday	Thanksgiving Day (no classes)

December

2	Monday	Classes resume 8 a.m. Weinberg College reading week begins Last day to apply for undergraduate financial aid for winter quarter
7	Saturday	Last day of classes
9	Monday	Final exams begin
13	Friday	Exams end; winter break begins 6 p.m.
16	Monday	Grades due 3 p.m.
27	Friday	Degree conferral for fall quarter graduates

Winter Quarter 2014

January

1	Wednesday	Tuition due
6	Monday	Classes begin 8 a.m. Start of late registration, change of registration (drop/add) period
10	Friday	Last day to add a class or change a section, change to or from part-time status with tuition adjustment, or receive a tuition refund; no tuition reductions for dropped or swapped classes after this date
20	Monday	Martin Luther King Jr. Day (no classes)
24	Friday	Last day to change to or from P/N grading option

February

14	Friday	Last day to drop a class or withdraw for the quarter
17	Monday	Preregistration for spring quarter begins
24	Monday	Registration for spring quarter begins

March

3	Monday	Last day to apply for undergraduate financial aid for spring quarter
11	Tuesday	Weinberg College reading week begins
15	Saturday	Last day of classes
17	Monday	Final exams begin
21	Friday	Exams end; spring break begins 6 p.m.
28	Friday	Degree conferral for winter quarter graduates

Spring Quarter 2014

March

31	Monday	Classes begin 8 a.m. Start of late registration, change of registration (drop/add) period

April

1	Tuesday	Tuition due
4	Friday	Last day to add a class or change a section, change to or from part-time status with tuition adjustment, or receive a tuition refund; no tuition reductions for dropped or swapped classes after this date
7	Monday	Classes begin 8 a.m. Registration for Summer Session begins
18	Friday	Last day to change to or from P/N grading option

May

1	Thursday	Last day to apply for undergraduate financial aid for spring quarter
9	Friday	Last day to drop a class or withdraw for the quarter
12	Monday	Preregistration for fall quarter begins
19	Monday	Registration for fall quarter begins
26	Monday	Memorial Day (no classes)

June

3	Tuesday	Weinberg College reading week begins
7	Saturday	Last day of classes
9	Monday	Final exams begin
13	Friday	Exams end 6 p.m.
16	Monday	Grades due 3 p.m.
20	Friday	156th annual Commencement Degree conferral for spring quarter graduates

Summer Session 2014

June

2	Monday	Tuition due
23	Monday	Classes begin Start of late registration, change of registration (drop/add) period

July

4	Friday	Independence Day (no classes)

August

2	Saturday	Six-week Summer Session ends
16	Saturday	Eight-week Summer Session ends
30	Saturday	Ten-week Summer Session ends

September

2	Tuesday	Degree conferral for summer quarter graduates

NOTE: Weinberg College, School of Communication, School of Education and Social Policy, Medill School, and Bienen School students planning to graduate in spring or summer quarter 2015 must file an application for a degree at the Office of the Registrar before the end of spring quarter 2014. McCormick School students must file at the appropriate school office. Students completing requirements in fall or winter quarter should file an application for a degree one year in advance.

The University reserves the right to make changes in this calendar. A detailed current calendar can be found at www.registrar.northwestern.edu/calendars.

The University

A private institution founded in 1851, Northwestern University is recognized nationally and internationally for the quality of its educational programs at all levels. Innovative teaching and pioneering research take place in a highly collaborative, interdisciplinary environment that combines the resources of a major research university with the level of individual attention of a small college.

Approximately 20,000 full- and part-time students are enrolled on Northwestern's lakefront campuses in Evanston and Chicago and branch campus in Qatar. Almost 8,500 undergraduates study at the University's largest campus in Evanston.

The University's 2,500 full-time faculty members range from MacArthur Fellowship recipients to Tony Award winners. In their ranks are members of the National Academy of Sciences, the National Academy of Engineering, the American Academy of Arts and Sciences, the American Council of Learned Societies, and numerous other honorary and professional societies.

Northwestern's more than 225,000 alumni include Pulitzer and Nobel Prize laureates, Academy Award winners, and leaders in education, government, science, law, technology, medicine, media, and other domains.

A HISTORICAL OVERVIEW

A year after nine Chicagoans met to establish a university "of the highest order of excellence" to serve the people of America's Northwest Territory, Northwestern University was officially incorporated in 1851. In 1853 the founders purchased a 379-acre tract of farmland along Lake Michigan 12 miles north of Chicago as a site for the new university. The town that grew up around Northwestern was named Evanston in honor of John Evans, one of the University founders.

Northwestern began classes in fall 1855 with two faculty members and 10 male students. In 1869 it enrolled its first female students, thereby becoming a pioneer in the higher education of women. By 1900 the University was composed of a liberal arts college and six professional schools, including the schools of law and medicine, with a total of 2,700 students. In the 20th century, schools were added in management, engineering, education, journalism, and continuing studies. With the establishment of the Graduate School in 1910, Northwestern adopted the German university model of providing graduate as well as undergraduate instruction and stressing research along with teaching. Recent years have seen a proliferation of academic programs and the opening of the Qatar campus.

Today, with the academic divisions listed on pages 7 to 9, Northwestern enjoys a position as one of the country's leading private research universities.

THE UNDERGRADUATE EXPERIENCE

Academic Excellence

Despite their relatively small numbers, Northwestern undergraduates enjoy a great range of educational choices, including more than 180 formal academic concentrations as well as opportunities to do research and special projects, study abroad, and pursue internships. Students frequently complete two majors or two degrees, and some construct and receive approval for their own programs of study. Nearly one-half of Northwestern's undergraduates engage in internships, practicums, paid cooperative education programs, applied research, study abroad, and other off-campus experiences, often for academic credit. All benefit from a level of faculty involvement unusual for undergraduates at major universities, with faculty teaching a large proportion of classes as well as inviting students to participate in research.

At the heart of a Northwestern education is the belief that a solid foundation in the liberal arts is essential, regardless of one's future plans. Students in all six undergraduate schools may take courses in science, mathematics and technology, individual and social behavior, historical studies, the humanities, and fine and performing arts. Moreover, Northwestern's emphasis on effective communication, regardless of field of study, fosters the ability to think analytically and write and speak clearly and persuasively.

Northwestern's many interdisciplinary research centers have profound implications for undergraduate education. Their research often alters theory and practice within an academic discipline and leads to new curricula. More immediately, many research centers have special programs for undergraduates, who may apply for research grants to fund independent scholarly projects. In recent years many new research centers have been established, especially in science and technology. See www.research.northwestern.edu/centers for a list of the University's research centers.

Other academic resources available to Northwestern students include the 10th largest library collection among

US private universities (www.library.northwestern.edu). Northwestern University Information Technology supports students' academic needs with extensive online services, wired and wireless access from nearly anywhere on campus, and abundant computing sites (www.it.northwestern.edu).

Underpinning the breadth of a Northwestern education is the quarter system, which gives students the opportunity to take more courses than under a traditional semester system. Most undergraduates attend for three quarters each year (fall, winter, and spring). They typically take 4 courses each quarter and 12 courses in an academic year.

Outside the Classroom

In its extracurricular offerings as well as in its academic programs, Northwestern encourages its students to develop holistically and to prepare for life in a diverse, interconnected, and rapidly changing world.

Supported by the Center for Student Involvement, the more than 480 extracurricular groups include organizations devoted to service on campus and in the community, cultural awareness and support, musical and theatrical performance, entertainment programming, political activism, career preparation, and countless mutual interests. The full list is available at www.wildcatconnection.northwestern.edu.

A charter member of and the only private university in the Big Ten conference, Northwestern sponsors 19 intercollegiate athletic teams (8 men's and 11 women's), as well as intramural, club, informal, and instructional sport and fitness programs. Fitness centers provide state-of-the-art facilities for exercise and recreation. Northwestern students even have their own beach and the opportunity to take sailing lessons.

About 4,000 undergraduates live in University residence halls, another 800 live in fraternity or sorority houses, and the remainder live off campus. On-campus residents choose from housing that ranges in size, age, and character and in suite arrangements, including themed residential colleges and same-sex facilities.

Services available to undergraduates include career advising and job and internship search help, psychological counseling, and health care. Specialized offices serve members of various religious denominations, students with disabilities, women, international students, and African American, Asian, Asian American, and Latina and Latino students. For all programs offered by the Division of Student Affairs, see www.northwestern.edu/student affairs.

In addition to enjoying numerous opportunities on campus, students benefit from Northwestern's location in the first suburb north of Chicago. Downtown Evanston offers restaurants, shops, and a multiplex movie theater, and the cultural, entertainment, and sporting events of America's third-largest city are just a short train ride away.

STUDENT DEMOGRAPHICS

Northwestern recruits students of demonstrated academic achievement from diverse social, ethnic, and economic backgrounds. More than 90 percent of applicants rank in the top 10 percent of their high school classes, and Northwestern's National Merit Scholar enrollment rate has recently ranked among the nation's highest. About one in eight applicants is accepted.

All 50 states and more than 65 countries are represented among the undergraduate student body. Nearly one-half (48 percent) of the class of 2017 are from underrepresented and international backgrounds. Slightly more than 60 percent of students are receiving financial assistance in the form of need-based scholarships and loans. Almost 97 percent of freshmen return for sophomore year.

Both the federal government and the National Collegiate Athletic Association use as a measurement for reporting purposes the graduation rates of entering classes over six continuous years. Such rates at Northwestern have remained above 90 percent since 1991–92. See www.registrar.northwestern.edu/academic_records/enroll-grad_statistics.

CAMPUSES AND SCHOOLS

The six undergraduate schools offer the programs and courses of instruction described in their respective sections of this catalog. Undergraduate study may lead to the bachelor's degree as a final academic goal or to graduate or professional study.

Northwestern is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools. Some schools have additional accreditation, as noted in the following sections.

Evanston Campus

The schools and other institutional divisions, in order of establishment, are as follows:

- The Judd A. and Marjorie Weinberg College of Arts and Sciences (1851) offers the degree of bachelor of arts. Majors and minors are available through departments and interdisciplinary programs spanning the arts and humanities, foreign languages, mathematics and statistics, the natural sciences, and the social sciences. Through the School of Continuing Studies, Weinberg College also offers the degrees of bachelor of philosophy and bachelor of science in general studies.
- The School of Communication (1878), with departments of communication sciences and disorders, communication studies, performance studies, radio/television/film, and theater, offers a bachelor of science in communication degree and a bachelor of arts in communication degree. Through the School of Continuing Studies, the School of Communication offers the bachelor of philosophy in communication. The school also offers

the degrees of master of science in communication and doctor of audiology. Its programs are accredited by the American Speech-Language-Hearing Association and the National Association of Schools of Theatre.

- The Henry and Leigh Bienen School of Music (1895) offers the degrees of bachelor of music, bachelor of arts in music, and bachelor of science in music. In its graduate division the school offers the master of music and doctor of musical arts degrees.The school is accredited by the National Association of Schools of Music.
- The J. L. Kellogg School of Management (1908) offers undergraduate certificates in financial economics and managerial analytics as well as the master of business administration degree. MBA students may choose from many majors, which are listed at www.kellogg.northwestern.edu/faculty/academics/majors. In addition to the full-time MBA program, Kellogg offers a part-time evening or weekend MBA program on Northwestern's Chicago campus, an executive MBA in Evanston and Miami, and international executive MBA programs in Canada, Europe, the Middle East, and Asia. There is also a PhD program; see www.kellogg.northwestern.edu/programs/doctoralprogram. In addition, a wide range of nondegree executive education courses are offered at the school's James L. Allen Center on the Evanston campus as well as in Miami. Kellogg is accredited by the American Assembly of Collegiate Schools of Business.
- The Robert R. McCormick School of Engineering and Applied Science (1909) offers the bachelor of science degree in applied mathematics, biomedical engineering, chemical engineering, civil engineering, computer engineering, computer science, electrical engineering, environmental engineering, industrial engineering, manufacturing and design engineering, materials science and engineering, mechanical engineering, and medical engineering (only for students enrolled in the Honors Program in Medical Education). All departments offer advanced study for graduate students. The McCormick School also offers master's degrees in biotechnology, engineering management, information technology, product design and development management, and project management. McCormick programs are accredited by the Engineering Accreditation Council of the Accreditation Board for Engineering and Technology.
- The Graduate School (1910) administers all advanced programs leading to the degrees of doctor of philosophy, master of arts, master of fine arts, master of public health, and master of science. Degree requirements and descriptions of individual graduate degree programs and curricula can be found through the school's website, www.tgs.northwestern.edu.
- Summer Session (1920) provides summer programs for undergraduate, graduate, and visiting students.
- The Medill School of Journalism, Media, Integrated Marketing Communications (1921) offers the bachelor of science degree in journalism, master of science degrees in journalism and integrated marketing communications, and an undergraduate certificate in integrated marketing communications. Medill is accredited by the Accrediting Council on Education in Journalism and Mass Communication.
- The School of Education and Social Policy (1926) offers the bachelor of science degree in education and social policy with concentrations in human development and psychological services, learning and organizational change, secondary teaching, and social policy. It offers master of science degree programs in education (MSEd) with concentrations in elementary, secondary, and advanced teaching; in higher education administration and policy (MSHE); and in learning and organizational change (MSLOC). School programs administered by the Graduate School offer MA and PhD degrees in human development and social policy and in learning sciences. Its teacher education programs are accredited by the Illinois State Board of Education.

Chicago Campus

Schools and institutional divisions on the Chicago campus, in order of establishment, are as follows:

- The Feinberg School of Medicine (1859) offers the degrees of doctor of medicine and doctor of physical therapy. High school graduates accepted for the Honors Program in Medical Education can receive the MD degree from Feinberg seven or eight years after they enter Weinberg College, the McCormick School, or the School of Communication as freshmen. The Feinberg and McCormick Schools cooperate in biomedical engineering programs; joint degree programs with the Graduate School and the Kellogg School offer an MD degree as well as MA, MS, MPH, MBA, and PhD degrees. The Feinberg School has accreditation from the Liaison Committee on Medical Education, Accreditation Council for Continuing Medical Education, American Psychological Association, American Board for Certification in Prosthetics and Orthotics, American Physical Therapy Association, and Accreditation Council for Graduate Medical Education.
- The School of Law (1859) offers the degrees of juris doctor (JD), master of laws (LLM), master of studies and LLM in international human rights, LLM in taxation, and doctor of juridical science. An accelerated JD program allows select motivated students to complete the JD in two calendar years. The School of Law and the Kellogg School offer a joint degree program allowing students to earn both JD and MBA degrees in three years. Another joint program with Kellogg permits international and foreign-trained students to earn an LLM degree and a certificate in business administration

in one year. Students also may participate in a five-year program to earn a JD and a PhD in one of the social sciences. In addition, the School of Law offers an LLM degree to executive students in Seoul, South Korea; Madrid, Spain; and Tel Aviv, Israel. The school is accredited by the American Bar Association and the Association for American Law Schools.

- The School of Continuing Studies (1933) is the continuing education division of the University, providing adults an opportunity to return to school part-time or full-time on evenings and weekends. Classes are offered on the Chicago and Evanston campuses, in the Chicago Loop, and online. In addition to postbaccalaureate and professional development certificates, the school offers courses leading to the degrees of bachelor of philosophy and bachelor of science in general studies, conferred by the Weinberg College of Arts and Sciences, and the degree of bachelor of philosophy in communication, conferred by the School of Communication. It also offers the degrees of master of arts in creative writing, liberal studies, literature, public policy and administration, and sports administration; master of fine arts in creative writing; and master of science in clinical research and regulatory administration, computer information systems, information systems, medical informatics, predictive analytics, and quality assurance and regulatory science. SCS administers Summer Session programs for the University and is the home of the Center for Public Safety and the Osher Lifelong Learning Institute.

Northwestern University in Qatar

Northwestern's 12th school and only overseas campus is based in Education City, Doha, Qatar. In addition to liberal arts instruction, the school offers bachelor of science degrees conferred by the Medill School of Journalism, Media, Integrated Marketing Communications and the School of Communication. For more information about Northwestern University in Qatar, please visit www.qatar.northwestern.edu.

Undergraduate Education

ADMISSION

General Requirements for Admission

Northwestern University attracts and enrolls a student body of high ability that reflects a variety of talents, ideas, backgrounds, and experiences, thereby contributing to the diversity of the campus community.

Candidates for admission should demonstrate a level of performance in curricular and extracurricular areas that indicates they will be able to succeed in a competitive academic environment. In the selection of students, careful attention is given to the ability of each candidate as evidenced by academic records and the results of entrance tests as well as by character and personality. The University attempts to select students who are committed to scholarship and who have shown a willingness to become involved in their expressed interest areas. In determining whether to accept a candidate, the University considers

- Secondary school record
- College record (required for transfer candidates)
- Recommendations from school officials and other persons who have information pertinent to the candidate's probable success at Northwestern
- Results of required or recommended tests (All candidates must submit either SAT or ACT Plus Writing scores. Candidates for certain special admission programs and all home-schooled applicants must submit the SAT Subject Tests specified in the following sections. SAT Subject Tests are recommended for other candidates.)
- Music audition (required of Bienen School of Music candidates)
- Candidate's written statements
- Any other information received by the University that bears on the candidate's readiness for study at Northwestern

SAT Subject Tests

Recommended for All Applicants

- Weinberg College of Arts and Sciences, School of Communication, School of Education and Social Policy, Medill School of Journalism, Media, Integrated Marketing Communications, and Bienen School of Music: three of the student's choice, in three different subject areas (math, English, social sciences, natural sciences, or foreign language)
- McCormick School of Engineering and Applied Science: Mathematics I or IIC, Chemistry or Physics, and a third subject of choice

Required for Special Admission Programs and Home-Schooled Applicants

- Honors Program in Medical Education: Mathematics IIC and Chemistry
- Integrated Science Program: Mathematics IIC, Chemistry or Physics, and an additional science
- Home-schooled applicants: Mathematics I or IIC and two other SAT Subject Tests of the applicant's choice from different subject areas (i.e., not two science, two foreign language, or two history, etc.).

Required Subjects

A broad academic experience in high school is the best preparation for admission to Northwestern. Whatever fields of study students follow, the best foundation consists of reading, writing, and mathematics. The value of thorough training in fundamental subjects cannot be overemphasized.

In considering the academic record of a candidate for admission, the Office of Undergraduate Admission notes the subjects studied and the grades received. The student's record should include a minimum of 16 units. (A unit represents a course studied for one year.)

The subject recommendations in the following list represent the minimum requirements for entrance to the University. Allowances are made to permit students to pursue special areas of academic interest. Most applicants present more academic subjects than the minimum.

Required Units

Weinberg College of Arts and Sciences, the School of Communication, the School of Education and Social Policy, Medill School of Journalism, Media, Integrated Marketing Communications, and Bienen School of Music: 16 units, divided among the following academic areas:

- English: 4 units
- Foreign language: 2 to 4 units
- Mathematics: 3 to 4 units
- Laboratory science: 2 to 3 units
- History/social studies: 2 to 4 units
- Electives: 1 to 3 units in the above academic areas

Students preparing for college are strongly advised to take four years of work in English with as much emphasis

on composition as the curriculum allows. Two units of the same foreign language should be taken; three or four years are strongly recommended.

The McCormick School of Engineering and Applied Science requires a sound secondary school education as described above, with strong preparation in mathematics and science. Specifically recommended are

- Mathematics: 3½ to 4 units (the minimum requirements for mathematics include algebra [2 units], plane geometry [1 unit], and trigonometry [½ unit]; many entering McCormick freshmen will have taken calculus [1 unit])
- Science: 2 units (credit in both chemistry and physics is recommended)

Credit in other subjects should bring the total to 16 units or more, including 4 units of English and work in social studies and foreign languages.

Admission Notification

Northwestern offers freshman candidates a choice of two notification plans, Early Decision and Regular Decision. Early Decision is a binding admission commitment. Candidates accepted to Northwestern under Early Decision must withdraw all other university applications.

The table on the next page outlines these plans, the notification plans for transfer students, and the financial aid application procedure, including deadlines and the forms available through the College Scholarship Service.

Admission Procedure

To be considered for admission to Northwestern, candidates must complete the following three steps:

- Complete both the Common Application and the Northwestern University Writing Supplement. You may apply online at www.commonapp.org. (Instructions for applying on paper instead are found at www.ugadm.northwestern.edu/apply/instructions-and-methods.) Applications for admission may be submitted before candidates take the standardized tests required for college admission.
- Arrange with the officials of their high school to complete and forward the Secondary School Report to the Office of Undergraduate Admission. All candidates should have their records through the sixth semester sent to Northwestern as early in the senior year as possible. Regular Decision candidates should have seventh-semester grades sent as soon as they are available.
- Take standardized tests as described on pages 10 and 12.
- Present a music audition if applying for admission to the Bienen School of Music; follow the audition guidelines specified at www.music.northwestern.edu/admission/undergrad-audition.

Application to Dual Bachelor's Degree Programs

A student interested in taking advantage of the opportunity to receive bachelor's degrees from two different Northwestern undergraduate schools in five years must apply to both schools. It is possible to be admitted to only one or both schools, since applicants are considered for each school separately.

Programs available include the following:

- BA/BMus in liberal arts and music
- BS/BMus or BS/BAMus in engineering and music
- BSJ/BMus or BSJ/BAMus in journalism and music

To apply, select the program that interests you on the Northwestern University Writing Supplement.

For descriptions of these and other dual bachelor's degree programs, see page 28 in the Cross-School Options chapter.

Special Admission Programs

The following undergraduate programs at Northwestern have special application requirements.

Honors Program in Medical Education

The Honors Program in Medical Education provides simultaneous admission to undergraduate study and the Feinberg School of Medicine at Northwestern. Interested students must preapply by the due date. Those whose preapplications qualify receive the special HPME application to submit in addition to their regular Application for Admission to Weinberg College, the School of Communication (human communication sciences major only), or the McCormick School. (See the Application and Testing Deadlines table on page 12.)

For information about HPME, see page 29 in the Cross-School Options chapter of this catalog.

Integrated Science Program

A student wishing to be considered for Weinberg College's Integrated Science Program, which provides a rigorous background in the major scientific disciplines and mathematics and can lead to a bachelor's degree in three years, must complete the special ISP application (available at www.isp.northwestern.edu/admissions/applying.html). The Common Application and Northwestern University Writing Supplement are also required.

For information on ISP, see page 110 in the Weinberg College chapter of this catalog.

Mathematical Methods in the Social Sciences

A student interested in Weinberg College's program in Mathematical Methods in the Social Sciences, which is designed for students with high mathematical aptitude and strong interest in social problems and issues, must complete the special MMSS application (available at www.mmss.northwestern.edu/admission/freshman.html). The Common Application and Northwestern University Writing Supplement are also required.

For more information on MMSS, see page 120 in the Weinberg College chapter of this catalog.

APPLICATION AND TESTING DEADLINES: NOTIFICATION PLANS

Regular Programs for Fall Quarter Matriculation

Freshman candidates for other quarters should request information from the Office of Undergraduate Admission.

	Early Decision	Regular Decision
Apply by	November 1	January 1
Take SAT Reasoning Test or ACT Plus Writing by	November test	January test
If taking SAT Subject Tests, take by	November test	January test
To apply for financial aid, file CSS PROFILE by	December 1	February 15
and file FAFSA by	February 15	February 15
Northwestern releases its decision by	December 15	April 1
Applicant's reply and nonrefundable tuition deposit due by	February 1	May 1

Honors Program in Medical Education

	Regular Decision
HPME preapplication deadline	December 1
HPME application deadline	January 1
Submit freshman application to Northwestern by	January 1
Take SAT Reasoning Test (or ACT Plus Writing) by	December test
Take two SAT Subject Tests by	December test
To apply for financial aid, file FAFSA and CSS PROFILE by	February 15
Northwestern releases its decision by	April 1
Applicant's reply and nonrefundable tuition deposit due by	May 1

Transfer Students for Fall or Winter Quarter Matriculation

	Fall	Winter
Apply by	March 15	October 1
(Space is limited in some programs; apply well before the deadline.)		
Take SAT Reasoning Test or ACT Plus Writing by	March 15	October 1
(Scores from previous academic years are acceptable.)		
Apply for financial aid by	March 15	October 1
(Aid availability is limited; consult the Office of Undergraduate Admission.)		
Northwestern releases its decision as soon as possible after the application deadline; a reply is due within two weeks.		

Advanced Placement

In nearly all areas Northwestern awards credit for Advanced Placement Examination scores of 5; in some cases credit is also awarded for scores of 3 and 4. Specific questions concerning Northwestern's advanced placement policies should be addressed to the Weinberg College Office of Undergraduate Studies and Advising. In some fields advanced placement and/or credit can be earned through appropriate performance on examinations administered by Northwestern departments.

Northwestern awards credit for distinguished performance on the British General Certificate of Education (A-Level) Examinations, the higher-level examinations of the International Baccalaureate, and certain other foreign university entrance examinations.

Northwestern also recognizes college credits earned by students before entering the University as freshmen. To qualify for such recognition, the courses must be similar to courses offered at Northwestern, must have been taken at a college or university whose accreditation is recognized by Northwestern, must not have been submitted in partial fulfillment of the normal secondary school graduation requirement, and must have been given on the campus of a college or university and taken primarily by bona fide college students (i.e., high school graduates pursuing a college degree). If candidates have taken college courses that do not qualify for credit under these conditions, they should take Advanced Placement Examinations in the appropriate subjects.

Transfer Candidates

Students may be considered for admission as transfers from another college or university provided they have completed one full year of university studies by the application deadline, are in good standing at their postsecondary institution, and have maintained at least a B average in rigorous academic courses. If students have been enrolled full-time at any institution except Northwestern, they cannot be considered for freshman admission and must meet the criteria to apply as transfer candidates. Some undergraduate schools at Northwestern enroll transfer students in the fall quarter only. Transfer students must meet the relevant provisions of the Undergraduate Registration Requirement (see pages 17–18 for details).

Transfer Admission Procedure

To be considered for admission, transfer students must complete the following steps:

- Complete the Common Application and the Northwestern University Writing Supplement. Submit both online at www.commonapp.org.
- Arrange with the officials of the high school to forward the complete high school report to the Office of Undergraduate Admission.
- Submit results of the SAT Reasoning Test or the ACT Plus Writing.
- Arrange with the registrar of each college previously attended to forward transcripts of record to the Office of Undergraduate Admission.
- Request a statement of good academic and social standing from the dean of students at the college from which the student is transferring.
- Present a music audition if applying for admission to the Bienen School of Music (for audition guidelines, see www.music.northwestern.edu/admission/undergrad-audition).
- Submit application for admission before the March 15 deadline (for fall quarter admission) or the October 1 deadline (for winter quarter).

Evaluation of Credits

Transfer candidates who are accepted by Northwestern will receive a preliminary evaluation of the credits they have earned to date before matriculation, assuming all pertinent transcripts have been received. An official evaluation of credits earned will be made by the Office of the Registrar when an admitted student matriculates. To read the transfer credit policy, go to www.registrar.northwestern.edu/graduation/transferring_non-NU_Courses.html.

International Students

In addition to meeting all regular admission requirements, international students are required to present evidence of their ability to speak, read, and write the English language and to meet the financial obligations associated with their study at Northwestern. Students for whom English is a second language must present the results of either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). International students must have achieved outstanding school records to be considered for admission. International transfer candidates may apply for fall quarter admission only and must submit their completed applications by March 15.

Continuing Education Students

The School of Continuing Studies, Northwestern's continuing education division, offers an extensive range of programs and courses in Chicago, Evanston, and online for adult students seeking personal enrichment or professional mobility, preparation for graduate study, or pursuit of a degree or a certificate.

SCS allows adults with a college degree, or some college credit and good standing, or a high school diploma but no prior college work to enroll in courses as students at large. Students who wish to earn a degree or a certificate should speak with an academic adviser about admission.

More information about SCS is available on its website, www.scs.northwestern.edu.

Special Students

Properly qualified persons who demonstrate a need for certain courses required for their academic or professional advancement may apply to the University as special nondegree-seeking students. Applicants must present official transcripts of previous study and show evidence of successful academic achievement. Persons who do not meet these requirements should not apply.

Enrollment as a special student does not constitute admission to any degree program at the University, and credits earned as a special student may not be counted toward a degree at Northwestern. (Exception: Special students who subsequently become eligible for admission into the School of Continuing Studies may apply these credits toward a degree.) Special students are granted academic credit for coursework satisfactorily completed, and these credits may be transferred to another institution.

Special students are admitted with the understanding that they may register only after students working toward Northwestern degrees have registered. Some classes will be closed, and some schools or departments may not accept nondegree students. These restrictions do not apply to Summer Session.

Special students are not permitted to enroll in 399 or 499 Independent Study courses.

All tuition and fees for special students are charged at the undergraduate rate. Complete instructions and application forms may be obtained from the Office of Special Students, Northwestern University, 405 Church Street, Evanston, Illinois 60208. For more information see www.scs.northwestern.edu/program-areas/summer/undergraduate-visiting-students/nondegree-special-students.php.

Auditors

Auditors are persons who enroll in a course to observe or listen only; they are not permitted to engage in class discussion, submit written or oral assignments, or take examinations, and they do not receive academic credit. Auditors are charged a special tuition rate. Degree-seeking students may not audit classes. Summer nondegree students are occasionally permitted to audit classes. Consult with the Office of Special Students or the School of Continuing Studies.

FINANCIAL AID

The University awards financial aid on the basis of need as determined by the financial circumstances of the family. Aid may consist of a loan, part-time employment, a grant or scholarship, or a combination of these. The funds may come from state, federal, institutional, or private sources. Students are required to reapply for financial aid each year and maintain the requirements established by the Financial Aid Committee. The amount of aid may change based on the family's financial circumstances.

For entering freshmen, financial aid is generally renewable for a maximum of 12 quarters of full-time enrollment or its equivalent. Students in the liberal arts and music, engineering and music, or journalism and music five-year dual degree programs are eligible to receive aid for a maximum of 15 quarters of full-time enrollment or its equivalent. Students must be enrolled in the dual degree program by the end of their sophomore year. A student who later decides to pursue only one degree reverts to a maximum eligibility of 12 quarters.

For transfer students, the maximum number of quarters of assistance depends on the number of quarters of transfer credit accepted as determined by the Office of the Registrar (e.g., a student who transfers with 3 quarters of acceptable credit would be eligible for 9 quarters of assistance).

If a student has been enrolled and has not applied for or received financial aid, all quarters of enrollment to date count toward the maximum eligibility.

Students who are unable to complete their degree in the allotted quarters of assistance may petition the Financial Aid Committee for an additional quarter of eligibility.

In the 2012–13 academic year undergraduate students at Northwestern received nearly $133 million in grant assistance—approximately $119 million from Northwestern, $9 million from federal and state governments, and $5 million from outside sources. The average Northwestern need-based grant for students receiving aid was $33,000. In addition, $13.5 million in loan assistance and more than $4 million in "self-help" aid through campus employment were available. Sources of assistance that is not need based—including the Reserve Officers Training Corps—are discussed in the Northwestern publication "Financial Aid at Northwestern," distributed by the Office of Undergraduate Admission. For more information consult www.ugadm.northwestern.edu/freshman/financing.

Who Should Apply

Any undergraduate students who believe they cannot afford the full cost of a Northwestern education may apply for financial aid.

Application Procedure

Applicants request consideration for financial aid when submitting the Application for Admission. The Financial Aid Committee cannot make a decision until the University has admitted the applicant. Candidates should do the following:

- Complete and submit the Common Application and the Northwestern University Writing Supplement.
- File the Free Application for Federal Student Aid (FAFSA) and the College Scholarship Service/Financial Aid PROFILE (CSS PROFILE) and request that copies of both reports be sent to Northwestern.

- Submit parent and student federal tax returns to the College Board's Institutional Documentation Service.
- File the applications as soon as the need for assistance is realized but not later than the dates indicated in the table titled Application and Testing Deadlines: Notification Plans (page 12).

Returning students should consult the website http://undergradaid.northwestern.edu for reapplication instructions, deadlines, and updated policies.

Students are expected to consult their accounts on CAESAR to verify that all required applications and additional information have been received by the Office of Undergraduate Financial Aid.

Registration Status and Financial Aid

For financial aid purposes, full-time students are defined as those who are registered and billed for 3 to 5.5 units of credit in an academic quarter; those registered for 2 to 2.99 units are considered half-time; those registered for fewer than 2 units are less than half-time. (Note that students who register for more than 5.5 units may be subject to overload tuition charges, and some schools require these students to obtain the approval of the dean before registering.) All quarters of full-time registration are counted toward the maximum number of quarters of financial aid eligibility (12 quarters in most cases). Each quarter of half-time status counts as .5 quarter. Any quarter of less than half-time status is not counted toward the maximum eligibility.

Students with less than half-time status are not eligible for financial aid from Northwestern but may have limited eligibility for federal aid. Students awarded aid at full-time status who reduce to half-time or less than half-time status will have their aid adjusted accordingly. Students may not receive additional aid to pay any overload tuition charges they incur.

Students considering a change of registration status should contact the Office of Financial Aid to determine how the change might affect their aid awards or quarters of eligibility. A detailed explanation of aid eligibility and adjustment policies is provided on the Office of Undergraduate Financial Aid's website, http://undergradaid.northwestern.edu. The Financial Aid Committee considers appeals for variances to these policies on a case-by-case basis.

Satisfactory Academic Progress and Financial Aid

Students are required to maintain satisfactory academic progress in order to stay eligible for federal student aid funds. For Northwestern students, SAP means the successful completion of at least 67 percent of the course units attempted in an academic year (e.g., a student who registers for a total of 12 quarter-courses a year must complete at least 8 to maintain SAP). Withdrawn, incomplete, and repeated courses are counted as attempted course units.

In addition, students must attain a GPA of 2.0 or better by the end of their second academic year and every year thereafter in order to meet SAP requirements. This GPA minimum may differ from a school's academic requirements, which are outlined in its chapter in this catalog.

A student may not continue to receive federal aid beyond a maximum time frame, which is 150 percent of the degree program's published length as measured in academic units. All transfer credits are counted toward the maximum time frame. The total number of units required for a bachelor's degree is specified in each school's chapter in this catalog; the website of the Office of Undergraduate Financial Aid notes the maximum time frames calculated in terms of credits required for degree completion.

A student who fails to maintain SAP as described above will lose financial aid eligibility. He or she will receive notification from the Office of Undergraduate Financial Aid and have the opportunity to appeal the cancellation and request a probationary period of aid. The appeal must be submitted to the Office of Undergraduate Financial Aid within two weeks of SAP failure notification. In some cases, an appeal will not be considered until the student has met with his or her academic adviser to determine an academic plan for completing the degree.

If awarded a probationary quarter of aid through the appeal process, the student must successfully complete 67 percent of the coursework attempted during the probationary quarter. Students who are required to submit an academic plan must meet its conditions in order to satisfy SAP requirements. SAP failure during the probationary quarter will result in the loss of further financial aid eligibility.

A student who is denied a probationary quarter or forgoes the appeal process may reestablish eligibility by successfully meeting SAP requirements without federal or institutional assistance.

Students returning to the University after academic dismissal must submit an SAP appeal before they will be considered for financial assistance.

When students have been in attendance at Northwestern for 12 quarters or the equivalent, they are not eligible for further institutional financial assistance even if they continue to maintain SAP. The only exceptions are students admitted to the liberal arts and music, engineering and music, or journalism and music five-year dual degree programs; these students are eligible for University funds for up to 15 quarters of enrollment. Students pursuing other dual degree opportunities are eligible for federal and state funding only.

The Financial Aid Committee may grant a continuation of aid when unusual circumstances exist and students demonstrate academic promise. More detailed information

regarding satisfactory academic progress is available on the Office of Undergraduate Financial Aid's website.

FINANCIAL REGULATIONS

Tuition and Fees

The cost of education at Northwestern is only partly covered by tuition charges. The balance is met by the income from invested funds and by the gifts of alumni and other supporters of the University.

Tuition and fees listed here are for 2013–14. Rates are subject to change without notice, and increases should be expected in subsequent years. For tuition purposes, "course" refers to course credit. Some course offerings carry more than 1 course credit.

All undergraduate degree–seeking students must conform to the Undergraduate Registration Requirement (see page 17).

Undergraduate Tuition: Degree-Seeking Students

Full-time tuition: each quarter	$15,040

Full-time registration is 3 to 5.5 units of credit in a quarter. Students taking more than 5.5 units may be subject to an overload charge.

Undergraduate Tuition: Nondegree-Seeking Students and Exceptions

Full-time tuition (3–5.5 units): each quarter	$15,040
Registration exceptions (fewer than 3 units or more than 5.5): each course, each quarter	$5,352

Fees

Tuition deposit (nonrefundable; new students only)	$400
Application fee (not refundable)	$65
Housing deposit	$200
Student activity fee: per quarter	$54
Athletic events fee	$45
Health Service fee (new students only)	$200
Aetna Student Health insurance	$3,067
Study abroad enrollment fees (nonrefundable):	
Semester or quarter	$2,440
Academic or calendar year	$3,990
Dual program	$3,225
Late registration fee	$25; $30 if billed
Retroactive registration fee	$225
Late payment penalty fee	$200
Returned check service fee	$35
Replacement WildCARD fee	$15
Transcript fee (electronic/paper)	$8/$10

Bills and Payments

The Office of Student Accounts issues student bills. A due date is shown on each University bill, and payment must be received by that date. Failure to receive bills is not sufficient cause to extend due dates.

Electronic Billing and Payment

Northwestern's preferred means of transmitting bills and receiving payments for tuition and fees is QuikPAY. Free to students and authorized payers such as their parents, it provides email notification of new bills, allows online payments, and offers the option of receiving paper bills.

Installment Payment Plan

The University provides a tuition and fee installment payment plan, 9PAY, which offers the benefit of dividing the educational costs for the academic year into nine monthly payments without incurring finance or interest charges.

Additional Information

For additional information about bills and payments or 9PAY, visit www.northwestern.edu/sfs or contact the Office of Student Accounts, 555 Clark Street, Evanston, Illinois 60208-1221, phone 847-491-5224, fax 847-467-2451.

Withdrawal from the University: Refunds

Students who withdraw from the University must immediately file a withdrawal form, available at the Office of the Registrar. The completed form, bearing the required signatures, must be filed at the Office of the Registrar.

The Office of Student Accounts considers the date the completed form is received at the Office of the Registrar as the effective date in making financial adjustments.

Tuition deposits are not refundable under any circumstances. Tuition, less the tuition deposit, and refundable fees are refundable depending on the percentage of time the student was enrolled in the quarter. The following policy applies to withdrawals:

- When or before the first 10 percent of the quarter has elapsed, 100 percent of the tuition (less the deposit) is refunded.
- After 10 percent but not more than 25 percent of the quarter has elapsed, 75 percent of the tuition is refunded.
- After 25 percent but not more than 50 percent of the quarter has elapsed, 50 percent of the tuition is refunded.
- After 50 percent of the quarter has elapsed, no refunds are given.

Residence and meal contracts are signed for the full school year. Students who leave a residence before the end of the year are liable for the entire year's rent or for charges up to the date another student takes the vacated space. Meal charges are assessed until the end of the week in which withdrawal is in effect. Adjustments may be made at the discretion of Residential Services for students who for financial reasons must make room and board arrangements other than those for which they first contracted.

Financial aid recipients who withdraw from the University may be required to return a portion of their Title IV funds to the federal programs as well as some of their state

assistance, outside scholarships, and/or institutional financial aid. Three different calculations—the Institutional Refund, Return of Title IV Funds, and Return of Non-Title IV Funds—are used to determine such repayments. Students may request samples of the applications of these refund policies from the Office of Student Accounts or the Office of Undergraduate Financial Aid.

Changes of Registration

No refund or bill reduction is made on any course dropped after the fifth day of classes in the quarter.

Financial Obligations

Students whose University bills are overdue may not be given an academic transcript until all financial obligations are paid in full. Students whose accounts are overdue must pay a late payment penalty fee of $200. The director of student accounts may cancel or prevent the registration of a student whose bills are past due.

Each student is liable for any costs associated with the collection of his or her past-due account, including but not limited to collection agency costs, court costs, and legal fees.

Supplemental Enrollment Benefit

Students who are unable to complete bachelor's degree requirements in 12 quarters due to circumstances beyond their control, and who have paid full-time tuition to Northwestern for 12 quarters, may petition the Registration Requirement Appeals Committee to enroll in their final quarter at no additional tuition charge. Transfer students who have paid full-time tuition to Northwestern for 9 quarters are also eligible. Students may submit a written petition to their degree auditor in the Office of the Registrar. It must be specific and document any unusual or mitigating circumstances such as illness, family hardship, or a death in the family. Students should also submit a letter of support from an academic adviser who is familiar with their situation. The Registration Requirement Appeals Committee convenes on a regular basis to review petitions.

A final quarter at no tuition charge is not available for students who choose a program that may take more than 12 quarters to complete or for students who have graduated. A final quarter at no charge is also not available for students who choose an optional program, such as study abroad, a double degree, double major, minor, or extra coursework beyond that normally required for the degree. For further information students should contact their degree auditor in the Office of the Registrar.

UNDERGRADUATE REGISTRATION REQUIREMENT

The Undergraduate Registration Requirement applies to undergraduate students seeking a bachelor's degree and must be completed in addition to the degree requirements established by the various school faculties. Each school specifies a minimum number of units of credit needed for a bachelor's degree (45 or more, depending on the degree). The URR specifies the number of quarters a student must be registered at Northwestern and how much credit must be earned at Northwestern. It is predicated on the principle that when a student receives a bachelor's degree from Northwestern University, the majority of the student's academic work is completed at the University.

For the purposes of the URR, the following definitions apply:

- Being "registered at Northwestern" for a quarter means that during that quarter the student is registered for and completes Northwestern coursework worth at least 2 full units of credit under the supervision of Northwestern faculty members. Eligible coursework includes, for instance, the practicum in the School of Education and Social Policy and the Journalism Residency in the Medill School of Journalism, Media, Integrated Marketing Communications. It does not include the Walter P. Murphy Cooperative Engineering Education Program or most study abroad credits (see exception below).
- For counting number of quarters, a credit-bearing course is considered completed if a student receives any of the following grades: A, B, C (including pluses and minuses), D, F, P, N, X, Y, K, or W.
- Only credits earned (not just attempted) count toward the minimum units of credit needed. Thus, only courses in which the student receives an A, B, C (including pluses and minuses), D, or P are included.

The provisions of the URR are as follows:

- A student entering as a freshman in a four-year degree program must be registered at Northwestern for at least 9 quarters and earn credit for courses worth at least 32 units at the University.
- A student entering as a freshman in a dual bachelor's degree program must be registered at Northwestern for at least 12 quarters and earn credit for courses worth at least 42 units at the University. See page 28 in this catalog for information on approved dual bachelor's degree programs.
- A student entering as a transfer student in a four-year degree program must be registered at the University for at least 6 quarters and earn credit for courses worth at least 23 units at the University.
- A student entering as a transfer student in a dual bachelor's degree program must be registered at Northwestern for at least 9 quarters and earn credit for courses worth at least 32 units at the University. See page 28 in this catalog for information on approved dual bachelor's degree programs.
- Students in Northwestern's Honors Program in Medical Education and Integrated Science Program are subject

to special URR regulations; refer to the programs' websites for details.
- As noted above, most study abroad credit does not count toward the URR. There is one exception: Some Northwestern study abroad programs offer courses with Northwestern course numbers and the "SA" course designation. A student who completes at least 2 full units of credit in such courses during a quarter is considered to be registered at Northwestern for that quarter, and this credit will count toward the minimum needed to satisfy the URR. Transfer credit for study abroad courses that do not carry Northwestern course numbers and the SA designation will not be counted toward the URR.

A student may appeal for a URR variance to the Registration Requirement Appeals Committee, which consists of the associate provost for University enrollment, the associate provost for undergraduate education, the University registrar, and two associate or assistant deans from different undergraduate schools. The deans serve three-year terms on a rotating basis. The student should submit a written petition to the degree auditor in the Office of the Registrar. The petition must be specific and document any unusual or mitigating circumstances, such as illness, family hardship, or a death in the family. The student should also submit a letter from an academic adviser who is familiar with the situation. The Registration Requirement Appeals Committee convenes on a regular basis to review petitions.

For additional information, interpretation, or application of the URR, contact the Office of the Registrar, 633 Clark Street, Evanston, Illinois 60208-1118, 847-491-5234, or nu-registrar@northwestern.edu.

Returning Students

Students who withdraw from the University and wish to return must submit a Returning Student Application Form to the Office of the Registrar six weeks before the desired date of reentry. Students who want credit for course work taken at another institution must submit an official transcript to the Office of the Registrar.

ACADEMIC REGULATIONS

Registration for All Students

Students register for classes using the CAESAR online system. The Office of the Registrar maintains a complete, up-to-date online class schedule, found by selecting the "Search for Classes" link at www.northwestern.edu/caesar.
- A quarterly reference copy of the class schedule may be downloaded from www.registrar.northwestern.edu/registration.
- The dates of registration for each quarter are announced in advance. Late registration is permitted only through the fifth full day of classes in any quarter.
- Credit is not given for work in a course in which a student is not properly registered.
- When courses designed to be taken once are repeated, all attempts remain on the student's record and are used to compute the cumulative grade point average. However, credit is awarded only once, following the attempt that resulted in the highest grade.
- Waiver of prerequisites for admission to a course may be obtained from the course instructor.

Changes of Registration

Changes in registration in fall, winter, and spring quarters are subject to the following provisions:
- In no case may a course be added after the fifth day of classes. No course may be dropped after the sixth Friday of classes.
- Undergraduate students may change grading options from grade to the pass/no credit (P/N) option or vice versa through the third Friday of the quarter. Check regulations of the individual schools for specific information on the P/N option.
- To add a class, students must log on to CAESAR and add the course to their record. Consent of the department or instructor may be required. See the class schedule for specific course information.
- To drop a course, students must log on to CAESAR and drop the course from the record. In most cases no special consent is required.
- Changes in ungraded sections (laboratory or discussion) before the add deadline must be made in CAESAR. Changes in ungraded sections after the add deadline may be made in the department and do not require notifying the registrar.
- A course dropped by the sixth Friday of a quarter does not appear on the permanent academic record, and no grade is recorded.
- Failure to drop a course within the time allowed may result in a failure and may be recorded with a grade of F.

(See also Withdrawal from the University: Refunds and Change of Registration under Financial Regulations.)

Registration in the School of Continuing Studies

The School of Continuing Studies, with locations in Evanston, Chicago, and the Chicago Loop, offers courses designed primarily for working adults. Students enrolled in an undergraduate school at Northwestern may take SCS courses for credit only with the approval of their school's dean or their faculty adviser, and generally only when the courses are not given during the day or when there are clear cases of conflict. SCS students have priority, so enrollment of undergraduate day students in SCS courses is capped. Registrations are processed on the first day of the quarter, and priority is given to students who need a course to complete a major.

To register for SCS courses, students must

- Pick up a Dual Registration Form from the Office of the Registrar in Evanston.
- Secure the required approvals.
- Turn in the form at the Office of the Registrar in Evanston as soon as possible before classes start.

Interschool Transfers

Undergraduate students who wish to transfer from one school or college of the University to another must have an interschool transfer approved by the dean's office of each school. A return to the original school must be approved in the same way. Approval of an interschool transfer is usually contingent on satisfactory performance in the original school. The policy concerning interschool transfer can be found at www.registrar.northwestern.edu/graduation/Inter-School_Transfers.html. Consult the academic calendar at www.registrar.northwestern.edu/calendars for interschool transfer application processing dates.

Cancellation of Registration

Students who register for a quarter and later decide not to attend must notify the Office of the Registrar in writing before the first day of classes of the quarter to avoid being charged the applicable tuition and fees.

Withdrawal from the University

Students who wish to withdraw from the University after registering for classes in any quarter must file a withdrawal form (available at the Office of the Registrar). The withdrawal takes effect the day the completed form, bearing the required signatures, is received at the Office of the Registrar. Students who have taken the final exam may not withdraw and must take the grade they earned. (See also Withdrawal from the University: Refunds under Financial Regulations.)

Readmission to the University

Undergraduate students who have not registered for one or more quarters of an academic year must file an application to reenter at the Office of the Registrar no later than six weeks before the first day of registration of the quarter in which they plan to return.

Application to reenter is not required if students have

- Registered during the spring quarter and intend to return in the fall
- Registered in the spring quarter and intend to return during Summer Session of the same year

Students must obtain advance approval from the dean of their school if they wish to transfer credit for work taken elsewhere during an absence from Northwestern. An official signed and sealed transcript of that work must be furnished to the Office of the Registrar before the end of the next quarter in residence at Northwestern, or credit for such work is not allowed.

If a student interrupts a program of study for an extended period of time and if degree requirements are changed during this period, the new requirements normally must be met. Any modification of the requirements is made by the appropriate administrative officers of the school in which the student is registered.

Work at Other Institutions

After enrolling at Northwestern, students who want to study at other accredited institutions and transfer credit for that work to Northwestern must obtain advance approval of their proposed course of study. A petition for credit for non-Northwestern courses may be filed at www.registrar.northwestern.edu/graduation/transferring_non-NU_Courses.html.

Students may not register concurrently at Northwestern and at another institution and receive transfer credit for work taken at the other institution unless permission is granted in advance by the office of the dean of their school. This applies to evening courses as well as to regular courses in residence.

If courses are taken elsewhere during an absence from Northwestern (or during the summer), an official transcript of the work must be on file in the Office of the Registrar before the end of the next quarter in residence at Northwestern, or credit for such work is not allowed.

Petition to Graduate

Undergraduate students should submit a graduation petition one calendar year before they expect to graduate. Students in Weinberg College, the School of Communication, the School of Education and Social Policy, the Medill School of Journalism, Media, Integrated Marketing Communications, and the Bienen School of Music submit petitions to the Office of the Registrar; McCormick School students submit petitions to their school's academic services office. Failure to petition in a timely fashion may delay graduation or result in omission of the student's name from the printed Commencement program.

For additional information, see www.registrar.northwestern.edu/graduation.

Academic Advising

Academic advising is an essential component of an undergraduate education. All freshmen are assigned an academic adviser through their school. Returning students may obtain academic advice through their major department and from the dean's office of their school. Specialized advice on academic issues that transcend school boundaries—such as study abroad or field studies options—may be obtained from the University Academic Advising Center.

In addition to meeting with an academic adviser on a regular basis, students should routinely check their degree progress report—accessible via CAESAR—to ensure that they are meeting their degree requirements; any concerns

about progress or discrepancies in the report should be promptly discussed with an adviser.

Classification of Students

Students are classified as follows:

- Senior: has completed at least 33 units
- Junior: has completed at least 22 but less than 33 units (engineering co-op students are considered preseniors when they have completed 32 units and seniors when they have completed 40 units)
- Sophomore: has completed at least 11 but less than 22 units
- Freshman: has completed less than 11 units
- Graduate student: has a bachelor's degree or equivalent and has been admitted to a graduate program
- Special student: is not working toward a degree at Northwestern but is working for credit
- Auditor: attends classes and listens to lectures but is not eligible to participate in class discussions or exercises and does not receive credit (not available to degree-seeking students)

For loan deferment and enrollment verification purposes, student status is defined as follows:

- Full-time: enrolled in at least 3 units or the equivalent
- Half-time: enrolled in at least 2 but fewer than 3 units or the equivalent
- Part-time: enrolled in fewer than 2 quarter-courses or the equivalent (also referred to as less than half-time)

Grading Policies

The following grading system is used in computing the grade point average:

Grade	*Grade Points*
A	4.0
A-	3.7
B+	3.3
B	3.0
B-	2.7
C+	2.3
C	2.0
C-	1.7
D	1.0
F	0
X Failed to earn credit: missed final examination	0
Y Failed to earn credit: work incomplete	0

The following notations are ignored in computing the grade point average:

P Pass with credit
N No grade, no credit
K In progress
S Satisfactory: noncredit course
U Unsatisfactory: noncredit course
W Withdrawn by permission
NR No grade reported by instructor

Class Rank

Northwestern University does not rank its students.

Pass/No Credit (P/N)

Many undergraduate courses are open to the P (pass) or N (no credit) option, which allows full-time students to explore fields beyond their areas of specialization without concern about grade point average. Students may exercise the P/N option in classes designated with "Student Option" grading in CAESAR. For information about a particular school's P/N policy, see that school's chapter in this catalog.

Incomplete Coursework

At the end of a quarter a grade of X (missed final exam) or Y (work incomplete) will be given only if the instructor believes the student has a reasonable chance of passing the course by taking an examination or turning in the required work, or both. Some undergraduate schools prohibit the posting of X or Y grades without the approval of the dean's office. Students should contact their school for its regulations concerning X and Y grades.

If a grade of X or Y is to be changed and credit established, the deficiencies must be made up before the end of the next quarter in which the student is in residence in any school of Northwestern, or within one year after the course was offered if the student is not in residence, or credit is forfeited.

Regular Examinations

Regular course examinations are held during the last week of each quarter at the times indicated in the quarterly class schedule, accessible via CAESAR and at www.registrar.northwestern.edu/registration. Summer Session examinations are usually held at the last class meeting. Students are responsible for knowing the time and location of each examination. Early examinations are not permitted. Both the instructor and the dean may permit a student to be absent from the final examination for cause beyond the student's control; normally such permission must be secured in advance of the date of the examination. Any deficiency must be made up before the end of the next quarter in which the student is in residence in any school of Northwestern, or within one year after the course was offered if not in residence, or credit is forfeited.

Makeup of Coursework and Examinations

All undergraduate students in residence in any school of Northwestern University must make up grades of X (missed final exam) and Y (work incomplete) before the end of the next quarter, or credit is forfeited. Students not in residence must make up all such grades within one year after the course was offered; they must also apply in advance to take any makeup examinations. Makeup examinations are conducted by the departments concerned early

in each quarter, and in most cases the student must file an application in advance at the office of the school in which the course is offered. (Applications for makeup examinations are due by specific dates on the academic calendar; see www.registrar.northwestern.edu/calendars.)

Class Attendance and Absence

Students are expected to attend all sessions of the courses for which they are registered. Excessive absence is cause for failure in the course. Some courses require attendance at the first class meeting; students may be dropped for nonattendance. Such courses are designated in CAESAR as "First Class Mandatory."

Grade Reports

Quarterly grades are not mailed but are delivered online through CAESAR. A printout of the CAESAR record may be made for verification purposes. Notices of deficiencies in scholarship may be reported to the student before the end of the quarter, but the University does not assume the responsibility of issuing such warnings.

Northwestern University Transcripts

Students who have satisfied all financial obligations to the University are entitled to an official transcript of their academic record, which they may request from the Office of the Registrar in person, by fax, or through CAESAR. Northwestern provides transcripts either on paper or in the form of a certified PDF that may be distributed securely. A fee is charged for all transcripts (see Fees under Tuition and Fees).

Except for internal educational uses or as otherwise required by law, Northwestern issues official transcripts only upon written authorization of the student concerned. Requests for transcripts initiated by persons or agencies other than the student or appropriate educational agencies will not be filled until written authorization has been secured from the student. When these requests can be anticipated, students can avoid delay by providing such authorization in advance. Because of the confidential nature of a student's record, telephone or email requests for transcripts will not be accepted.

Current students may use CAESAR to request an official transcript from the Office of the Registrar or to print unofficial copies for their personal use. Former students may order an official transcript by following the instructions at www.registrar.northwestern.edu/academic_records/obtaining_a_transcript.html. The site provides full information on the University's policies and procedures governing academic records.

Transcripts from Other Institutions

Northwestern neither releases nor certifies copies of transcripts received from other schools or institutions. Students who study abroad and subsequently need a transcript of their coursework must request it from the institutions they attended or through their study abroad programs.

Access to Student Records

Under the Family Educational Rights and Privacy Act, all students have certain rights with regard to their educational records. Northwestern's student records policy is available at www.registrar.northwestern.edu/academic_records/FERPA_policy.html.

FERPA grants students various rights, including the rights to

- Inspect and review their educational records at Northwestern University
- Request an amendment of their records to ensure that the records are not inaccurate, misleading, or otherwise in violation of privacy or other rights
- Consent to release or to restrict disclosure of personally identifiable information contained in their educational records, except under certain limited circumstances when, by law, consent is not required
- File a complaint with the US Department of Education concerning alleged failures by Northwestern University to comply with FERPA requirements

The University's Use of Email

Email is the University's mechanism for official communication with students, and Northwestern has the right to expect that students will read official email in a timely fashion.

All students are assigned a "u.northwestern.edu" address that is maintained in the University email directory. Northwestern provides a convenient mechanism for students who want to forward email from the University address to another email address of their choice, but students assume the risk of forwarding email. Failure to receive or read University communication that was sent to the "u.northwestern.edu" address does not absolve a student from knowing and complying with the content of the communication.

Faculty may use email for communicating with students registered in their classes so that all students will be able to comply with course requirements.

Academic Integrity

Academic integrity at Northwestern is based on a respect for individual achievement that lies at the heart of academic culture. Every faculty member and student belongs to a community of scholars in which academic integrity is a fundamental commitment.

Students enrolled at Northwestern are expected to adhere to the University's standards of academic integrity.

Questions about the acceptability of specific behavior should be addressed to the appropriate faculty member or school dean. The following is a nonexhaustive list of types of behavior that violate the standards of academic integrity:

- *Cheating:* using unauthorized notes, study aids, or information on an examination; altering a graded work after it has been returned, then submitting the work for regrading; allowing another person to do one's work and submitting that work under one's own name; submitting identical or similar papers for credit in more than one course without prior permission from the course instructors
- *Plagiarism:* submitting material that in part or whole is not entirely one's own work without attributing those same portions to their correct source (material discussing the use and acknowledgment of sources is available in the Office of the Provost)
- *Fabrication:* falsifying or inventing any information, data, or citation; presenting data that were not gathered in accordance with standard guidelines defining the appropriate methods for collecting or generating data and failing to include an accurate account of the method by which the data were gathered or collected
- *Obtaining an unfair advantage:* stealing, reproducing, circulating, or otherwise gaining access to examination materials prior to the time authorized by the instructor; stealing, destroying, defacing, or concealing library materials with the purpose of depriving others of their use; unauthorized collaborating on an academic assignment; retaining, possessing, using, or circulating previously given examination materials, where those materials clearly indicate that they are to be returned to the instructor at the conclusion of the examination; intentionally obstructing or interfering with another student's academic work; otherwise undertaking activity with the purpose of creating or obtaining an unfair academic advantage over other students' academic work
- *Aiding and abetting dishonesty:* providing material, information, or other assistance to another person with knowledge that such aid could be used in any of the violations stated above; providing false information in connection with any inquiry regarding academic integrity
- *Falsification of records and official documents:* altering documents affecting academic records; forging signatures of authorization or falsifying information on an official academic document, grade report, letter of permission, petition, ID card, or any other official University document
- *Unauthorized access to computerized academic or administrative records or systems:* viewing or altering computer records; modifying computer programs or systems; releasing or dispensing information gained via unauthorized access; interfering with the use or availability of computer systems or information

It is the responsibility of every member of the academic community to be familiar with the specific policies of his or her school. A student who violates these policies may be subject to sanctions, including but not limited to one or more of the following: a letter of warning; a defined period of probation with the attachment of conditions; a period of suspension with or without the attachment of conditions; course failure; notation on the official record; exclusion from the University, with notation on the transcript; or revocation of an awarded degree. A student may not change his or her registration in a course in which a violation of academic integrity has been alleged, regardless of whether the allegation has been referred to the designated school official. Nor may a student receive a University degree while a finding is pending or while a suspension has been imposed pursuant to a finding. Information on procedures that will be followed in cases of alleged violations of academic integrity may be obtained from the dean's office of each school. This will include information regarding how decisions may be appealed to the appropriate University officials, up to and including the University provost. A complete statement of the University's principles regarding academic integrity may be obtained from the Office of the Provost at www.northwestern.edu/provost/students/integrity.

Academic Standing

The faculty of the school in which a student is enrolled determines the academic standing of that student.

Academic probation constitutes notice of unsatisfactory academic performance; it is a warning that minimum standards for graduation are not being met. Unless a student demonstrates significant scholastic improvement during the period of probation and thereby indicates ability to fulfill degree requirements within a reasonable period of time, the student may be dismissed from the University. A student will be notified in writing no later than the middle of a term that, because of unsatisfactory work in a previous term or terms, he or she will be excluded in the event of unsatisfactory work during the term for which the notice is issued.

Academic Probation

The following are ordinarily placed on academic probation:

- Students who have received final grades below C in 2 or more courses in any term
- Sophomores, juniors, or seniors who have a cumulative academic record below a C average on all work attempted at Northwestern University
- Students who have failed to complete at least 3 quarter-courses or the equivalent in each of 2 consecutive quarters

- Students who, on account of dropped courses, failure, or uncompleted courses, have failed to earn credit for an average of 3 quarter-courses per quarter after 6 quarters of residence
- Students who have failed to maintain a C average in the major or a professional field of study

The faculty of each school may impose such additional conditions of academic probation as they may deem appropriate.

Removal from Academic Probation

Students on academic probation are ordinarily removed from probation if the deficiencies that resulted in probation have been remedied during the next succeeding quarter in residence. Students are rarely removed from probation on the basis of a program consisting of less than 4 courses graded on a basis other than the pass/no credit option.

If students on probation who receive grades of X or Y are not dismissed, probation continues until they have completed all courses or until the end of the next quarter in residence, when the students' records are again subject to scrutiny.

In no case are students removed from probation at the end of a quarter in which they have failed any course.

Academic Dismissal

The following is a partial list of categories of students who may be dismissed for academic deficiencies (in every case the decision is determined in part by the student's cumulative academic record):

- Students on academic probation whose academic records have not improved significantly during the period of probation (which will not normally exceed 2 consecutive quarters)
- Students not on academic probation who fail in half the work in any quarter or Summer Session
- Students who demonstrate flagrant neglect of academic work at any time
- Students who do not make satisfactory progress toward completion of degree requirements

As a matter of general policy, the probation period for a freshman may be extended to the third quarter of residence if such extension appears to be in the best interests of the student and the University. Such consideration is not granted to a freshman whose record clearly discloses lack of aptitude or flagrant neglect of work.

Disciplinary Dismissal

Students suspended from Northwestern by the University Hearing and Appeals Board or the Sexual Assault Hearing and Appeals System may not receive Northwestern credit for academic work at any other institution during the period of suspension.

HONORS AND PRIZES

Graduation with School Honors

Degrees with honors are determined by grades in all work at Northwestern University and are awarded to the top 25 percent of the students in each school who complete graduation requirements. Spring quarter graduates in the highest 5 percent of the school's class are awarded degrees summa cum laude; those in the next 8 percent, magna cum laude; and those in the next 12 percent, cum laude. Graduation honors are not announced before June Commencement, and the GPA cutoffs for each level of honors based on the stated percentages are not made public. Students who complete degrees in the summer, fall, or winter quarter are awarded school honors based on the GPA cutoffs established by the prior spring quarter's graduating class.

Graduation with Departmental Honors

Departmental honors may be granted to graduating seniors who have done outstanding work in a department in connection with a research project or work of an integrative nature. Students are nominated for these honors by their departments. The faculty of the school concerned makes the final awards. See the school chapters of this catalog for more information on departmental honors.

Honorary Organizations and Prizes

Students who qualify by reason of superior scholarship or other outstanding achievement are eligible for membership in certain honorary societies. Some of these recognize outstanding performance within one of the undergraduate schools, while others recognize distinction in a specific field of study, certain extracurricular options, or other endeavors.

In addition, several prizes established through gifts and endowments are awarded each year to undergraduate students. Some are all-University prizes, and others are available only to students in the school, department, or program that administers the awards. Prizes may recognize past achievements or provide students with funding for research projects or creative activities. See the section on support for undergraduate research endeavors on page 25.

SPECIAL ACADEMIC OPPORTUNITIES

Second Majors, Minors, and Certificates

Some students complete two majors or supplement their major with a minor and/or certificate. Often these programs are in the same undergraduate school, but completing programs in two or more schools may also be an option. See the relevant school and department sections in this catalog for details.

Self-Designed Major

A self-designed major permits students, with the permission of the school's curriculum committee or dean, to concentrate advanced study in an area other than one of those recognized through a departmental or interdisciplinary major. This option is identified as an ad hoc major in Weinberg College and the Bienen School of Music and as the Combined Studies Program in the McCormick School.

Dual Bachelor's Degree Programs

Qualified students may undertake a program to receive bachelor's degrees from two different undergraduate schools at Northwestern. Five years of full-time study are usually required. The following options are available:

- BA/BS in liberal arts and engineering
- BA/BMus in liberal arts and music
- BS/BMus or BS/BAMus in engineering and music
- BSJ/BMus or BSJ/BAMus in journalism and music

For information on applying to the combined music programs, see Application to Dual Bachelor's Degree Programs on page 11. For descriptions of all the programs, including requirements, see the Cross-School Options chapter of this catalog.

Accelerated Degree Programs

Honors Program in Medical Education

The Honors Program in Medical Education (HPME) provides an opportunity for highly talented high school seniors to be admitted to an undergraduate program and to the Feinberg School of Medicine and to complete their formal premedical and medical studies in seven or eight years. Each year a small number of students are admitted to the program and to Weinberg College, the School of Communication, or the McCormick School. For information on applying to HPME, see Special Admission Programs on page 11. For a description of the program, including requirements for students in the different undergraduate schools, see the Cross-School Options chapter of this catalog.

Integrated Science Program

The Integrated Science Program (ISP) is a highly selective undergraduate program of integrated science studies within Weinberg College. The curriculum provides a thorough and rigorous background in the major scientific disciplines and mathematics and offers special research opportunities. ISP can lead to a bachelor's degree in three years or, after a fourth year at Northwestern, to a double major or an advanced degree. For information on applying to ISP, see Special Admission Programs on page 11. For a description of the program, see page 113 in the Weinberg College chapter of this catalog and www.isp.northwestern.edu.

Accelerated Master's Programs

Combined bachelor's/master's degree programs enable exceptional undergraduates in the McCormick School, the Medill School of Journalism, Media, Integrated Marketing Communications, and certain departments of Weinberg College to receive both degrees in less than the usual time. See Accelerated Master's Programs in the Cross-School Options chapter of this catalog for more information.

Teaching Certification

Weinberg College students may complete the requirements of the secondary teaching program and qualify for Illinois state certification. See Teacher Certification at Northwestern in the School of Education and Social Policy chapter of this catalog.

Study Abroad

Northwestern encourages qualified students to study abroad when such study promises to enrich their academic programs. With early planning, most students, regardless of school or major, should be able to study abroad during the academic year and still graduate within four years. Students may also study abroad during the summer on one of Northwestern's summer programs or on an approved non-Northwestern program.

The Study Abroad Office provides information and advising services to all students interested in study abroad. Approval from the University Study Abroad Committee and the Study Abroad Office is required before the study abroad experience. Students must submit a study abroad application, including signatures from school advisers and, in many cases, department advisers, to the Study Abroad Office. All students approved by Northwestern to study abroad remain registered at Northwestern while abroad.

Most Northwestern students studying abroad do so on one of more than 100 programs administered by or affiliated with the University. Students participating in University exchange programs continue to pay Northwestern tuition. For all other programs, students pay the program fee plus a Northwestern administrative fee. Students participating in affiliated programs may apply for financial aid, including Northwestern grant assistance, to help offset the cost of their programs.

Students who wish to participate in unaffiliated programs must petition for permission to apply through the Study Abroad Office. No financial aid is available from the University for students on unaffiliated programs, and Northwestern cannot process their outside aid.

Since study abroad often requires special language or other preparation, interested students should consult with the Study Abroad Office early in their Northwestern careers. The office hosts information sessions and has an extensive resource library with detailed information on affiliated programs and study abroad policies. For more

information please see its website at www.northwestern.edu/studyabroad.

Field Studies and Internships

Many off-campus field studies, internships, and research opportunities sponsored by schools and departments are available to Northwestern students. The programs vary greatly. Some carry academic credit and/or a stipend. Some are done in conjunction with coursework, while others require full-time commitment and may involve living away from campus. Field study and internship opportunities are available during both the regular academic year and Summer Session. See the individual schools and departments in this catalog for details. Additional information on internship opportunities is available from University Career Services.

Fellowships

Northwestern undergraduates have a strong record in many national and international fellowship competitions. Depending on the award, fellowship winners may receive funding for a portion of their undergraduate expenses or for graduate studies, for the costs of overseas coursework or research, or for public service opportunities in the United States and abroad. The Office of Fellowships assists students in identifying fellowships that fit their educational, intellectual, and personal interests and talents. The office also assists in the preparation of written applications, conducts practice interviews, and offers individual and group sessions that explore available opportunities. For more information, see the website of the Office of Fellowships: www.northwestern.edu/fellowships.

Special Courses

Student-Organized Seminars (SOS)

Students who wish to pursue studies not included in the catalog may plan and initiate their own courses under the supervision of sponsoring faculty members. SOS credit courses may be developed in all undergraduate schools except the Medill School of Journalism, Media, Integrated Marketing Communications.

Residential College Tutorials

With the sponsorship and participation of a faculty member, students in a residential college may organize a course on a topic of special interest. Proposals must be approved by the dean's office of the appropriate school, and enrollment is normally limited to 10 members of the residential college.

Independent Study (399)

Many departments offer undergraduate seminars and independent studies for qualified students. A 399 course in any department enables a student to engage in individual special study and research, which may involve work in a laboratory or library, fieldwork outside the University, or the creation of a work of art. The maximum credit a student may receive for 399 (or equivalent independent study) during any quarter is 2 units.

Support for Undergraduate Research Endeavors www.undergradreserch.northwestern.edu

Northwestern opened the Office of Undergraduate Research in 2012 to pursue three primary goals: to administer its grant programs, which award more than $500,000 a year; coordinate University-wide efforts in undergraduate research and communicate these opportunities to students; and help students prepare for these experiences. The office aims to encourage as many students as possible to engage in research and creative projects.

The office's flagship Undergraduate Research Grant program, funding research and creative work in any discipline, offers a $3,000 stipend for eight-week summer projects and up to $1,000 for research expenses during the academic year. Other grants provide support for intensive language study during the summer or for conference travel. An annual $9,000 award—the Circumnavigators Travel-Study Grant, jointly funded by Northwestern University and the Circumnavigators Club Foundation—enables one undergraduate researcher to undertake around-the-world travel during the summer before senior year. The Undergraduate Research Assistant Program offers students funding to work as research assistants on faculty projects.

The office's extensive UR@NU website holds the searchable database called Undergrad ARCH (Accessing Research and Creative Help), containing information about opportunities based at Northwestern and externally. Because many students may be undertaking independent projects and applying for funds for the first time, the office offers one-on-one advising and regularly conducts information sessions and workshops, working with various partners on campus—from the schools, departments, labs, and other groups—to ensure that students receive guidance relevant to their research interests. Outstanding research projects are showcased each year at the annual Undergraduate Research and Arts Exposition, which features a Creative Arts Festival in addition to poster and panel presentations by undergraduate researchers.

Key to Course Numbers

Although the course listings in this catalog are as complete and exact as is possible at the time of printing, some changes may occur later, and courses may be dropped or added. The class schedule for each quarter is posted on CAESAR and contains a complete and updated listing of classes for each quarter. The University reserves the right to cancel classes when necessary, including those for which registration is not sufficient.

Undergraduate Course Credits and Quarters

Traditional undergraduate work in all the schools on the Evanston campus is on the quarter system. In a quarter-long course, students and faculty meet at least three hours per week, and students are awarded 1.0 unit of credit. Exceptions are courses that meet less than three hours per week, which carry less than 1.0 unit, and 15-week courses, which carry 1.5 units.

For purposes of transfer to other institutions or for certification stated in credit or semester hours, a quarter-long course bearing 1.0 unit of credit is generally the equivalent of $2^2/_3$ (2.66) semester hours. In quarter hours, 1 quarter-long course is equal to 4 quarter hours of undergraduate credit.

Numbering System

Three sets of characters denote all courses:

- The first set is the subject code indicating the area of study.
- The second set is a three-digit course number:
  - *100-level* courses are primarily for freshmen and sophomores, usually without college prerequisite.
  - *200-level* courses are primarily for freshmen, sophomores, and juniors, sometimes with the prerequisite of a 100-level course in the same or a related department.
  - *300-level* courses are primarily for juniors and seniors, with the prerequisite of junior standing or a 100- or 200-level course in the same or a related department.
  - *400-level* courses or seminars, in which the major part of the work is not research, are primarily for graduate students; they may be open to advanced undergraduate students with permission.
  - *500-level* courses or seminars are graduate courses in which the work is primarily research.
- The third set (one, two, or more numbers) usually indicates whether the course is part of a sequence.
  - -0 = one-quarter course
  - -1,2 = two-quarter sequence
  - -1,2,3 = three-quarter sequence

Special characters identify certain groups of courses. If a course is taught only through a Northwestern study abroad program, the designation SA is included with the course number. Other designations may be used by the individual departments; see departmental listings for details.

If a course carries less or more than 1.0 unit of credit, the number of units follows the course title in parentheses —e.g., (1.5) or (1.5 units) = 1.5 units of credit.

Cross-School Options

Northwestern values interdisciplinarity. Many Northwestern faculty are members of more than one department or program, and many of their academic endeavors cut across traditional fields of study. Similarly, many Northwestern students have interests that span traditional academic boundaries.

Each of Northwestern's six undergraduate schools has its own unique curriculum, but many courses across the University are open to students from all six undergraduate schools. In addition, each school offers majors, minors, certificates, field studies, or other programs in which students from other schools may participate. Collaborative efforts involving more than one undergraduate school, an undergraduate school and a graduate program, or a University center or institute provide additional options for students. The University is committed to developing programs that build pedagogical and intellectual bridges between disciplines and across schools to create new interdisciplinary opportunities for undergraduates.

SCHOOL-BASED OPTIONS FOR ALL UNDERGRADUATES

In the Weinberg College of Arts and Sciences

All majors and minors in Weinberg College are open to students from Northwestern's other undergraduate schools. These include traditional fields of study in the social sciences, the humanities, mathematics, and the natural sciences, as well as many interdisciplinary majors and minors. Students from throughout Northwestern may also participate in the Chicago Field Studies Programs housed within Weinberg College. For more information on these options, see the Weinberg College chapter of this catalog.

In the School of Communication

The School of Communication offers several programs open to students from other schools. These include the following:

- Dance minor
- Film and media studies minor
- Human communication sciences minor
- Internship program
- Sound design minor
- Theatre minor

See the School of Communication chapter of this catalog for more information.

In the School of Education and Social Policy

Northwestern undergraduates regardless of school may participate in the School of Education and Social Policy's Certificate in Civic Engagement Program and Summer Field Studies Programs in Chicago, Washington, DC, and San Francisco. For more information on these programs, see the School of Education and Social Policy chapter of this catalog.

Additionally, Weinberg College students may pursue secondary teaching certification in a variety of subject areas through the School of Education and Social Policy's teacher preparation program.

In the McCormick School of Engineering and Applied Science

The Certificate in Engineering Design Program, administered by the Segal Design Institute of the McCormick School, is open to undergraduates from other schools. For details on requirements, see the McCormick School chapter of this catalog.

The Farley Center for Entrepreneurship and Innovation supports the development of interdisciplinary curricula and innovative learning opportunities for students interested in entrepreneurship. The center administers a Certificate in Entrepreneurship Program for undergraduates from any school. Course requirements and application procedures are outlined on the center's website: www.fcei.northwestern.edu.

In collaboration with McCormick School departments, Weinberg College offers majors and/or minors in computer science, environmental sciences, and materials science. For details on these options, see the Weinberg College chapter of this catalog.

In the Medill School of Journalism, Media, Integrated Marketing Communications

Medill offers a Certificate in Integrated Marketing Communications Program open to undergraduates throughout Northwestern and including prerequisite courses from the other undergraduate schools. Details on prerequisites and requirements can be found in the Medill School chapter of this catalog. Medill also offers a range of courses exclusively for nonmajors; course descriptions and class schedules are posted on the Medill website.

In the Bienen School of Music

Several minors in the Bienen School are open to students from other schools. These include the following:

- Commercial music
- Jazz studies
- Music cognition
- Music composition
- Music technology

In addition, any nonmusic major may complete a concentration in music or a musicology minor. Information on these options, including course requirements and application instructions, can be found in the Bienen School chapter of this catalog.

DUAL BACHELOR'S DEGREE PROGRAMS

Cross-school collaborations provide opportunities for undergraduate students to complete coursework in two Northwestern schools concurrently and to receive bachelor's degrees from both schools. Students may choose from four dual bachelor's degree programs:

- BA/BS in liberal arts and engineering
- BA/BMus in liberal arts and music
- BS/BMus, BS/BAMus, or BS/BSMus in engineering and music
- BSJ/BMus, BSJ/BAMus, or BSJ/BSMus in journalism and music

Typically, five years of full-time study are required to complete any of these programs and meet the Undergraduate Registration Requirement (the URR policy is described on pages 17–18 in the Undergraduate Education chapter of this catalog and at at www.registrar.northwestern.edu/graduation/undergraduate-registration-requirement.html).

Students apply to the BA/BS program after matriculating. For information on applying to the other three programs, see page 11. Students receiving financial aid should also note the restrictions under Satisfactory Academic Progress and Financial Aid on page 15.

Liberal Arts and Engineering Program

Qualified Northwestern undergraduates with strong interests in the liberal arts as well as engineering may elect to earn both a bachelor of arts degree in a liberal arts discipline from Weinberg College and a bachelor of science degree in an engineering field from the McCormick School (BA/BS). Students may pursue any combination of majors from the two schools. They must complete all requirements of both schools and both majors and are subject to all regulations of both schools and the URR. The one exception is that students may be exempted—by decision of the Weinberg College associate dean for undergraduate academic affairs—from the rule that a maximum of 11 non-Weinberg College courses may be counted toward requirements for a Weinberg BA degree.

Interested students most often begin their studies in the McCormick School. To do the necessary planning, they should consult with Weinberg College's Office of Undergraduate Studies and Advising and the undergraduate engineering dean's office in the McCormick School as soon as possible after enrolling at Northwestern. Students should meet regularly with advisers in both schools to discuss their progress toward completion of both sets of requirements.

Liberal Arts and Music Program

Some Northwestern undergraduates choose to combine intensive study in music with a broad exploration of the liberal arts and a major in a liberal arts discipline. Students accepted into the Weinberg College–Bienen School of Music dual bachelor's degree program may simultaneously earn a bachelor of arts degree from Weinberg College and a bachelor of music degree from the Bienen School (BA/BMus). In addition to the URR, they must complete all Weinberg College degree requirements, including at least 30 Weinberg courses, as well as all Bienen School degree requirements, including at least 30 music courses.

Participants in this program must be accepted by both Weinberg College and the Bienen School. Students work closely with academic advisers from both schools to develop an individual curricular program. Most follow a balanced curriculum in which about half of the coursework each year is done in each school. It is possible, however, to take mostly courses in one school in the earlier years and to then take mostly courses in the other school. Current students interested in this program should consult with the associate dean for undergraduate academic affairs in Weinberg College and the assistant dean for student affairs in the Bienen School.

Engineering and Music Program

Highly capable students who have a strong interest in and commitment to both engineering and music may apply to the McCormick School–Bienen School dual bachelor's degree program. Students accepted into this program may simultaneously earn a bachelor of science degree from the McCormick School and a bachelor of music, bachelor of arts in music, or bachelor of science in music degree from the Bienen School (BS/BMus, BS/BAMus, or BS/BSMus). In addition to the URR, they must complete all McCormick School degree requirements, including at least 36 McCormick courses, as well as all Bienen School degree requirements, including at least 30 music courses. Any field of study in engineering may be chosen, resulting in a bachelor of science degree in the chosen field.

The program may be entered no later than the beginning of the sophomore year, and admission requires concurrent approval of both the McCormick School and the Bienen School. Current students interested in this

program should consult with advisers in the Undergraduate Engineering Office in the McCormick School and the assistant dean for student affairs in the Bienen School.

Journalism and Music Program

This dual bachelor's degree program allows extremely talented students to earn both a bachelor of science in journalism from Medill and a bachelor of music, bachelor of arts in music, or bachelor of science in music degree from the Bienen School (BSJ/BMus, BSJ/BAMus, or BSJ/BSMus). The program is intended to prepare students for journalism careers emphasizing music and arts reporting. Prospective students typically apply to the program while applying for undergraduate admission to Northwestern.

The program requires completion of all Medill degree requirements, including at least 35 Medill courses, as well as all Bienen School degree requirements, including at least 30 music courses, in addition to the URR. Students must fulfill all minimum GPA requirements for journalism classes and for the Journalism Residency. The three freshman journalism classes and core music classes are taken during the freshman year. Students complete the Journalism Residency and all prerequisite coursework in a concentrated 1½-year time frame—either during their second and third years or during their third and fourth years of enrollment. Students should work with advisers from both schools to develop a timeline for completing all requirements.

COLLABORATIONS WITH THE GRADUATE AND MEDICAL SCHOOLS

Accelerated Master's Programs

Accelerated master's programs enable exceptional, advanced undergraduates in Weinberg College, Medill, and the McCormick School to apply for admission early and meet requirements for the master's degree in an expedited manner. The programs are highly demanding intellectually, require early commitment to a discipline, and necessitate careful planning.

The following Weinberg College departments and programs have combined degree programs approved by the Graduate School: chemistry, comparative literary studies, economics, French, and linguistics. The Graduate School also offers an accelerated master's program in plant biology and conservation that is available to eligible students from several undergraduate majors. More information is available from the program.

Graduate School–approved BS/MS degrees are offered by all departments in the McCormick School.

Students in Medill who exhibit exceptional ability in undergraduate work may apply to that school's graduate division for early admission to the graduate editorial program. This program allows students to qualify for BSJ and MSJ degrees in 12 to 15 quarters of full-time study.

For more information on an individual accelerated master's program, see the appropriate section of this catalog.

Honors Program in Medical Education

www.feinberg.northwestern.edu/education/degree-programs/hpme

The Honors Program in Medical Education provides an opportunity for highly talented high school seniors to be admitted to an undergraduate program and to the Feinberg School of Medicine and to complete their formal premedical and medical studies in seven or eight years. Applicants should be able to qualify for advanced placement in chemistry and mathematics. Each year a small number of students are admitted to the program and to Weinberg College, the School of Communication, or the McCormick School. Only candidates applying directly from high school are considered. For information on applying, see Special Admission Programs on page 11.

The first three or four years of the program are spent in undergraduate study, during which students must complete 37.7 units of credit that meet HPME requirements; these include required courses and labs in chemistry, physics, and the biological sciences, as well as courses that meet the requirements for HPME students in an undergraduate school. Special Undergraduate Registration Requirement provisions apply to HPME students and are described on the registrar's website. To remain in the program, students must maintain designated grade point averages both in required science courses and overall.

In addition to the required science courses, HPME students enrolled in Weinberg College fulfill the college's general education requirements by taking courses in the humanities, social sciences, and arts. In the first year they complete at least one freshman seminar. The third year is usually devoted to completing the requirements for a BA in Weinberg College by doing advanced coursework in the major and/or to studying abroad in a Northwestern-affiliated program. Students may also take an additional undergraduate year at Northwestern.

Students in the McCormick School spend three or four years pursuing an in-depth education in mathematics, the sciences, and engineering while taking core courses in biomedical engineering. To supplement their technical courses, students also take courses in the humanities and the social sciences.

Students in the School of Communication's Department of Communication Sciences and Disorders supplement their HPME science requirements with courses in the social sciences, humanities, and the arts. At the same time, as majors in human communication sciences, they study the basic science principles underlying human communication and cognition, as well as hearing, speech, language, and learning disorders. Through exposure to both

research and clinical activities, they consider the relationship between basic science and real-life health issues.

After the first three or four years, HPME students who meet the program requirements move to the Chicago campus as members of the first-year Feinberg School of Medicine class. After successfully completing their first year at the Feinberg School, Weinberg College students who have not received a BA degree qualify for a bachelor of science in medicine, and School of Communication students qualify for a bachelor of science in communication. After the second year of medical school, McCormick School students qualify for a bachelor of science in medical engineering. At the end of seven or eight years, HPME students qualify for the doctor of medicine degree from the Feinberg School.

Northwestern Undergraduate Premedical Scholars Program

www.feinberg.northwestern.edu/admissions/nupsp

Each year a few highly select third-year undergraduates gain admission to the Northwestern Undergraduate Premedical Scholars Program. The program offers acceptance into the Feinberg School of Medicine and participation in its preprofessional experiences. Upon matriculation into the Feinberg School after their fourth or senior year, students choose between two combined degree programs: master of arts in bioethics and medical humanities (MD/MA) or master in public health (MD/MPH). See the website for more information.

KELLOGG CERTIFICATE PROGRAM FOR UNDERGRADUATES

www.kellogg.northwestern.edu/certificate

The Kellogg School of Management administers a program leading to an undergraduate certificate in either financial economics or managerial analytics. Each certificate requires completion of 4 courses taught at an advanced level by Kellogg faculty members. Building on students' existing analytical skills, the certificate curriculum serves as excellent preparation for careers in consulting, financial services, and other data-driven professions and/or for doctoral or professional school programs.

About 100 students each year are accepted into the certificate program through a competitive application process. Any Northwestern undergraduate who meets the program's rigorous selection criteria may apply. Course prerequisites include advanced calculus and linear algebra, intermediate probability and statistics, advanced econometrics and statistics, microeconomics, and optimization; see www.kellogg.northwestern.edu/certificate for a complete list. Students may apply during the winter quarter of their sophomore or junior years for admission to the program in the following fall.

Certificate students also benefit from one-on-one counseling from a dedicated career development specialist to help them secure summer internships and full-time employment.

Certificate in Financial Economics

The 2013–14 financial economics curriculum comprises the following 4 courses:

KELLG FE 310-0 Principles of Finance Foundation course for the certificate; taken in the fall. Basic principles of finance, focusing on the effects of time and uncertainty on value. First half emphasizes valuation, including discounted cash flows, equity and debt valuation, the term structure of interest rates, portfolio theory, asset pricing, and efficient market theory. Second half examines firms' financing decisions, including capital budgeting, capital structure, and payout policy.

KELLG FE 312-0 Investments Active portfolio strategies in bonds and stocks, optimal portfolio selection from the perspective of individual and institutional investors, and the role of style and performance benchmarks in portfolio management. Performance evaluation, trading costs, and other special topics.

KELLG FE 314-0 Derivatives Use and pricing of forwards and futures, swaps, and options. Strategies for speculation and risk management, no-arbitrage pricing for forward contracts, binomial and Black-Scholes option pricing models, applications of pricing models in other contexts.

KELLG FE 316-0 Topics in Financial Economics In-depth examination of selected issues in finance; topic varies each year. The topic for 2013–14 is fixed income.

Certificate in Managerial Analytics

The 2013–14 managerial analytics curriculum comprises the following 4 courses:

KELLG FE 310-0 Principles of Finance See Certificate in Financial Economics.

KELLG MA 324-0 Operations and Supply Chain Strategy Provides framework for determining what key capabilities an operation and a supply chain must develop to support the business strategy of a firm and the relationship between the desired capabilities and the structure of a supply chain. Exposure to methodologies and analysis that support operations and supply chain strategy and planning decisions. Analysis uses case studies and development of analytical spreadsheet models.

KELLG MA 326-0 Topics in Managerial Analytics In-depth examination of selected issues in managerial analytics; topic varies each year. The topic for 2013–14 is empirical methods in consumer analytics.

KELLG MA 328-0 Competitive Strategy and Industrial Structure Examines the determinant nature of competitive strategy in various industry structures. Consideration of how a firm's industry structure affects its strategic choices and performance. Topics include the dynamic aspects of

pricing; entry and predation in concentrated industries; and product differentiation, product proliferation, and innovation as competitive strategies.

ADDITIONAL OPTIONS

News Innovation

www.knightlab.northwestern.edu

Undergraduate and graduate students in journalism, computer engineering, electrical engineering, and computer science may participate in the Knight News Innovation Laboratory. A joint initiative of the Medill School and the McCormick School, the Knight Lab's mission is to accelerate local media innovation by creating new digital tools, building partnerships with media companies, and expanding the media innovation community. See the website for more information.

Leadership

www.lead.northwestern.edu

Northwestern's Center for Leadership offers the Undergraduate Leadership Program, a certificate program open to all Northwestern undergraduates. The interschool program helps students understand the nature of leadership and prepares them to become leaders on campus, in the community, and in their professions. ULP participants explore key leadership themes and issues, build and refine a personal leadership model, and develop foundational leadership assets.

Certificate requirements (4 units)

- 1 introductory course: LDRSHP 204
- Field study component: LDRSHP 396 (2 units)
- 1 elective course complementing LDRSHP 204
  - May be taken at any time but ideally after 204.
  - Chosen from a preapproved list (found on the ULP website) to provide a macro-level exploration of leadership; students may petition to substitute a related course.
  - May not be double-counted toward student's major or minor program requirements.

Courses

LDRSHP 204-0 Paradigms and Strategies of Leadership
ULP students' introduction to six foundational leadership assets: asking powerful questions, navigating and leading amid change, inspiring others through narrative, mobilizing difference to maximize team performance, thriving in collaborative and hierarchical settings, and responding to setbacks and failure with resilience. Components include weekly lectures, guest speakers, discussion groups, and a community group project.

LDRSHP 396-0 Field Study in Leadership Students have the opportunity to leave a positive "leadership footprint" by fostering the success of a group, organization, or community. Spending at least 160 hours outside the classroom, they undertake a leadership role, an internship or externship, or a community engagement experience, exploring leadership models and concepts through application. Consent of instructor required.

Study of the Environment

www.environment.northwestern.edu

Study of the environment can be approached from the perspectives of science, engineering, and the interrelationship between society and nature. Some aspects of environmental problems lie within the purview of the natural sciences and engineering, while others are addressed in the social sciences and humanities. Broad training and collaboration among experts in diverse fields are required to confront many environmental issues effectively. Thus, environmental sciences students are prepared to tackle complex environmental problems in a rigorous way and with an appreciation of the related science, engineering, and policy issues. Similarly, environmental engineering involves analysis and design combined with an understanding of human use of and effects on the environment. Environmental policy and culture students engage in multidisciplinary study of the relationship between people and their natural surroundings from social sciences and humanities perspectives. The development and implementation of effective environmental policy require understanding of relevant aspects of human behavior, the natural world, and their interactions.

Courses in departments and programs across Northwestern provide opportunities for learning about the environment. The environmental science, engineering, and policy programs, coadministered by Weinberg College and the McCormick School, offer two majors and a minor, each described in the schools' respective chapters of this catalog:

- Weinberg College major in environmental sciences
- McCormick School major in environmental engineering
- Weinberg College minor in environmental policy and culture

Other Northwestern programs relevant to the study of the environment include a major and a minor offered by the Department of Earth and Planetary Sciences, the plant biology concentration in the Department of Biological Sciences, and the environmental chemistry concentration in the Department of Chemistry in Weinberg College; the environmental engineering and sustainability specialization in the Department of Chemical and Biological Engineering and the environmental engineering specialization in the Department of Civil and Environmental Engineering in the McCormick School; and the ISEN certificate in energy and sustainability (see next page). Details can be found in the appropriate school chapters of this catalog and on the study of the environment website.

Sustainability and Energy

www.isen.northwestern.edu

The mission of the Initiative for Sustainability and Energy at Northwestern is to create, advance, and catalyze the development of new science, technology, education, and policy for sustainability and energy. ISEN supports on-campus research at the undergraduate, graduate, and faculty levels spanning multiple fields, including physical and social sciences, engineering, law, policy, ethics, business, economics, and journalism. It also sponsors a variety of outreach programs, both on and off campus, in collaboration with student groups, academic and governmental partners, and private industry. In partnership with Northwestern's Study Abroad Office and Office of International Program Development, ISEN offers two for-credit summer programs in Germany and China with a focus on renewable energy policy and green technology development.

Certificate in Energy and Sustainability

ISEN approaches education with an interdisciplinary style, providing courses that are open to all undergraduates and involve teams of faculty from across the University. ISEN awards a certificate in energy and sustainability to students who complete ISEN's 200-level course sequence along with 4 electives chosen from approved curricula—including study abroad options—in the natural and social sciences, engineering, and other disciplines. Courses must be from at least two different academic departments or programs and include at least 3 at the 300 level. A list of eligible courses appears on the ISEN website.

Courses

ISEN 210-0 Introduction to Sustainability: Challenges and Solutions Introduction to using life-cycle systems perspectives in forming evaluations and basic quantitative understandings of the challenges and potential solutions that exist for sustainable societies; framing these in the context of resource use, energy consumption and development, and environmental constraints.

ISEN 220-0 Introduction to Energy Systems for the 21st Century Overview of energy issues in the context of global sustainability: energy demands for industrial, transportation, housing, and commercial uses, strategies for demand reduction, traditional versus renewable energy systems.

ISEN 230-0 Climate Change and Sustainability: Economic and Ethical Dimensions Interdisciplinary analysis of economic and ethical issues concerning climate change; scientific evidence for anthropogenic global warming; economics and ethics of resource use, conservation practices, and sustainability. Cross-listed with PHIL 270; students may not earn credit for both courses.

ISEN 390-0 Special Topics in Energy and Sustainability Focused exploration of specific topical themes, trends, and challenges in applied energy and sustainability. Content varies each year; previously offered topics include geographic information systems and the impact of energy systems on the geographic distribution, well-being, and social organization of societies. May be repeated for credit with change in topic.

Transportation and Logistics

www.transportation.northwestern.edu

The interschool Transportation and Logistics Program offers a minor that is available to all undergraduates.

Passenger and freight transportation represents nearly a fifth of the US gross domestic product and influences every aspect of our lives: where we live, where we work, and the goods we can purchase. The study of transportation and logistics is inherently interdisciplinary, reaching across disciplines, schools, and departments. Northwestern offers relevant courses through the Departments of Civil Engineering and Industrial Engineering and Management Sciences in the McCormick School and the Department of Economics and other social science departments in Weinberg College. This minor offers undergraduates the opportunity to obtain a more rounded education in transportation and logistics than that offered within their selected majors. The curriculum equips students with a broad understanding of the economics, engineering, and operations of transportation and logistics systems and the role of public policy.

The minor is administered by the Transportation Center, an interdisciplinary research center founded in 1954. The center's affiliated faculty are drawn from many of the participating departments. Additional information about the program is available from the Transportation Center.

Minor in Transportation and Logistics

Students are required to complete 7 courses, of which 1 is a required course. The other 6 courses must include at least 3 core courses, at least 2 of which must be outside the school in which the student is majoring.

Students in the McCormick School may double-count a maximum of 2 courses from their major program toward the minor. Students from other schools are not allowed to double-count courses that are part of their major but may count courses that fulfill related course, distribution, or social science and humanities requirements.

Prerequisites

It is assumed that students in the minor will already have taken courses in calculus and probability and statistics as part of their major.

Minor requirements (7 units)

- TRANS 310
- 3 or more core courses
  - Chosen from ECON 310-1, 355; CIV ENV 371, 376; IEMS 310 or 313, 381, 383.

- 2 must be outside the student's major school.
- No substitutions are allowed.

- 3 additional courses selected from core courses or approved electives:
  - Approved electives include ECON 309, 337, 349, 350, 354, 361, 370, 381-1,2; GEOG 312, 341, 343; HISTORY 322-2; POLI SCI 221, 329, 367; SOCIOL 301, 312; CIV ENV 304, 338, 360; IEMS 315, 317, 382; IEMS 326 or ECON 360; 1 unit of approved independent study.
- Students in the McCormick School may double-count a maximum of 2 courses from their major program toward the minor.
- Students from other schools are not allowed to double-count courses that are part of their major but may count courses that fulfill related course, distribution, or social science and humanities requirements.

Courses

TRANS 310-0 Seminar in Transportation and Logistics Yearlong senior seminar on the structure of the transportation and supply-chain industries and evaluation of relevant public policy. Students receive 1 credit in the spring quarter of their senior year.

TRANS 399-0 Independent Study Advanced work chosen by mutual agreement with a faculty member. Only 1 unit may count toward the minor. Consent of faculty required.

Writing Arts

www.northwestern.edu/writing-arts

The Center for the Writing Arts was established in 1994 to highlight Northwestern's strengths in the teaching of writing and to provide a focal point for continuing efforts to fulfill the University's commitment to excellence in writing. Among other programs, the center sponsors innovative writing-intensive courses taught by distinguished visiting writers-in-residence and a variety of colloquia for the entire campus community on topics related to writing. Consult the center's website or assistant director for more information about its courses and admission requirements.

Courses

WRITING 301-0 The Art of Fiction Fundamental skills of narrative in the creation of fictional works. Extensive writing exercises. Prerequisites: background in writing, a writing-intensive course, and submission of a manuscript of 5–15 pages.

WRITING 302-0 The Art of Poetry Writing of poetry in the light of the poetic, linguistic, and historical tradition. Extensive writing exercises. Prerequisites: serious interest in poetry, a writing-intensive course, and submission of sample poems.

WRITING 303-0 The Art of Nonfiction Narrative as a fundamental skill of nonfiction writing of many kinds. Extensive writing exercises. Prerequisites: background in writing, a writing-intensive course, and submission of a manuscript of 5–15 pages.

MILITARY PROGRAMS

The military studies programs are administered by the Office of the Provost.

Naval Science

www.northwestern.edu/nrotc

The Northwestern University Naval Reserve Officers Training Corps (NROTC) Unit was established in 1926 by congressional authorization when Northwestern became one of the original six universities to create a naval science department. The professor of naval science chairs Northwestern's Department of Naval Science. Department faculty members are commissioned officers serving on active duty in the US Navy or Marine Corps. They are selected and nominated by their respective services and screened and approved by the University. The unit is located at 617 Haven Street, Evanston, Illinois 60208-4140, phone 847-491-3324.

Naval ROTC Programs

NROTC offers young men and women the opportunity to obtain leadership and management experience as commissioned officers in the US Navy (Navy option) or Marine Corps (Marine Corps option) after graduation from Northwestern, through either the Scholarship Program or the nonscholarship College Program.

At Northwestern, NROTC midshipmen lead essentially the same campus life as other students. They make their own arrangements for room and board and participate in campus activities of their choice, including the opportunity for University-sponsored overseas study. There are no prescribed academic majors for NROTC students, though scientific and technical studies are encouraged. NROTC students are required to complete the naval science curriculum, attend a weekly two-hour laboratory, and participate in four to six weeks of active-duty summer training at sea or ashore. NROTC students are required to abide by the Midshipmen Regulations issued by the unit. Students may enroll in the NROTC program at any time from the beginning of their freshman year until the end of their sophomore year.

Courses

In addition to the required courses listed below, participants in the NROTC program must satisfactorily complete a number of other courses prescribed by the Department of the Navy, which are offered by other departments of the University. Current information on those course requirements is available from the NROTC unit.

With the exception of 110 and 355, Northwestern course credit is granted for successful completion of naval

science courses; applicability to graduation requirements is subject to limitations imposed by the responsible University faculty committees and by the undergraduate schools. For more information on credit availability, consult the dean of each school. Naval science courses are open to non-NROTC students with department approval. Courses with an asterisk (*) are not required for Marine Corps option students.

NAV SCI 110-0 Introduction to the Organization and Culture of the Naval Services Composition and organization of the Naval Services; diverse missions, makeup, and manning of naval sea services with emphasis on duties and responsibilities of officers, rank and enlisted rating structure, training of subordinates, promotion and advancement, and military courtesy. Students gain a fundamental understanding of the formal and informal structures of the main warfare communities and how each contributes to completion of the US Navy and Marine Corps missions.

NAV SCI 120-0 Seapower and Maritime Affairs A study of the influence of seapower on world history with a focus on US naval history. Topics include the evolution and use of naval strategy; the influence of technology on tactics; naval power as an instrument of foreign policy; the Navy's interactions with the other armed services and with the executive and legislative branches of government; naval leadership in historical perspective; and past and future roles of the US Navy and Marine Corps during conflict (including those in Iraq and Afghanistan) and in peacetime.

***NAV SCI 210-0 Marine Navigation** An in-depth study of marine navigation from the perspective of a deck officer aboard a naval warship. Focus on piloting, electronic navigation, and the rules governing the conduct of vessels on the high seas. Students become familiar with the proper use of navigational charts, publications, and various aids to navigation and gain understanding of the influence of environmental factors (e.g., weather, tides, and currents) on ship operations.

***NAV SCI 220-0 Naval Ship Systems II (Naval Weapons Systems)** Theory and employment of the Navy's weapons, navigation, and communications systems. Processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Topics include fire control systems and major weapons types, including capabilities and limitations; physical aspects of radar and underwater sound; tactical and strategic significance of command, control, communications, computers, and intelligence with respect to weapons system integration. Supplemental review/analysis of case studies involving the moral and ethical responsibilities of leaders in employing weapons.

NAV SCI 230-0 Leadership and Management Seminar for Naval Officers Addresses leadership, management, and organizational behavior issues facing naval officers in a stressful environment, including strategic planning, time management, communication, counseling, team building, and decision making.

***NAV SCI 331-0 Naval Operations** Introduction to basic concepts and tools required for safe and proper operation of naval vessels. Students become proficient at maneuvering boards, concentrating on interception, pass-no-closer-than, and wind problems. Formation operations, external communications, replenishment at sea, and ship handling.

NAV SCI 336-0 Evolution of Warfare (Marine Corps option only) Evolution of warfare from 600 B.C.E. to present. Students develop understanding and knowledge of the classic principles of war, the changes in conduct of war through time, and the actions and decisions of battlefield commanders and their soldiers.

NAV SCI 341-0 Naval Leadership and Ethics An academic, discussion-oriented course intended to provide future leaders with a broad understanding of the various moral, ethical, and leadership philosophies that help strengthen junior-officer character.

***NAV SCI 345-0 Naval Ship Systems I (Naval Engineering)** Provides an elementary overview of naval engineering systems and a detailed knowledge of the principles behind ship construction. Taught from a systems engineering standpoint. Topics include ship design, stability, and structural engineering; hydrodynamic forces; air and water systems; electrical theory, generation, and distribution systems; thermodynamics; damage control; hydraulics and ship control; theory and design of steam, nuclear, gas turbine, and diesel propulsion.

NAV SCI 346-0 History of Amphibious Warfare (Marine Corps option only) Evolution of amphibious warfare from the battle of Marathon to present. Students develop understanding and knowledge of the evolution of amphibious warfare doctrine, the impact of significant events in history relating to amphibious operations, and the problems and advantages relative to employing amphibious forces in the modern era.

NAV SCI 350-0 Naval Science Laboratory A two-hour weekly laboratory required each quarter for all NROTC students. The laboratories serve to develop students' professional leadership skills, provide a basic understanding of the US Navy and Marine Corps as part of the US armed forces, and further challenge, test, and evaluate students on their potential to become commissioned officers in the US Navy or Marine Corps.

NAV SCI 355-0 Directed Study Provides midshipmen with an opportunity to work under the supervision of an officer-instructor on projects related to professional development. Prerequisite: consent of department.

Judd A. and Marjorie Weinberg College of Arts and Sciences

www.weinberg.northwestern.edu

The Judd A. and Marjorie Weinberg College of Arts and Sciences—oldest of Northwestern's 12 schools—has been the center of the University's academic and intellectual life since the 1850s. Weinberg College offers a liberal arts education that combines broad exposure to the insights and methods of the principal academic disciplines with focused study in one or more areas. The 600-member college faculty is dedicated to superior teaching informed by advanced research. Nearly all members of the faculty, including the most senior, regularly teach undergraduates in a curriculum including more than 2,000 courses each year, as well as tutorials, supervised laboratory experiences, internships, and other individualized forms of instruction. The 4,200 undergraduates and 1,300 graduate students in arts and sciences enjoy a great deal of choice, with access to departments and programs offering 37 majors, 7 adjunct majors, and more than 50 minors. Among these are several majors and minors that are interdisciplinary within Weinberg and a growing number that represent curricular collaboration across schools.

A liberal arts education in Weinberg College emphasizes the ability to reason clearly, to extract the essential significance of large bodies of information, to apply general principles in new contexts, to communicate effectively, and to be sensitive to human creativity and morality. Required coursework in several disciplines provides an overview of the complexity of the world and different ways of apprehending and solving problems. These courses examine how scholars from many backgrounds confront fundamental issues and how social conditions shape their inquiries. Proficiency in composition and competence in a foreign language build communication skills and expand the capability to study and understand another culture, while intensive coursework in a required major and optional minor develops an understanding of advanced concepts and lays the groundwork for original research. Many areas of the curriculum encourage interdisciplinary study that integrates the approaches of different fields and enhances the ability to address questions that cross traditional academic boundaries. A period of study abroad is encouraged to develop firsthand knowledge of other cultures and greater intellectual and personal independence. Students are also encouraged to undertake independent research projects that help them move beyond coursework and synthesize what they learn in their majors.

Weinberg College promotes participatory learning that begins in the first year of study in required freshman seminars and continues in laboratory experiences, internships, professional linkage and senior seminars, and other small-group or individualized instruction. Students can experience the excitement of discovery in the sciences, humanities, and social sciences not only through lectures by faculty working at the forefront of their fields but also through special projects developed under faculty guidance or by assisting faculty in their research. Northwestern's strong undergraduate preprofessional schools and its graduate and professional schools offer liberal arts students enhanced opportunities to extend their interdisciplinary studies and to pursue applied work in several areas. In some cases this may lead to a minor, a concentration, or a certificate. (See the Cross-School Options chapter.) The University's outstanding libraries and its research centers further support and enrich the educational pursuits of liberal arts undergraduates.

ACADEMIC POLICIES

Requirements for the Degree of Bachelor of Arts

Weinberg College offers courses of study in the arts and sciences leading to the degree of bachelor of arts. Students have extensive flexibility in structuring their academic programs within a framework of general education and major requirements specified in the following sections. Guidance in planning a coherent personal curriculum is available from several sources; see Academic Advising on page 40.

Students earning the bachelor of arts degree must complete 45 units of credit and fulfill the course and grade requirements described below. These include completing 2 freshman seminars, demonstrating proficiency in writing and in a foreign language, satisfying distribution requirements in six major areas of intellectual inquiry, and completing the requirements of a major in one of the departments or programs of Weinberg College. They must also complete a specified amount of their coursework within Weinberg College.

Freshman Seminar Requirement

First-year students must complete two freshman seminars. Offered by nearly all departments and programs in Weinberg College, these are small, discussion-oriented courses designed to develop basic intellectual skills: how to read critically, think logically, and communicate effectively, typically through the investigation of a specific theme or issue. Freshman seminars are limited to about

15 or 16 students to encourage discussion, and each seminar requires considerable expository writing—usually a minimum of 15–20 typed pages a quarter. These seminars ordinarily supplement rather than replace standard introductory courses and usually do not provide the preparation necessary for advanced work in a field. P/N registration is not allowed in freshman seminars.

Except for students in HPME, ISP, and MMSS, who take their seminars in winter and spring, incoming freshmen are assigned to a fall seminar based on preferences they submit to the Weinberg Office of Undergraduate Studies and Advising during the summer. The fall-seminar instructor also serves as the students' academic adviser for that quarter. Also during the summer, freshmen are informed of the quarter in which they are to take their second seminar. Freshmen also have the opportunity through the Kaplan Humanities Scholars Program to take small seminars linked to larger lecture courses focusing on a common broad theme.

Writing Proficiency Requirement

Students are required to demonstrate proficiency in writing. This may be achieved in a number of ways. Freshman seminar instructors make the initial evaluation of writing in courses. Students who do not write well in their freshman seminars or in other courses may be asked to take ENGLISH 105 Expository Writing. Courses in expository writing and intermediate composition are available for all students who wish to increase their skill and confidence in writing.

Foreign Language Requirement

Before graduation students must demonstrate proficiency in a classical or modern foreign language equivalent to the work covered in a second-year college-level course. Language proficiency may be shown in any one of three ways:

- Achieving a score designated by the Weinberg College Council on Language Instruction on a College Entrance Examination Board Advanced Placement Examination
- Passing a proficiency examination given online during the summer or at Northwestern during New Student Week and periodically during the school year (language departments may limit the number of times a proficiency examination may be taken)
- Successfully completing designated coursework (these courses may not be taken under the pass/no credit option, and a grade of C- or higher must be earned in the last course in a sequence fulfilling the foreign language requirement)

Students who believe they are proficient in a language not regularly taught at Northwestern may petition the Council on Language Instruction for a proficiency examination in that language. Petitions are available in the Office of Undergraduate Studies and Advising and must be filed during a student's first quarter.

Students with professionally diagnosed disabilities related to foreign language acquisition should contact the Office of Services for Students with Disabilities about possible accommodations.

Distribution Requirements

To ensure breadth of education, Weinberg College students must take 2 courses in each of the six distribution areas listed below. The list of courses that satisfy the distribution requirements is established by a Weinberg College faculty committee. A current list is available on the college website, and eligible courses for each quarter are identified on the registrar's website.

- I. Natural sciences
  Courses introduce methods of inquiry and fundamental concepts in the natural sciences.
- II. Formal studies
  Courses introduce concepts, methods, and use of formal rules of inference in mathematics, statistics, computer science, logic, linguistics, and other areas by showing how objects of thought and experience and their relationships can be analyzed in formal terms.
- III. Social and behavioral sciences
  Courses introduce the theories, methods, and findings of empirical research on human behavior and its relation to social, cultural, economic, and political influences, groups, and institutions.
- IV. Historical studies
  Courses introduce the chronological development of cultural, social, political, and economic affairs and their historical relationships.
- V. Ethics and values
  Courses introduce the analysis of moral, social, and religious values and how they have developed.
- VI. Literature and fine arts
  Courses foster understanding of how the attitudes, ideas, and values of individuals, groups, societies, or cultures are represented in their literature, arts, and other creative activities.

Courses taken P/N cannot be counted toward the distribution requirements. Students may satisfy a maximum of 2 of their 12 distribution requirements by achieving sufficient scores on College Entrance Examination Board Advanced Placement or higher-level International Baccalaureate examinations. A list of qualifying scores and tests as well as detailed information concerning the distribution requirements are available from the Office of Undergraduate Studies and Advising and on the college website.

Major Study Requirement

All students must fulfill the requirements of a major, which should be declared by the end of sophomore year. Majors are declared by meeting with a designated department or program adviser to discuss opportunities and requirements, develop a course plan, and complete a Declaration of

Major Form. All courses applied to the major requirements must be passed with grades of C- or higher. Grades of P (pass) are not acceptable in major and related courses. (See also Grade Requirements.)

Students may pursue two or more majors by completing each department's major requirements. With limited exceptions, the same course may not be applied to the major requirements of two departments. However, a course used as a department or program course in one major may also fulfill a related course requirement for another major.

A student's total number of majors plus minors may not typically exceed three. Exceptions require permission from the Weinberg College Advising Office and cannot be granted during freshman year.

Transfer students normally must complete at least 4 300-level courses at Northwestern in the major department or program.

A student may elect a major from among the following options:

- Departmental major
  Each department offers a major in one or more programs of specialization. Requirements are described in detail in the respective department sections of this catalog.
- Area or interdisciplinary major
  The college offers many interdisciplinary majors that apply the approaches of several departments to certain scientific, cultural, and political areas. Most are open to all students. American studies, integrated science, legal studies, and mathematical methods in the social sciences are limited-admission majors that require a special application, as does the English department's creative writing major. African studies, geography, international studies, legal studies, mathematical methods in the social sciences, science in human culture, and urban studies are available only as adjunct majors and must be completed with a second major that is not an adjunct major. Requirements for area and interdisciplinary majors are described in detail in their respective sections of this catalog.
- Ad hoc major
  Occasionally students with well-defined interests are led to programs of study that do not fit neatly into the mold of a traditional major. They may develop an ad hoc major in astrobiology or medical ethics, for example, by bringing together courses from various departments. Ad hoc majors must be approved by the faculty's Curricular Review Committee. For more information see the assistant dean for advising in the Office of Undergraduate Studies and Advising.

The Weinberg College website is being redesigned. The home page will stay the same, but some lower-level pages will change.

Registration Requirements: Number of Courses and Quarters

All Weinberg College students, except those in the Integrated Science Program, the Honors Program in Medical Education, and the dual bachelor's degree programs (BA/BMus and BA/BS), must successfully complete coursework earning at least 45 units of credit in order to graduate. Students must be degree candidates in Weinberg College during the last three quarters before receiving the BA degree. They may take courses in any other Northwestern school, but a limited amount of such coursework may be counted toward the degree. For details see the section Taking Courses in Other Schools of the University.

In addition to and independent of the requirements set by Weinberg College, all students must satisfy the University's Undergraduate Registration Requirement (see Undergraduate Education chapter of this catalog). This requirement addresses the number of quarters for which a student must be registered at Northwestern and the minimum number of units of credit that must be completed at the University.

Grade Requirements

Students must achieve an overall grade point average of C (2.0) or higher in courses offered to meet degree requirements. They must earn at least a C- in all major courses, all minor courses, all related courses for a major, and all prerequisites for these courses, as well as in courses used to satisfy the foreign language proficiency requirement.

Full-time students in Weinberg College are permitted to enroll in a limited number of courses with the understanding that in place of a regular letter grade they will receive the notation P (pass) or N (no credit), neither of which counts in the grade point average. No more than 1 course a quarter and 6 courses in all may be taken under this P/N option. Courses used to satisfy freshman seminar, distribution, foreign language, major, or minor requirements may not be taken P/N. No more than one-fifth of the total courses taken at Northwestern and offered for graduation may have grades of P or D.

While some other undergraduate schools of the University offer a Target Grade–P/N registration option, such registration is not available for courses offered by Weinberg College. Special rules govern registrations by Weinberg College students in courses of the undergraduate schools where this plan is available as well as by non–Weinberg College students who transfer into the college. Questions concerning this policy should be addressed to the Office of Undergraduate Studies and Advising.

Taking Courses in Other Schools of the University

Weinberg students may take advantage of Northwestern's other schools to take as many as 11 of their required 45 units; of those 11, up to 3 may be instruction in applied music. Students must obtain the advance approval of the

Office of Undergraduate Studies and Advising to register for courses in the School of Continuing Studies. Approved SCS courses in Weinberg disciplines do not count toward the 11-unit limit.

No more than 4 of the required 45 units of credit may come from the military studies programs.

Taking Courses at Other Institutions

Students must secure prior approval from the Weinberg College Office of Undergraduate Studies and Advising before taking courses at other US institutions that they will submit for Northwestern credit. University, college, and department and program rules govern how many courses taken at other institutions a student may count toward requirements, where they may be taken, in which areas of study they may be, and which requirements they may fulfill. Information about credit from other institutions is available from the Office of the Registrar. Courses taken at other institutions but not accepted for credit by Northwestern cannot be counted toward a Weinberg College degree.

Many Weinberg College students spend time studying abroad, most often for a summer or for part or all of junior year. The University's Study Abroad Office is an essential source of information about programs around the world as well as about the rules and process for going abroad. Advisers in the Study Abroad Office, the college's Office of Undergraduate Studies and Advising, and the departments and programs can help students select programs that fit their academic needs.

Awards and Honors

Each year Weinberg College awards several prizes and honors to exceptional students. Recognition is given for outstanding writing in freshman seminars and outstanding academic achievement in certain areas of study. Each quarter the college's Dean's List honors students with sufficiently high grades. Each spring the Northwestern chapter of the liberal arts honorary society Phi Beta Kappa elects juniors and seniors to membership. Seniors whose grade point averages meet certain criteria graduate with college honors. In addition, many departments and programs recognize outstanding achievement, including awarding department or program honors at graduation.

The college also awards funds to students working on research projects and creative activities; see Research Funding on page 40 for information.

ACADEMIC OPTIONS

Minors

Students may choose from more than 50 minors offered at Northwestern; among these are Weinberg College minors, interschool minors, and minors offered by some of Northwestern's other undergraduate schools (see Cross-School Options chapter). Minor requirements are listed under the appropriate headings in this catalog.

Completion of a minor is optional, not a degree requirement. A student's total number of majors plus minors may not typically exceed three. Exceptions require permission from the Weinberg College Advising Office and cannot be granted during freshman year.

Students may not count any course toward both a minor and a major unless the catalog description of the minor explicitly permits this or the course fulfills a related course requirement for the major. A course may not be counted toward more than one minor. All courses counted toward a minor, including prerequisites for the minor, must be completed with a grade of at least C-.

Independent Study and Undergraduate Seminars

Registering for 399 Independent Study allows students to earn course credit by working on a research or creative project under the supervision of a faculty member. 399 is generally open to juniors and seniors, and department consent is required; in some cases sophomores may qualify. During the quarter before enrolling in 399, students must submit for departmental approval a detailed description of the work they will undertake and the basis for its evaluation. Upon completion of the course, they must submit an abstract of the completed work to the department, where the description and the abstract are filed.

By departmental invitation seniors may take 398 (a senior-year seminar) in one or more quarters, up to a maximum of 4 units.

Students may not register for more than 2 units of 399 in a quarter or take 399 to make up for credit they lack as a result of failure or uncompleted courses. No more than 9 units of 398 and 399 may be presented as credit for graduation. Certain independent study courses offered by some departments with course numbers different from 398 and 399 are also subject to these restrictions.

Honors in the Major

Each major in Weinberg College offers a program that may lead to the award of honors in the major to graduating seniors with outstanding records of achievement. Criteria vary by major, but all share certain features. Students recommended for honors in the major must

- Complete with distinction the regular courses required for the major and at least two quarters of 398 or 399 or their equivalent, or 400-level courses, or some combination thereof. (These courses may count toward major requirements in some departments and programs.) Majors set different GPA criteria.
- Complete a research project or other type of integrative work under the guidance of a faculty adviser. The project must result in a research report, thesis, or other tangible record; coursework by itself is not sufficient. Simple data collection, computer programming, analysis of data with

canned programs, and summaries of primary or secondary sources are not by themselves bases for the award of honors in the major.

Each major has an undergraduate honors committee responsible for administering its honors program and for preparing the final recommendations for honors submitted in May to the Weinberg College Committee on Undergraduate Academic Excellence. The faculty adviser proposes a student for honors and writes a letter describing and evaluating the student's project. A faculty member typically unconnected with the project must submit another letter giving independent and substantive judgments. The departmental honors committee reviews nominations during spring quarter and takes a separate recorded vote on each candidate. Approved nominations are reviewed by the Committee on Undergraduate Academic Excellence, which makes the final decision.

Information on procedures for students pursuing separate honors in two departments or programs, or interdisciplinary honors spanning two majors, is available from the Office of Undergraduate Studies and Advising and at www.weinberg.northwestern.edu/advising/majors/honors.

Professional Linkage Seminars

Undergraduates may take specially designed linkage seminars that approach social and work-related concerns through the eyes of an accomplished nonacademic professional with an affinity for the liberal arts and a gift for intellectual inquiry. These seminars link liberal education to professional issues, illustrating how theory and practice affect and enrich one another and thus focusing on the transition from the academic to the nonacademic world. Topics have included professional ethics, science writing, gender issues in aid to developing countries, the history of business, and the history of urban planning in Chicago.

Preprofessional Study

Weinberg College offers its students excellent preparation for subsequent training in professions such as law, medicine, and management. Each year many graduates pursue professional study in these areas. Other students enter the workforce directly.

All majors can furnish suitable preparation for professional schools, provided appropriate courses are taken. No major, however, is intended solely as preprofessional training. The college advisers in the Office of Undergraduate Studies and Advising help students design academic programs that combine the breadth of a liberal arts education with adequate preparation for further professional study.

Internships

Many students seek to enrich their education with practical experiences gained off campus. Chicago Field Studies administers several programs that combine seminars taught on campus with internships at Chicago-area organizations. Other Weinberg College departments and programs also offer opportunities for off-campus work. These are described in their sections of this catalog.

Study Abroad

Weinberg College students are encouraged to study abroad. The philosophy of the college is that the best foreign study experience combines continued work in a student's chosen course of study with significant opportunities for immersion in the culture of the host country. For example, a political science student might study the European Union in France. The college encourages participation in full-academic-year programs that include extensive study of languages and culture. The Office of the Provost offers grants for intensive summer foreign language study abroad. As early as freshman year, interested students should discuss study abroad plans with their advisers. Complete study abroad information is available from the Study Abroad Office (www.northwestern.edu/studyabroad).

Cross-School Options

Dual Bachelor's Degree Programs (BA/BS and BA/BMus)

Two programs allow undergraduates to combine a bachelor's degree in the liberal arts with a bachelor's degree in another Northwestern undergraduate school. One results in a BA from Weinberg College and a BS from the McCormick School of Engineering and Applied Science, and the other results in a BA from Weinberg College and a BMus from the Bienen School of Music. Both options typically require five years of study. For more information see the Cross-School Options chapter of this catalog.

Honors Program in Medical Education

The Honors Program in Medical Education is designed for unusually gifted high school students who seek a career in medicine or medical science. It provides a plan whereby students entering Northwestern are admitted simultaneously to Weinberg College, the McCormick School, or the School of Communication and to the Feinberg School of Medicine. HPME students then spend the first three or four years in undergraduate study and the last four years in the Feinberg School, potentially reducing the period of formal training by one year. For more information see the Cross-School Options chapter of this catalog.

Accelerated Master's Programs

Undergraduate students doing outstanding work in certain Weinberg College majors (chemistry, comparative literary studies, economics, French, and linguistics) may be accepted into one of the accelerated master's programs approved by the Graduate School. These students receive permission to double-count some courses toward both bachelor's and master's degrees.

The approved departmental programs share the goal of selecting and training exceptional students. Students are not self-selected but are recommended by the department to the Graduate School for admission. No particular grade point average in undergraduate courses, however high, automatically entitles a student to participate in an accelerated master's program. Students are officially admitted only after their credentials have been thoroughly reviewed and approved by the senior associate dean of the Graduate School.

See the individual department sections of this catalog for more information on accelerated master's programs. Further details and policies are available from advisers in the relevant departments and on the Graduate School's website at www.tgs.northwestern.edu/academics/academic-programs/degree-programs/bachelors-masters.

Teaching Certification

Students enrolled in a number of departments of Weinberg College may simultaneously pursue secondary teaching certification through the School of Education and Social Policy. Students may earn science certification with a biology, chemistry, or physics designation; social science certification with an economics, history, political science, or sociology designation; or certification in art, English, French, German, Latin, mathematics, or Spanish.

Majors in the certification areas who wish to be considered for teaching certification must apply, be admitted to, and complete all requirements of the Secondary Teaching Program as described in the School of Education and Social Policy chapter of this catalog. Applications should be submitted to the Office of Student Affairs in the School of Education and Social Policy.

Other Cross-School Options

Weinberg College students participate in many academic opportunities outside of the college, sometimes taking individual courses of interest and sometimes completing a formal program of study. In addition to options described above, opportunities include the Undergraduate Leadership Program as well as programs administered through the Center for the Writing Arts and the Transportation Center (see the Cross-School Options chapter of this catalog for more information). Certificates open to Weinberg undergraduates are offered through the School of Education and Social Policy, the McCormick School of Engineering and Applied Science, the Kellogg School of Management, and the Medill School of Journalism, Media, Integrated Marketing Communications. Minors in several of Northwestern's undergraduate schools, as well as a concentration in music, are also open to Weinberg College students. For more information see the relevant school chapter of this catalog. Interested students should also contact the schools through which the options are offered.

STUDENT RESOURCES

Academic Advising

Weinberg College provides an integrated academic advising structure centered in the college's Office of Undergraduate Studies and Advising, where faculty advisers are available throughout the year to assist students in all aspects of academic and career planning. Each freshman is assigned a freshman adviser who in nearly all cases is the student's instructor in a fall-quarter freshman seminar. At the end of fall quarter each student is assigned a Weinberg College adviser, who will continue to be that student's adviser through graduation. In addition, each Weinberg department and program has a corps of faculty advisers who counsel all undergraduates about course selections, majors and minors, and research and career opportunities.

Research Funding

Weinberg College is committed to facilitating student research and to helping undergraduates immerse themselves in challenging, intense explorations through well-focused projects. The college, as well as some of its departments and programs, awards competitive grants to support research and creative projects of students working under faculty guidance. Academic-year awards cover some research expenses, and some summer awards also provide assistance with living expenses. Conference travel grants help fund travel to professional conferences to present research or creative work.

The University's Undergraduate Research Grants Program is another source of research funding for qualified students. See page 25 for information.

Student Organizations

Many departments and programs within the college sponsor student organizations. Some are honorary organizations, recognizing students who have achieved distinction within their fields of study. Others provide opportunities for students with common interests to come together for academic, social, career-focused, and service activities that complement classroom experiences.

The Weinberg College Student Advisory Board, the primary source of student advice to the dean and the associate dean for undergraduate academic affairs, selects students to serve on several college committees. The board includes representatives from each major in the college.

ACADEMIC OFFERINGS

FRESHMAN SEMINARS

Freshman seminars, offered by nearly all departments and programs in Weinberg College, are small, discussion-oriented classes designed to develop students' basic intellectual skills: reading critically, thinking logically, and

communicating effectively. Expository writing is an important activity in each seminar.

Most Weinberg College freshmen are required to complete two freshman seminars. For more information, see the section on the freshman seminar requirement under Academic Policies in this chapter.

GENERAL LIBERAL ARTS

These interdivisional courses are open to all qualified students.

GEN LA 190-0 Science Research Workshops (0 units) Registration for students participating in science research workshops. Instructor permission required. Grade of satisfactory given to students who attend weekly workshops and complete a written research proposal.

GEN LA 280-1,2,3,4,5,6,7 Residential College Tutorial A seminar for members of a residential college on a theme of common interest, meeting in the residential college and often directed by one of its faculty associates. Enrollment is normally limited to 10 students. Course number indicates distribution requirement area in which a tutorial counts. Proposals for tutorials must be approved by the associate dean for undergraduate academic affairs of Weinberg College.

GEN LA 290-0 Summer Research (0 units) Required registration for students receiving summer research grants from Weinberg College or the Undergraduate Research Grants Committee. Grade of satisfactory will be entered after final report is submitted.

GEN LA 298-0 Student-Organized Seminars Students who desire to study topics in arts and sciences that are not covered in the college's course offerings may initiate their own courses under the supervision of sponsoring faculty members. Enrollment in these seminar courses is limited to 20 students. The student organizer or organizers must, in consultation with the faculty sponsor, prepare a plan for the seminar and submit it to the assistant dean for advising before the middle of the quarter preceding the quarter in which the seminar is held. The plan must include a topic description, a reading list, specification of the work that will be graded (such as term papers and written examinations), prerequisites, and the meeting schedule. Students may enroll in only 1 Student-Organized Seminar a quarter, and enrollment must be on the P/N basis. Weinberg College students interested in organizing a seminar should consult the associate dean for undergraduate academic affairs for further details.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

AFRICAN AMERICAN STUDIES

www.afam.northwestern.edu

The study of the African American experience has a long and distinguished history in the United States. Interdisciplinary from its beginnings, the field has developed exciting insights and firm intellectual and empirical foundations to systematically study the African American experience and consequently better understand the larger American experience. With these strengths and traditions, the Department of African American Studies provides opportunities to explore the richness and diversity of the African American experience in a meaningful and coherent way.

The department offers courses that focus on people of African descent in the United States and other regions of the Americas and the African diaspora—the communities created by the dispersion of peoples from the African continent. By comparing the black experience in various parts of the world, students learn to analyze identity, race, and racism as formations that change over time and space. This broad study of the black experience is one of the key features that distinguish the department from similar departments at other institutions. Major themes in the curriculum include the nature of colonization and its impact on the colonizer and the colonized; racism and its effects on society as well as on scholarship; the importance of oral language, history, and tradition in the African American experience; the roots and development of African American music, literature, and religious styles; analysis of key social, political, and economic institutions such as families, churches, and labor markets; and the traffic of people, ideas, and artifacts throughout the African diaspora.

African American studies provides good preparation for graduate work in the social sciences, the humanities, and the professions, as well as for jobs and careers in a variety of fields. Education, law, journalism, urban planning, healthcare delivery and administration, business, social work, and politics are only a few of the fields for which African American studies provides an excellent background. In addition, as scholars and political leaders pay increased attention to the Caribbean and Latin America as well as to blacks and other minorities in the United States, African American studies touches on issues of far-reaching national and international significance.

Major in African American Studies

Department courses (12 units)

- 5 core courses chosen from 210; 211; 212-1,2; 213; 214; 215; 236; 245
- 6 elective courses in the department, including at least 4 at the 300 level
- 1 senior course: 390, 396, or 399

Related courses (5 units)

- At least 3 must be at the 300 level, and the other 2 can be 200- or 300-level courses.

- Courses must be approved by the department adviser.
- See page 44 for approved related courses or consult the director of undergraduate studies for other courses to satisfy this requirement.

Minor in African American Studies

The minor in African American studies provides thorough exposure to contemporary scholarship concerning the black experience.

Minor requirements (8 units)

- 4 core courses chosen from 210; 211; 212-1,2; 213; 214; 215; 236; 245
- 4 elective courses in the department, including 3 at the 300 level

Honors in African American Studies

Majors with strong academic records and an interest in pursuing honors must notify the honors coordinator during fall of senior year. To qualify for honors, a student must complete a substantial senior-year research project. In consultation with the honors coordinator, the student selects a thesis adviser, who need not be a member of the department. Completion of the thesis ordinarily requires at least two quarters of research and writing. During one or both of those quarters students may register for 399, an independent study with the thesis adviser. This course counts as either 1 of the 6 required "elective courses" in the major or as the senior-course requirement.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information contact the director of undergraduate studies and see Honors in the Major on page 38.

Core Courses

AF AM ST 210-0 Survey of African American Literature Literature of blacks in the United States from slavery to freedom. Works of major writers and significant but unsung bards of the past.

AF AM ST 211-0 Literatures of the Black World Introductory survey of fiction, poetry, drama, folktales, and other literary forms of Africa and the African diaspora. Texts may span the precolonial, colonial, and postcolonial periods and cover central themes, such as memory, trauma, spirituality, struggle, identity, freedom, and humor.

AF AM ST 212-1,2 Introduction to African American History **1.** Key concepts in African American history from 1700 to 1861, including African origins, the Atlantic slave trade, origins of slaving and racism in the United States, life under slavery in the North and South, religion, family, culture, and resistance. **2.** Key concepts in African American history from emancipation to the beginnings of the civil rights era. Focus on constructions of class, gender, and community; the rise of Jim Crow; strategies of protest; and migration and urbanization. Taught with HISTORY 212; students may not receive credit for both courses.

AF AM ST 213-0 History of the Black World Introductory survey of the history of Africans and their descendants across the globe. African civilizations prior to European colonialism, encounters between Africa and Europe, movements of "Africans" to the Americas and elsewhere, and development of black communities in and outside Africa.

AF AM ST 214-0 Comparative Race and Ethnic Studies Problems and experiences of racialized minorities: blacks, Native Americans, Asian Americans, and Latina/os. Comparison of their relationships with each other and with the majority society.

AF AM ST 215-0 Introduction to Black Social and Political Life Analysis of class, gender, sexuality, immigrant status, and ethnic origin in black society and politics. Focus on demographic trends, lived experiences, and ideological debates.

AF AM ST 236-0 Introduction to African American Studies Key texts and concepts in African American studies from a range of disciplinary perspectives.

AF AM ST 245-0 The Black Diaspora and Transnationality Examination of events, movements, theories, and texts that have shaped development of the African diaspora. Topics include slavery, abolitionism, pan-Africanism, the culture-politics nexus, hip-hop, AIDS, and linkages among gender, sexuality, and diasporic sensibilities.

Courses

AF AM ST 218-0 Asian-Black Historical Relations in the United States Comparative historical analysis of Asian-black relations in the United States, including racialized and sexualized discourses structuring interracial relations and social, political, and economic location. Slavery, immigration, model minority myth, cross-racial politics. Taught with ASIAN AM 218; students may not receive credit for both courses.

AF AM ST 220-0 Civil Rights and Black Liberation The Northern and Southern civil rights movements and the rise of black nationalism and feminism, 1945–72.

AF AM ST 225-0 African American Culture Survey of African American culture from slavery to the present. Relation of African American culture to African and Euro-American cultures, the Black Atlantic as a unit of analysis, representations of blackness in the public imagination.

AF AM ST 250-0 Race, Class, and Gender Introduction to scholarship and key theories that treat race, class, and gender as intersecting social constructs. Race, class, and gender in work, family and reproduction, education, poverty, sexuality, and consumer culture. How race, class, and gender inform identity, ideology, and politics to incite social change.

AF AM ST 251-0 The Mixed-Race Experience Exploration of demographic trends in interracial and interethnic marriages in various US Asian, white, and black communities

to highlight the complexity of the American experience. Special attention to mixed-race experiences portrayed in film and novels. Taught with ASIAN AM 251; students may not receive credit for both courses.

AF AM ST 259-0 Introduction to African American Drama Thematic and historical survey of African American drama. Sociopolitical context, the aesthetic reflected in the work, impact on African American and general theater audiences.

AF AM ST 261-0 Queer Literatures in the African Diaspora Advanced introduction to critical theories of race, gender, and sexuality in the African diaspora from the 19th century to today.

AF AM ST 310-0 Contemporary Asian-Black Relations Divides between Asians and blacks; areas of positive cross-cultural collaboration. Historical analysis of reparations, the 1992 Los Angeles riots, and affirmative action. Cross-racial exchange in youth expressions, popular culture, hip-hop. Taught with ASIAN AM 310; students may not receive credit for both courses.

AF AM ST 315-0 Religion in the Black Atlantic Afro-Atlantic religions since the 1400s; traditions of Orisa devotion and monotheisms; religion and revolution in African slave religion; racialization and empire; theories of religion, materialities, and diaspora.

AF AM ST 319-0 Race, Ethnicity, and the American Constitution Investigation of how race and ethnicity have influenced the evolution of the US Constitution and legal debate and practice. Topics include affirmative action, school integration, and the death penalty. Prerequisite: 220 or POLI SCI 220 or 230.

AF AM ST 320-0 The Social Meaning of Race Race as a social concept and recurrent cause of differentiation in multi-racial societies. Impact of race on social, cultural, economic, and political institutions. Discussion of prejudice, racism, and discrimination.

AF AM ST 327-0 Politics of Black Popular Culture Examination of the debates within black communities about the proper role and function of black art and artists in relation to black politics.

AF AM ST 330-0 Black Women in 20th-Century United States Experiences and leadership of African American women in major events in recent history, including antilynching, women's suffrage, civil rights movements, and World War II.

AF AM ST 331-0 The African American Novel Readings in classic black American fiction. The author as creator and participant. Works of Wright, Ellison, Baldwin, and others. Prerequisite: sophomore standing.

AF AM ST 334-0 Gender and Black Masculinity Perceptions and constructions of black masculinity within African American and "American" cultures in the United States; readings in gender and sexuality studies, feminist theory, African American studies, and cultural studies.

AF AM ST 335-0 Race and Literature in 19th-Century America Examination of the evolution and persistence of the notion of "race" in 19th-century America, with attention to the origins of the idea of race in the West. Focus on the multiracial character of 19th-century America.

AF AM ST 339-0 Unsettling Whiteness Making the historical, political, and cultural formation of whiteness in Western modernity visible and narratable for commentary and analysis. Particular reference to contemporary culture.

AF AM ST 342-0 Comparative Slavery Traces slavery across historical epochs and geographic contexts, with an emphasis on Latin America, the Caribbean, and the United States.

AF AM ST 345-0 Afro-Latin America Exploration of Afro-Latin communities, cultures, and identities throughout Latin America and the Hispanic diaspora after 1800. Emergence of race and nation in modern Latin America, migration, gender, Afro-Latin spiritual systems and religion, family, and politics.

AF AM ST 348-0 Africans in Colonial Latin America History of Africans and African-descended people throughout Latin America from 1492 to 1800, emphasizing the varied experiences of slavery and freedom struggles, the emergence of race and colonial categories of difference, and the gendered lives of racialized colonial subjects.

AF AM ST 350-0 Theorizing Blackness Advanced introduction to critical theories of race and racialization. Investigation of blackness as a category of critical analysis for analyzing Afro-diasporic formations. Consideration of how blackness is shaped by gender, class, sexuality, and nationality.

AF AM ST 355-0 Diaspora Studies Interdisciplinary examination of the significance of diasporas, their histories, and common dynamics, illustrated with examples drawn from a wide range of cases.

AF AM ST 357-0 Performing Memory in the Black World Exploration of the ways in which peoples of the Black Atlantic remember slavery and fashion identities through novels, film, folktales, and drama.

AF AM ST 360-0 Major Authors In-depth examination of a selected author's body of work. Choice of author varies. May be repeated for credit with change of author.

AF AM ST 363-0 Racism in Western Modernity Impact of racism in the formation of Western modernity. Critical conceptual and historical analyses of the social formation of "race" and the historical implications of racism in the contemporary West.

AF AM ST 365-0 Black Chicago Surveys the social, cultural, and political history of African Americans in Chicago, including the Great Migration, the black political machine, black Chicago music, racial segregation, internal class stratification, and the role of black churches.

AF AM ST 375-0 Postcolonial African American Studies Development of critical approaches to African American studies from the perspectives of postcolonial analysis. In particular, examination of the meaning of the colonial in the formation of African American experiences and the

significance of modernity, race, and black politics in the historical contexts of the United States, Latin America, and the Caribbean.

AF AM ST 378-0 The Harlem Renaissance African American political and social movements and cultural production in theater, music, visual arts, and literature from 1915 to 1930. Prerequisite: 210 or another African American literature course.

AF AM ST 379-0 Black Women Writers Intensive, multigenre examination of the contribution of black women to African American, women's, and American literature, with consideration of the factors and figures that have influenced the reception of black women's writings across time.

AF AM ST 380-0 Topics in African American Studies Advanced work on social, cultural, or historical topics. May be repeated for credit with different topic. Prerequisite: advanced student or senior standing.

AF AM ST 381-0 Topics in Transnational Black Studies Examination of texts such as novels, poetry, film, drama, slave narratives, political manifestos, and historical texts in order to compare how people from across the African diaspora have approached issues of identity, culture, and community. Prerequisite: advanced student or senior standing.

AF AM ST 390-0 Research Seminar in African American Studies Methods of researching the African American experience. Identification of research problems; location, selection, and critique of relevant literature; data gathering and analysis; report writing. Topics vary. Prerequisite: advanced student or senior standing.

AF AM ST 396-0 Internship in African American Studies Analysis of social and cultural institutions through field study and participant observation. Entails a research project sponsored by a Northwestern faculty member. Prerequisite: advanced student or senior standing.

AF AM ST 399-0 Independent Study Open to advanced students with consent of instructor. Prerequisite: advanced student or senior standing.

Relevant Courses in Other Departments

- AF ST 390, 398
- ANTHRO 255, 320, 327, 332, 340, 372, 373
- ART HIST 220, 222, 384, 385
- ASIAN AM 365
- COMM ST 326 (see the School of Communication chapter of this catalog)
- ECON 321, 325, 326, 354
- ENGLISH 365 (if related to people of African descent), 366
- FRENCH 365, 366
- GEN MUS 330, 340-1,2,3 (see the Bienen School of Music chapter of this catalog)
- HISTORY 212-1,2, 306-1,2, 355, 356-1,2, 357, 358-1,2
- LATIN AM 391
- LATINO 222, 342, 392
- PERF ST 216, 309 (see the School of Communication chapter of this catalog)
- PHIL 368 (when appropriate)
- POLI SCI 327, 357 (if related to people of African descent), 359, 360
- SOCIOL 201, 207, 323, 325
- THEATRE 368 (see the School of Communication chapter of this catalog)

AFRICAN AND ASIAN LANGUAGES

Northwestern's curricula in African and Asian languages have been reorganized. Courses formerly offered through the Program in African and Asian Languages are now housed in the following department and programs:

- African Studies (below)
  - Swahili
- Asian Languages and Cultures (page 57)
  - Chinese
  - Japanese
  - Korean
  - Hindi
  - Minor in Chinese or Japanese language and culture
  - A new major will be developed during the 2013–14 academic year.
- Jewish Studies (page 112)
  - Hebrew
- Middle East and North African Studies (page 127)
  - Arabic
  - Persian
  - Turkish

AFRICAN STUDIES

www.northwestern.edu/african-studies

More than six decades after the distinguished scholar Melville J. Herskovits organized the Program of African Studies at Northwestern, the program remains a model of Africanist study and research. Through sponsorship of multidisciplinary courses with African content, language training, and promotion of Africa-based study, it supports and enlivens the undergraduate study of Africa while serving as the University's "headquarters" for formal and informal interaction among interested students, faculty, and visitors. The program brings undergraduates studying Africa together with faculty and other experts in many areas of inquiry—across disciplinary boundaries and regional specializations—for lectures, seminars, workshops, conferences, and research programs. Northwestern's Melville J. Herskovits Library of African Studies, an unparalleled resource for Africanist study, attracts students and scholars from all over the world. Over the years the program has remained in active contact with its counterparts in Africa and elsewhere, while expanding its role in the University and off-campus communities.

The program offers both an adjunct major and a minor. Although there is no formal language requirement for either, students are strongly encouraged to study a non-English language that is spoken in Africa or its diaspora, such as Swahili, Arabic, French, German, Italian, Portuguese, or Spanish. Competence in a foreign language can facilitate individual research projects, widen understanding of particular topics, and increase study abroad opportunities.

Adjunct Major in African Studies

The adjunct major is structured to serve two broad aims.

First, students are exposed to the geographical and disciplinary breadth of African studies. To that end, all students take 200-level core courses in African history, anthropology, literature, and/or politics, as well as 7 elective courses chosen from an array of disciplines, including African studies, African American studies, anthropology, history, political science, religious studies, and several language and literature departments.

Second, students engage in in-depth research or immersion practicums, the products of which they develop in a capstone senior research seminar. Practicums often involve a central research component, but other proposed practicums of acceptable quality, depth of immersion, etc., may be approved. Among the experiences that may satisfy this requirement with appropriate content are study abroad in Africa, research connected to the Program of African Studies, internships, and independent study and senior capstone projects.

Program courses (11 units)

- 3 core courses chosen from 276; ANTHRO 255; HISTORY 255-1,2,3; POLI SCI 259 (additional courses from this list may be counted toward the next group)
- 7 additional courses chosen from an approved list
  - At least 3 must be at the 300 level.
  - Courses must be selected from at least three departments.
- 1 senior seminar: 395
- All adjunct majors require completion of a stand-alone major as well. At most 2 courses counted toward the African studies adjunct major may be double-counted toward another major.

Research or immersion practicum

- The quarter-long practicum must be approved by the program.
- It must directly relate to African studies.
- Credit earned through the practicum may count as 1 of the 7 additional courses with adviser permission.

Minor in African Studies

The minor in African studies approaches the study of African societies, cultures, histories, and arts across disciplines in the humanities, the social sciences, and professions. Students earning a bachelor's degree in Weinberg College or another Northwestern school may complete the minor. In addition, undergraduates in all disciplines are welcome to participate formally or informally in the program's activities, which advance the training of Africa specialists at Northwestern and promote awareness of Africa in a wider context.

Minor requirements (6 units)

- Courses must be chosen from at least two departments.
- At least 2 courses must be from the HISTORY 255-1,2,3 sequence.
- 1 must be ANTHRO 255.
- Students must have at least an overall B average in the 6 courses.
- At least half of the work in a course taken through another department must have African studies content. Selections must be approved by the program.
- At least 5 courses for the minor must not be double-counted toward a major.
- Students must declare the minor at least two terms before they intend to graduate. They are encouraged to meet regularly with program staff and the director of undergraduate studies to monitor their progress.

Honors in African Studies

Majors with strong academic records and an interest in pursuing honors should submit an application to the director of undergraduate studies during spring of junior year. In addition to the 395 senior seminar, at least 2 of the following must be included among the 11 courses for the adjunct major: 399, 392 (Herskovits Undergraduate Research Award), or an approved graduate seminar. A report on original research or some other integrative capstone project, such as organizing a relevant conference or exhibition, is also required.

Students whose capstone projects and grades meet department criteria are recommended to the college for graduation with honors. For further information contact the director of undergraduate studies and see Honors in the Major on page 38.

Courses

AF ST 276-0 African Literature in Translation Continental African literature. Content varies. May be repeated for credit with different topic. Taught with COMP LIT 276; students may not receive credit for both courses with same topic.

AF ST 390-0 Topics in African Studies A general examination of topics relevant to African studies. May be repeated for credit with change of topic.

AF ST 392-1,2 Herskovits Undergraduate Research Award Courses 2-course sequence required for recipients of the Herskovits Undergraduate Research Award.

AF ST 395-0 Senior Research Seminar Capstone seminar addressing both techniques of research and the substance of a significant issue in African studies. Students develop skills at formulating a research topic and organizing research. Generally offered in winter quarter.
AF ST 398-0 Seminar in African Studies Close study and discussion of an issue or question central to African studies. May be repeated for credit with change of topic.
AF ST 399-0 Independent Study May be repeated for credit with change of topic.

Swahili Courses

SWAHILI 111-1,2,3 Swahili I Basic literacy skills and interactive proficiency; Swahili in cultural and historical context.
SWAHILI 121-1,2,3 Swahili II Development of literacy and interactive proficiency skills; introduction to verbal arts. In Swahili. Prerequisite: 111-3 or equivalent
SWAHILI 216-1,2,3 Introduction to Swahili Literature **1**. Swahili verbal arts in the oral tradition. **2.** Classical Swahili literature. **3**. Standard Swahili literature. Prerequisite: 121-3 or equivalent
SWAHILI 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Swahili. Prerequisite: consent of instructor.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

AMERICAN STUDIES

www.amstp.northwestern.edu

The American Studies Program is interdisciplinary, comparative, and internationally oriented. The competitive-admissions major examines the development and expressions of national culture alongside those of borderland and diasporic American cultures and amongst global cultures. It draws on a broad range of faculty from the humanities and social sciences so that students can examine components of US culture and the diverse experiences of Americans and others affected by Americans locally, nationally, and globally. Students are allowed a wide-ranging yet disciplined exploration that crosses the boundaries of traditional academic fields. All students write a thesis explicitly dealing with the United States in a comparative or global dimension.

Because this selective honors program has more applicants than available space, admission depends in part on academic distinction and on demonstrated interest in comparative American cultures. Freshmen and sophomores apply for admission to the major early in spring quarter.

Study abroad and upper-level language proficiency are strongly encouraged.

Major in American Studies

Program courses (5 units)

- 301-1 during sophomore or junior year
- 301-2 or -3
- 1 approved course from African American, Asian American, or Latina and Latino studies
- 390-1,2 during senior year

Related courses (10 units)

- Must be at the 200 or 300 level.
- 2 of the following, preferably 1 history and 1 English: HISTORY 210-1,2, ENGLISH 270-1,2
- 8 additional courses chosen with the program director
  - Theme of courses should have strong US dimension but also global or comparative implications.
  - At least 1 course must be relevant to the theme but not centered on the United States.

Honors in American Studies

In senior year all majors participate in the senior project seminar (390-1,2) and work on a thesis on a topic of their choice. Students meet weekly with their project advisers, the seminar instructor, and fellow seniors to discuss their projects and common concerns. Students whose senior theses and grades are judged to meet program criteria are recommended to the college for graduation with honors. For more information consult the program director and see Honors in the Major on page 38.

Courses

AMER ST 301-1,2,3 Seminar for Majors Set of required courses structured to share a broad comparativist or internationally oriented theme, integrating methods and materials from different disciplines. Change of instructor each quarter; change of theme every year. Limited to 20 students.
AMER ST 310-0 Studies in American Culture Readings and discussions of topics in American cultural life—for example, law in 20th-century America or television news in contemporary US culture. Limited enrollment with emphasis on student participation. Prerequisites vary. May be repeated for credit with consent of program director.
AMER ST 390-1,2 Senior Project Thesis or field study. Required of majors.
AMER ST 399-0 Independent Study Readings and conferences on special subjects for students pursuing their theme within the major.

ANTHROPOLOGY

www.anthropology.northwestern.edu

Anthropology studies humankind from a broad comparative and historical perspective: the biological evolution of the human species and aspects of the biology of living human populations, the origins of languages and cultures, the long-term development of human cultures over many millennia, and the social life of humans in

groups—families, communities, and nations. Anthropologists attempt to describe specific cultural traditions, forms of social structures, languages, and transitions in human evolution and cultural history. They compare cultures and societies to assess what cultures are similar or different, and why. Anthropology is at once a biological science, a social science, and one of the humanities.

Anthropology's breadth and emphasis on biological and cultural change and cross-cultural comparison make it an ideal major for anyone seeking a solid liberal education as well as for those seeking careers in academic or applied anthropology or archaeology. It serves as an excellent background for students to pursue specialized training in law, medicine, nursing, social work, education, conservation, international relations, or commerce. The world is an ever-smaller and more culturally mixed global community. Knowledge of the developmental processes that explain biological and cultural differences is relevant to a variety of careers. For example, prelaw students would profit from the cross-cultural study of conflict and conflict resolution, and premedical students from courses in human evolution and population genetics as well as the cross-cultural study of health and disease.

The department has many strengths: the application of evolutionary and other biological perspectives to the development of humankind; North American, South American, and European prehistoric archaeology; the study of African societies; the anthropology of complex societies; political economy; and gender. The department is strong in basic theory and refinements of qualitative and quantitative analysis of anthropological data as well as ethnography.

Anthropology majors are encouraged to participate in a variety of field studies programs, including the department's archaeological field training in Dominica, field training conducted with study abroad programs, and summer urban field studies in Chicago. The department is also formally affiliated with Northwestern's Chicago Field Studies Program, which offers a variety of academic internships throughout the year. Field studies that offer the opportunity to conduct original research are especially recommended as preparation for preparing a senior capstone project.

Major Concentrations in Anthropology

Major in Anthropology

Students are expected to complete a 15-course program (11 courses in anthropology and 4 in related fields) for a major in anthropology. The department's 4 required 200-level courses provide background in the four major subfields of anthropology. 370 examines the philosophical and historical roots of the discipline. The 5 additional 300-level courses, including an examination of appropriate methods and research design issues, develop the student's intellectual maturity in the discipline. All seniors are required to take 398 and to prepare a senior capstone project. This requirement provides students with an opportunity to conduct original research and, in the process, gain valuable analytical, critical thinking, and writing skills.

Department courses (11 units)

- 4 core courses: 211, 213, 214, and 215 (students with background in anthropology may petition to substitute a 300-level course)
- 370
- 5 additional 300-level courses, usually selected from one of the subfields below in consultation with an adviser, although students may receive adviser consent to develop a focus that bridges the subfields of anthropology (e.g., culture and technology, health and human development, the institutionalization of power)
  - *Archaeology:* 322 (recommended junior year) and 4 courses chosen from 301, 302, 311, 321 (offered in summer), 325, 327, 328, 339, 362, 381, 382, 383, 390, 391, 396 (offered in summer)
  - *Biological anthropology:* 5 courses chosen from 306, 308, 310, 312, 313, 314, 315, 316, 317, 362, 383, 390
  - *Cultural anthropology:* 389 (recommended junior year) and 4 courses chosen from 310, 311, 315, 320, 330, 332, 334, 339, 340, 341, 347, 350, 354, 355, 360, 361, 365, 368, 369, 372, 373, 374, 376, 377, 378, 383, 390, 395; CFS 393-1,2, 394-1,2, 395-1,2
  - *Human biology:* See Concentration in Human Biology for requirements.
  - *Linguistic anthropology:* 360, 361, 365, and 2 300-level courses in cultural anthropology
- 1 capstone seminar: 398

Related courses (4 units)

- Courses are subject to the department adviser's approval.
- 1 must be in formal or statistical methods.
- At least 2 must be 300-level courses.
- All 4 courses should relate to the student's independent research work and strengthen the focus that guided the selection of 300-level courses in anthropology.

Concentration in Human Biology

The human biology concentration is a good option for students interested in pursuing careers in the health sciences or graduate work in the biological sciences. The concentration combines a core foundation in basic science with an integrative perspective on the human organism, drawing on both the biological and the social sciences. Coursework emphasizes the study of human biology and health from a comparative and evolutionary perspective.

In their freshman and sophomore years students complete the introductory (200-level) anthropology requirements as well as foundational courses (which are also premedical school requirements). Junior- and senior-year coursework includes 300-level courses in biological anthropology/human biology and related courses from

other departments. Additionally, all seniors are required to take 398 and prepare a senior capstone project.

Department courses (11 units)
- 4 core courses: 211, 213, 214, 215
- 2 advanced courses: 370, 386
- 4 concentration courses chosen from 306, 308, 310, 312, 313, 314, 315, 316, 317, 362, 383, 390
- 1 senior seminar: 398

Related courses *(Units depend on chemistry and mathematics sequences taken. Most are also premedical school requirements.)*
- BIOL SCI 215, 216, 217, 220, 221, 222
- CHEM 102/121, 102/122, 103/123 *or* 171/181, 172/182
- CHEM 210-1,2/230-2,3 *or* 212-1,2,3/232-1,2
- MATH 220, 224 or equivalent
- PHYSICS 130-1,2,3 or 135-1,2,3
- 4 additional related courses from other departments
  - STAT 202
  - 3 300-level courses, subject to the approval of the departmental adviser, who maintains a list of recommended courses

Minor in Anthropology

The minor in anthropology provides students in other fields with a framework to pursue a particular focus within the discipline. Such a focus might be within a subfield of anthropology (e.g., biological anthropology, archaeology, cultural anthropology, linguistic anthropology), in area studies (e.g., Africa, the Middle East, the United States), or in a specific topic (e.g., ethnicity, gender, the origins of the state, urban studies). To fulfill this goal, the minor in anthropology combines 2 of the 4 200-level courses required of majors in anthropology, 1 in the area of ethnography (211 or 215) and 1 in the area of origins (213 or 214), with 5 300-level courses that constitute a coherent focus. The 200-level courses provide a foundation for pursuit of specialized topics.

Students pursuing the minor in anthropology must consult with the department's director of undergraduate studies to establish a program and be assigned a departmental adviser.

Minor requirements (7 units)
- 211 or 215
- 213 or 214
- 5 300-level courses in anthropology constituting a coherent combination with a specific focus

Sample programs: Students majoring in biological sciences but with an interest in ecology and behavior would build a coherent minor in biological anthropology by taking 211 or 215; 213; and a focused course selection such as 306, 310, 312, 313, and 383. Students majoring in history with an interest in pre- and early history would build a coherent minor in archaeology by taking 211 or 215; 214; and a focused course selection such as 301, 302, 303, 322, and 381. Students majoring in political science with an interest in noninstitutional or nongovernmental political processes would build a coherent minor in cultural anthropology by taking 211; 213 or 214; and a focused course selection such as 311, 320, 332, 341, and 347. Other programs for the minor in anthropology may be designed to meet a student's particular needs or interests.

Honors in Anthropology

All anthropology majors enroll in 398 and complete a senior capstone project. Majors who have strong undergraduate records and an interest in writing an honors thesis apply in fall quarter of senior year to be considered for the anthropology honors program. In addition to the required quarter of 398, students must take 399 or an appropriate graduate-level course to be eligible for honors consideration. This course is in addition to the 5 300-level courses in the subfield concentration that are required for all majors.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For additional information about honors requirements, please review the department website, consult the director of undergraduate studies, and see Honors in the Major on page 38.

Courses

For 300-level courses in anthropology, the prerequisite is sophomore standing or 1 100- or 200-level course, unless a specific prerequisite is included in the description below. A student without the prerequisite occasionally may be admitted to a course with the consent of the instructor.

ANTHRO 105-0 Evolution and Social Behavior: The Basics Introduction to anthropology; the biological evolution of humankind; the evolution of culture; the comparative study of existing or historically recorded societies.

ANTHRO 211-0 Culture and Society Introduction to the comparative study of culture, exploring different types of social organization, their evolutionary significance, and their economic and political correlates.

ANTHRO 212-0 Global Cultures, Global Inequalities A cultural anthropological introduction to the contemporary world and the historical backdrop to contemporary globalization.

ANTHRO 213-0 Human Origins Emergence of the human species through the process of organic evolution, emphasizing genetics, the fossil record, and comparison with our nearest living relatives.

ANTHRO 214-0 Archaeology: Unearthing History The evolution of culture from its earliest beginnings through the development of urbanism and the state. Principles of archaeological research.

ANTHRO 215-0 The Study of Culture through Language The scope of linguistic anthropology, from the study of

language as an end in itself to the investigation of cultures through the medium of human languages.

ANTHRO 232-0 Myth and Symbolism Introduction to different approaches to the interpretation of myth and symbolism, e.g., Freudian, functionalist, and structuralist.

ANTHRO 235-0 Attending to Culture Techniques of social and cultural analysis for students planning to study or work abroad, with an emphasis on field-study exercises that treat culture as a lived experience, society as a participatory process, and social observation as systematic and abstract.

ANTHRO 255-0 Contemporary African Worlds Use of key anthropological insights about value judgments and cultural relativism to examine the survival strategies and turbulent histories of contemporary African societies.

ANTHRO 260-0 Plagues and Peoples: The Anthropology of Global Health Introduction to global health theory and method, policy, governance, practice, and research. Medical anthropology case studies of infectious disease (malaria, HIV/AIDS, ebola), structural inequities (poverty, gender-based violence), and health systems (Cuba).

ANTHRO 306-0 Evolution of Life Histories Evolved strategies for allocating resources among growth, reproduction, and maintenance; emphasis on the biological processes underlying the human life cycle and its evolution.

ANTHRO 308-0 Global Health in Human History Exploration of paleopathology, including records of pre- and protohistoric adaptations to human disease, health, and medicine. The biocultural perspective on patterns of disease links past perspectives and current realities. Prerequisite: 200-level anthropology, global health, or biology course or consent of instructor. Taught with GBL HLTH 308; students may not receive credit for both courses.

ANTHRO 310-0 Evolution and Culture Introduction to the application of theory from evolutionary biology to cultural anthropology; principles of evolutionary biology; application of principles to human social behavior and culture. Prerequisite: 213 or equivalent.

ANTHRO 311-0 Indians of North America Aboriginal cultures of northern Mexico, continental United States, Alaska, and Canada. Languages, art, and social, economic, and religious life.

ANTHRO 312-0 Human Population Biology Current theory and research in human biological diversity, focusing on the impact of ecological and social factors on human biology; how adaptation to environmental stressors promotes human biological variation. Prerequisite: 213.

ANTHRO 313-0 Anthropological Population Genetics Principles of population genetics applied to primates. Mathematical models, analyses of small populations, and interaction of social and genetic processes. Prerequisite: consent of instructor.

ANTHRO 314-0 Human Growth and Development Integrated biological and cultural perspective on human growth and development from infancy through adolescence; cross-cultural variation in developmental processes and outcomes. Prerequisite: 100- or 200-level anthropology, biology, or psychology course or consent of instructor.

ANTHRO 315-0 Medical Anthropology Theories of interactions between culture and biology that affect human health. Beliefs and practices for curing illness and maintaining well-being. Cross-cultural study of infectious and chronic diseases, mental illness, infant/maternal mortality, poverty, and gender. Prerequisite: 100- or 200-level anthropology or sociology course or consent of instructor.

ANTHRO 316-0 Forensic Anthropology The application of traditional skeletal biology to problems of medicolegal significance, primarily in determining identity and analyzing trauma from human remains. Prerequisite: 200-level anthropology or biology course or consent of instructor.

ANTHRO 317-0 Human Evolution Fossil record and reconstruction of phylogeny; morphological and behavioral adaptation of early hominids and forebears.

ANTHRO 320-0 Peoples of Africa A survey of the cultures of Africa and the significant similarities and differences among the indigenous societies of the continent. Prerequisite: 211.

ANTHRO 321-0 Archaeological Field Methods Practical training in basic methods and techniques at an excavation site; given with summer Archaeology Field School.

ANTHRO 322-0 Introduction to Archaeology Research Design and Methods Regional and site-specific approaches to the description and analysis of patterns in archaeological data, including settlement survey, site characterization, vertical excavations, and horizontal household excavations.

ANTHRO 324-0 Archaeological Survey Methods Unique contributions of archaeological surveys to research about past peoples and places. Course uses geospatial technologies, such as shallow geophysics and GIS.

ANTHRO 325-0 Archaeological Methods Laboratory Analysis of archaeological methods (faunal, botanical, artifact, or soil analysis) with various techniques. May be repeated for credit.

ANTHRO 327-0 Archaeology of Ethnicity in America History of different ethnic groups in America as shown through living quarters, burials, food remains, tools, jewelry, etc. How groups have been portrayed in museums claiming to depict the American past. Focus on African Americans and Native Americans.

ANTHRO 328-0 The Maya The archaeology of the Maya in Latin America; life and society in pre-Columbian Maya civilization.

ANTHRO 330-0 Peoples of the World Comparative ethnography of a regionally or historically associated group of cultures or a type of community defined in ecological, ideological, or other terms. May be repeated for credit.

ANTHRO 332-0 The Anthropology of Reproduction Marriage and reproduction throughout the world, particularly the developing world and Africa. Conjugal strategies, fertility, contraception.

ANTHRO 334-0 The Anthropology of HIV/AIDS The experiences of HIV-positive people; local and global policies shaping access to treatment; contributions of anthropologists to reducing HIV/AIDS globally. Readings from classic and current ethnographies. Prerequisite: 1 300-level course in anthropology or sociology.

ANTHRO 335-0 Language in Asian America Survey of linguistic anthropological topics relevant to Asian American communities, including bilingualism, code switching, language socialization, language shift, style, sociolinguistic variation, indexicality, media, and semiotics. Taught with ASIAN AM 335; students may not receive credit for both courses.

ANTHRO 339-0 Material Culture Relationship between material objects and social life; review of theoretical approaches to gifts and commodities; ethnographic collecting in colonial and postcolonial settings; relationship between culture and aesthetics. Prerequisite: 211 or consent of instructor.

ANTHRO 340-0 Visual Anthropology of Africa Anthropological analysis of techniques, visual rhetoric, and narrative strategies embedded in images of Africa and Africans in a variety of contemporary and digital media. Course includes instruction in video production. Prerequisite: 200-level social science or African studies course or consent of instructor.

ANTHRO 341-0 Economic Anthropology Economic organization in small-scale nonindustrialized communities. Traditional structures of primitive and peasant economies.

ANTHRO 343-0 Anthropology of Race Anthropological approaches to the analysis of race, racialization, and antiracism. Human variation, space, segregation, comparative analysis, and language ideologies.

ANTHRO 347-0 Political Anthropology Cross-cultural study of political organization in stateless and state societies. The state, its origin, and changing role in developing countries.

ANTHRO 350-0 Anthropology of Religion The human relationship with the supernatural. Action patterns accompanying beliefs. Comparison of nonliterate religions and historical religions.

ANTHRO 354-0 Gender and Anthropology Cross-cultural survey of women's roles from three perspectives: biosocial, sociocultural, politicoeconomic. Theory of gender inequality. Emphasis on the third world.

ANTHRO 355-0 Sexualities Cross-cultural survey of sexuality from an anthropological perspective. Focus on first half of the 20th century, the 1970s, 1980s, and the turn of the 21st century.

ANTHRO 360-0 Language and Culture Relationship between language and culture; language as the vehicle of culture and as the manifestation of thought.

ANTHRO 361-0 Talk as Social Action Analysis of talk in interaction based on examination of audio and video recorded data and associated transcripts. Conversation, action, turn, sequence, relevance, social structure, qualitative methodologies. Prerequisite: 215 or consent of instructor.

ANTHRO 362-0 Advanced Methods in Quantitative Analysis Advanced applications of univariate and multivariate statistics to anthropological research questions. Prerequisite: 200-level statistics course.

ANTHRO 365-0 Language, Race, and Ethnicity in the United States Analysis of connections between language ideologies, language use, and meanings of race and ethnicity. Bilingualism, immigration, identity, accented English, African American English, language policy, English-only movement, education, social change. Taught with ASIAN AM 365; students may not receive credit for both courses.

ANTHRO 368-0 Latino Ethnography Sociocultural analysis of US Latino communities. Examines ethnographies by and about Latinos based in the United States. Draws on a broad disciplinary basis, including Latino studies and ethnic studies, to critique and elaborate on ethnographic methods and epistemologies. Prerequisite: 211, LATIN AM 251, or consent of instructor.

ANTHRO 369-0 Contemporary Immigration to the United States Major theories in immigration studies; contemporary processes of immigration and immigrant "community building" in the United States. Prerequisite: 1 300-level course in anthropology or sociology.

ANTHRO 370-0 Anthropology in Historical Perspective Major schools of thought in social, archaeological, and biological anthropology over the last century. Prerequisite: 200-level anthropology course or consent of instructor.

ANTHRO 372-0 Third World Urbanization Urbanization processes in the third world. Spatial development, wage labor, the informal sector, gender relations, rural-urban migration, and global and transnational interactions. Effects of these processes on sociocultural practices. Prerequisite: 100- or 200-level social science course or consent of instructor.

ANTHRO 373-0 Power and Culture in American Cities Overview of history and present realities of American urban life, with focus on ethnographic knowledge and stratifications by class, race, ethnicity, gender, nationality, and sexuality. Reconstitution of social and cultural relations, politics, and labor markets by recurrent streams of migration. Prerequisite: 100- or 200-level cultural anthropology or sociology course or consent of instructor.

ANTHRO 374-0 The Anthropology of Complex Organizations Examination of recent research in organizational ethnography based on investigations in industrial ethnology, the anthropology of work, studies of public-sector bureaucracies, and research in multinational corporations. Prerequisite: 100- or 200-level anthropology or sociology course or consent of instructor.

ANTHRO 376-0 Socialization Cross-cultural study of the intergenerational transmission of culture; processes by which social groups pass on social tradition and behavior

to succeeding generations. Prerequisite: 211, introductory psychology course, or consent of instructor.

ANTHRO 377-0 Psychological Anthropology Contemporary approaches to cross-cultural behavior: ecocultural aspects of behavior development through maturation and socialization in human and nonhuman primates. Prerequisite: introductory survey courses in psychology or anthropology or consent of instructor.

ANTHRO 378-0 Law and Culture Introduction to the anthropology of law; institutional knowledge as seen in material culture and legal documents; colonial and postcolonial settings; theoretical approaches to the relationships between law and culture, colonialism, evidence, and globalization. Prerequisite: 200-level anthropology course or consent of instructor.

ANTHRO 381-0 North American Prehistory Intensive study of cultural history of one or more areas of the continent from archaeological evidence.

ANTHRO 382-0 Households and Everyday Life The role of households and everyday life in past and present societies throughout the world. Focus on people, gender, social relations, and interpersonal relations. Prerequisite: 100- or 200-level anthropology, history, or sociology course.

ANTHRO 383-0 Environmental Anthropology How humans have changed and are changing the environment and what can be done to halt environmental deterioration. Topics include tribal lifestyles, population trends, food supplies, consumerism, environmental regulation, and ecological consciousness.

ANTHRO 384-0 Slavery's Material Record Archaeological approaches to studying Atlantic world slavery; botanical and material legacies of Africans in the Americas; archaeologies of resistance.

ANTHRO 386-0 Methods in Human Biology Research Laboratory-based introduction to international research in human biology and health; methods for assessing nutritional status, physical activity, growth, cardiovascular health, endocrine and immune function. Prerequisite: 213 or consent of instructor.

ANTHRO 389-0 Ethnographic Methods and Analysis Descriptive, naturalistic study of the culture of human social groups. Data gathering through observation and interview. Data analysis for ethnographic reporting. Prerequisites: 211 and 215.

ANTHRO 390-0 Topics in Anthropology Advanced work in areas of developing interest and special significance. May be repeated for credit with different topic.

ANTHRO 391-0 Archaeology, Ethics, and Contemporary Society Why study of the past is relevant to the present; examination of ethical issues in archaeology as they arise during the fieldwork experience. Prerequisite: 321.

CFS 393-1,2, 394-1,2, 395-1,2 Chicago Field Studies See Chicago Field Studies.

ANTHRO 395-0 Field Study in Anthropology Ethnographic field experience in the United States or abroad. Offered in conjunction with summer field schools for exceptional students. Prerequisite: consent of instructor.

ANTHRO 396-0 Advanced Archaeological Field Methods Complex excavation and survey procedures, topographic map making, excavation drawing, soil description; offered in conjunction with the summer Archaeology Field School.

ANTHRO 396-7 Junior Tutorial Intensive work on a topic not normally offered.

ANTHRO 398-0 Capstone Seminar Supervised group discussion of research during preparation of the senior capstone project. Required of all majors.

ANTHRO 399-0 Independent Study Open with consent of department to juniors and seniors who have completed with distinction at least 2 courses or the equivalent in anthropology. Under direction of individual members of department.

Relevant Courses in the Bienen School of Music

- MUSICOL 323, 326-1,2

Summer Field Schools

Archaeology Field School: Courses may include 321, 322, 325, and 396, some of which are also offered on the Evanston campus.

For additional information, contact the Department of Anthropology.

ARABIC

See Middle East and North African Studies.

ART HISTORY

www.wcas.northwestern.edu/arthistory

Art history studies the world's arts and architecture from antiquity to the present. It analyzes visual objects from multiple perspectives, including their aesthetic and historical contexts, use of technology, relationship to science, ideological or social function, and visual and spatial characteristics. It studies individual artists or makers, cultural institutions, audiences, and intercultural exchanges. Because the field is inherently interdisciplinary, it often engages anthropology, philosophy, political science, history, literature, film, performance, theater, and theories of race, gender, class, and sexuality.

The study of art history provides knowledge of geographically and historically diverse artworks and related cultural practices. Departmental course offerings explore these works and practices with varying intensity and specialization. The major is an essential platform for those interested in the classic art history careers. (Curatorial work in museums normally requires at least a master's degree, and college and university teaching and research require a PhD.) With its liberal arts emphasis on informed and critical reading, writing, speaking, and looking, and with its broad historical, cultural, geographic, and methodological range, the major also offers an excellent

foundation for specialization in law, medicine, business, international relations, politics, education, and other areas.

All majors are required to confer with their adviser or the director of undergraduate studies at the start of the academic year and are encouraged to do so before each registration period. Those wishing to petition to graduate or to transfer credits must see the director of undergraduate studies.

Major in Art History

Department courses (12 units)

- 2 200-level courses
- 9 300-level courses, including
  - 391
  - At least 1 390 or 395 seminar
  - At least 1 art history course in each of the following four art historical categories: ancient or medieval; Renaissance or baroque; modern or contemporary; and non-Euro-American
- 1 studio art course, typically from the department of art theory and practice; other courses may be approved

Related courses (4 units)

- 4 additional 200- or 300-level courses from related humanistic or social science fields; no more than 2 courses from the same department

Minor in Art History

Minor requirements (8 units)

- 2 courses at the 200 level
- 6 courses at the 300 level
- At least 1 300-level course must be in a non-Euro-American area.

Honors in Art History

Majors with strong academic records and an interest in pursuing honors must submit an application to write a senior honors thesis to the director of undergraduate studies by the end of junior year. The thesis requires

- Successful completion of 2 independent study courses (399), 1 of which may count toward the major (taken in fall and winter quarters of senior year)
- Participation in the departmental senior thesis colloquium

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For further information see the description of the honors program on the art history department website, contact the director of undergraduate studies, and see Honors in the Major on page 38.

Courses

ART HIST 210-0 Introduction to Art History Conceptual introduction to the problems and methods of art history. Team-taught by departmental faculty, it introduces professors and their areas of expertise as well as fundamental concepts, monuments, and objects in art history.

ART HIST 220-0 Introduction to African Art Thematic and historical survey of the major periods of art making in Africa; analysis of a few exemplary works.

ART HIST 222-0 Art History and the African Diaspora Introduction to the visual and performance art of the African diaspora, including the Carribean, Brazil, and the United States.

ART HIST 224-0 Introduction to Ancient Art Introduction to the art and architecture of the ancient Near Eastern, Egyptian, Aegean, Greek, and Roman worlds.

ART HIST 225-0 Introduction to Medieval Art Introduction to the art and architecture of the medieval Mediterranean from the late Antique, Byzantine, and Islamic periods through the early medieval, Romanesque, and Gothic artistic traditions.

ART HIST 228-0 Introduction to Pre-Columbian Art Introduction to pre-Columbian and Native American art and architecture, from tribal societies, such as the Iroquois, Mandan, and Kwakiutl, to complex states, such as the Aztec, Maya, and Inca.

ART HIST 230-0 Introduction to American Art Survey of art and architecture in cultural context, from the art of conquest to contemporary issues.

ART HIST 232-0 Introduction to the History of Architecture and Design The theory and history of architecture in relation to cities and landscape; the history of design, 1850 to today.

ART HIST 235-0 Introduction to Latin American Art Survey of the work of artists and groups from throughout the various countries of Central and South America from colonial times to the present.

ART HIST 240-0 Introduction to Asian Art Introduction to the art and architecture of India, China, and Japan from ancient cultures to contemporary developments, including religious, court, and popular genres.

ART HIST 250-0 Introduction to European Art Leading centers and artists of Europe from the Middle Ages to the 20th century. Architecture, sculpture, painting, and graphic arts in relation to their social and cultural settings.

ART HIST 255-0 Introduction to Modernism Conceptual introduction to modernism, covering art and visual culture from the late-19th century to the mid-20th century, with a focus on Europe and the United States.

ART HIST 260-0 Introduction to Contemporary Art Conceptual and thematic introduction to art since the 1960s, with attention to the impact of new technologies, social and political change, globalization, and the ongoing transformation of artistic production and distribution.

ART HIST 310-1,2 Ancient Art Art and architecture of the Ancient Greco-Roman world. **1.** Art and architecture of Greece from the prehistoric Aegean to the Hellenistic periods. **2**. Art and architecture of the Roman world from Etruscan forerunners to the High Empire. Prerequisite: 1 200-level art history course.

ART HIST 318-0 Exhibiting Antiquity: The Culture and Politics of Display Examination of the construction of Mediterranean antiquity through modes of reception since 1750. Analysis of programs of collecting and display and the intersection of institutional and scholarly agendas. Taught with CLASSICS 397 and HUM 397; students may receive credit for only 1 of these courses.

ART HIST 320-1,2,3 Medieval Art Art and architecture of the Middle Ages. **1.** Byzantine. **2.** Early medieval. **3.** Late medieval. Prerequisite: 1 200-level art history course.

ART HIST 330-1,2,3 Renaissance Art Painting, sculpture, architecture, and the graphic arts in Europe from the late Middle Ages through the 16th century. **1.** Italian art from c. 1300 to the sack of Rome (1527). **2.** Italian art from Mannerism to the High Baroque in Rome. **3.** The art of France, Germany, and/or the Netherlands from the 14th through the 16th centuries. Prerequisite: 1 200-level art history course.

ART HIST 340-1,2 Baroque Art Painting, sculpture, and the graphic arts in Europe from the late 16th through the 17th centuries. **1.** Art and visual culture of the Mediterranean regions (Italy, Spain, France). **2.** Northern Baroque art and visual culture. Prerequisite: 1 200-level art history course.

ART HIST 350-1,2 19th-Century Art Survey of European painting and sculpture. **1.** The late 18th century to 1848. **2.** 1848–1900. Prerequisite: 1 200-level art history course.

ART HIST 360-1,2 20th-Century European Art European painting, sculpture, architecture, design, and visual culture of the 20th century. **1.** Pre–World War II. **2.** Post–World War II. Prerequisite: 1 200-level art history course.

ART HIST 365-1,2 American Art Survey of the arts and visual culture in the United States, encompassing architecture, painting, sculpture, photography, prints, film, and popular culture. **1.** Colonial times to the Civil War. **2.** Post–Civil War. Prerequisite: 1 200-level art history course.

ART HIST 366-0 Contemporary Art In-depth study of art since 1960 as seen from a global perspective and with attention to concurrent developments in critical theory. Prerequisite: 1 200-level art history course.

ART HIST 370-1,2 Modern Architecture and Design 1. The history and theory of architecture in relation to cities and landscape, 1800 to today. **2.** The history of design, 1850 to today. Prerequisite: 1 200-level art history course.

ART HIST 372-1,2 Japanese Art Survey of historical or media-specific art in Japan and Japanese culture. **1.** Arts of Japan pre-Meiji Restoration (1868), including painting, calligraphy, ceramics, architecture, sculpture, textiles, and gardens in religious and secular settings. **2.** Modern Japanese art and architecture, 1868–present. Prerequisite: 1 200-level art history course.

ART HIST 378-0 Architecture and Urbanism of the World City in the 20th Century Critical examination of the modern city as a socioeconomic system. Prerequisite: 1 200-level art history course.

ART HIST 380-1,2 Tibetan Buddhist Art Focused study of Buddhist art made in Tibet and neighboring countries. **1.** Art of the Imperial period (7th–9th centuries) through the end of the 14th century, including regional developments in western Tibet. **2.** Art of the 15th–19th centuries, including regional developments in eastern and northeastern Tibet. Prerequisite: 1 200-level art history course.

ART HIST 382-1,2 Chinese Painting In-depth study of painting in China with consideration of formal and historical developments. **1.** Visual culture of the Tang and Song dynasties. **2.** Yuan and Ming dynasties. Prerequisite: 1 200-level art history course.

ART HIST 384-0 African American Art Art of the African-descended cultures of North and South America and the Caribbean. Prerequisite: 1 200-level art history course.

ART HIST 385-0 Black Visual Culture: Race and Representation Examination of how visual representations and technologies of vision have been used to create, transform, or destabilize the idea of race as it pertains to people in the African diaspora at specific historical moments. Prerequisite: 1 200-level art history course.

ART HIST 386-0 Art of Africa Thematic examination of art and art historiography of sub-Saharan Africa from the 15th century to the present. Prerequisite: 1 200-level art history course.

Special Topics Courses

ART HIST 319-0 Special Topics in Ancient Art Content varies—for example, picturing the gods; monument and commemoration in antiquity; narrative in ancient art; and the Roman provinces. Prerequisite: 1 200-level art history course.

ART HIST 329-0 Special Topics in Medieval Art Content varies—for example, the early Christian church; history of illuminated manuscripts; pilgrimage and saints' cults; the cathedral; Spain; art and crusade. Prerequisite: 1 200-level art history course.

ART HIST 339-0 Special Topics in Renaissance Art Content varies—for example, the art of Bosch and Brueghel; the history of collecting; art at court; portraiture; gender and representation. Prerequisite: 1 200-level art history course.

ART HIST 349-0 Special Topics in Baroque Art Content varies—for example, French art of the 16th and 17th centuries; art and the New World; early modern prints and drawings; art and science. Prerequisite: 1 200-level art history course.

ART HIST 359-0 Special Topics in 19th-Century Art Content varies—for example, the art of Edouard Manet; orientalism; the spaces of 19th-century art; painting in the south of France. Prerequisite: 1 200-level art history course.

ART HIST 367-0 Special Topics in American Art Content varies—for example, nationalism and internationalism in American art; the myth of America; the artist in American society; elite and popular visual traditions. Prerequisite: 1 200-level art history course.

ART HIST 368-0 Special Topics in 20th-Century Art Content varies—for example, art of the Russian Revolution; the avant-garde; totalitarian art; art during war; modernism and its discontents; art and decolonization; medium specificity. Prerequisite: 1 200-level art history course.

ART HIST 369-0 Special Topics in Contemporary Art Content varies and may coincide with local exhibitions—for example, art and activism, utopia and dystopia in recent practice; participatory art; the Sixties; video art; art criticism; globalization; visual cultural studies; photography in/as art; installation art; truth and fiction in recent practice. Prerequisite: 1 200-level art history course.

ART HIST 379-0 Special Topics in Architecture Content varies—for example, Chicago architecture, including the work of Sullivan and Wright; Beaux Arts architecture in Europe and America; modernism in architecture; American architecture from Thomas Jefferson to Frank Lloyd Wright. Prerequisite: 1 200-level art history course.

ART HIST 389-0 Special Topics: Arts of Asia and the Middle East Content varies—for example, aspects of painting in the Indian subcontinent: Mughal and Rajput; issues of gender and sexuality in Japan and China from the 18th through the 20th century; art in/about the Middle East. Prerequisite: 1 200-level art history course.

Courses Primarily for Majors

ART HIST 390-0 Undergraduate Seminar Content varies—for example, video's first decade; readings in medieval art; Frank Lloyd Wright and Mies Van der Rohe, 1937–50; Bosch and Brueghel; Japanese prints; Jerusalem; the spaces of Chicago. Prerequisite: 1 300-level art history course.

ART HIST 391-0 Undergraduate Methods Seminar An introduction to the history of the discipline of art history and to the different methodological approaches to the study of art and visual culture. Prerequisite: 1 300-level art history course.

ART HIST 395-0 Museums Museum studies seminars. Content varies—for example, the history of museums, their ethical basis, community responsibilities, educational prerogatives, and future directions. Prerequisite: 1 300-level art history course.

ART HIST 396-0 Internship in the Arts Direct participation, with oversight by the director of undergraduate studies, in the curatorial/educational activities of an established arts organization. By petition, on a limited basis; may be taken only once. Prerequisite: 1 300-level art history course or consent of instructor.

ART HIST 399-0 Independent Study Special projects involving reading and conferences with a supervising professor. Arranged in exceptional circumstances. Two quarters required for students writing a senior thesis in art history. Prerequisite: 1 300-level art history course.

ART THEORY AND PRACTICE

www.art.northwestern.edu

As its name suggests, the Department of Art Theory and Practice explores both the making of contemporary art and the ideas and theories that drive it. Faculty and students pursue the visual arts as a theoretical discipline that pushes the boundaries of aesthetic and cultural experience. The department offers a range of courses that apply traditional approaches, adopt newer media, or use alternative strategies. The study of art practice in traditional media, such as painting, drawing, sculpture, and photography, is the core of the undergraduate course structure, enabling students to develop a solid foundation in the field's traditions and established forms. Studio art classes address both technique and critical thinking about contemporary art; these are complemented by classes in contemporary art theory. Other courses expressly look forward, exposing students to experimental approaches and a foretaste of future developments in visual art making. This dynamic curriculum incorporates digital technology, video, and conceptual art practice, thus blending new trends with traditional practices.

Major in Art Theory and Practice

Students majoring in art theory and practice plan a program of study in consultation with and subject to the approval of a department adviser.

Major requirements (15 units)

- 3 introductory courses: 125, 130, and 140
- 3 history and theory courses: 270, 272, and either 372 or an approved course in the art history department
- 280 in junior year
- 380 in senior year
- 7 additional courses
  - 3 must be at the 300 level.
  - 4 must be studio art courses at any level.

Honors in Art Theory and Practice

All senior majors enroll in 380 and produce a final exhibition or project. The department's honors committee reviews all final projects, considering innovation, creativity, scope and ambition, and realization and presentation. Students whose projects and overall records meet department criteria are recommended to the college for graduation with departmental honors. For more information consult the department adviser and see Honors in the Major on page 38.

The Teaching of Art

Weinberg College students pursuing a major in art who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student

Affairs in SESP as early as possible in their academic careers.

Courses

ART 120-0 Introduction to Painting Introduction to problems in oil painting and visual thinking. Includes surface preparation, color mixing, and composition. No previous experience necessary.

ART 124-0 Color Theory Introduction to color theory with emphasis on its application to the visual arts. Key terms, the basics of color physics, the physiology of visual perception, and theories of color relationships.

ART 125-0 Introduction to Drawing Introduction to basic drawing techniques and problems in line, space, perception, and the expressive use of various graphic media. No previous experience necessary.

ART 130-0 Introduction to Time-Based Arts Introduction to a wide range of time-based art practices as used in the visual arts, including performance, sound, and video. No previous experience necessary.

ART 140-0 Introduction to Sculpture Introduction to basic sculptural materials and techniques and issues of three-dimensional form. No previous experience necessary.

ART 150-0 Introduction to Photography Extensive darkroom instruction focusing on aesthetic problems and the production of high-quality black-and-white prints. No previous experience necessary.

ART 210-0 Digital Tools for Artists Introduction to basic digital tools including Adobe Photoshop and Illustrator and their use in the production of both traditional media and digital works. Prerequisite: 1 100-level course in the department.

ART 222-0 Intermediate Painting Development of visual language and technical skills in oil painting. Prerequisite: 120.

ART 225-0 Intermediate Drawing Continued development of drawing skills, perceptual abilities, content, and creative thought. Prerequisite: 120 or 125.

ART 230-0 Alternatives to the Object Alternative approaches to making and understanding visual art. Rather than approaching the work of art as an object, students explore it as gesture, idea, or experience. Prerequisite: 1 100-level course in the department.

ART 240-0 Intermediate Sculpture Concepts, forms, and processes in sculpture, with an emphasis on developing a personal artistic direction. Prerequisite: 140 or consent of instructor.

ART 250-0 Intermediate Photography Large-format studio lighting techniques, conceptual approaches, introduction to digital photography. Prerequisite: 150.

ART 252-0 Color Photography Techniques and issues of contemporary color photographic process; digital printing. Prerequisite: 150.

ART 260-0 Video Art Methods of the studio-based production of video art, including shooting, editing, and presentation. Prerequisite: 1 100-level course in the department.

ART 270-0 Contemporary Art Survey Forms and concerns of art from the 1960s to the present, introduced in slide-lecture format.

ART 272-0 Critical Methods for Contemporary Art Introduction to basic key terms, concepts, and analytical categories of theoretical discourses relevant to an informed and critical engagement with contemporary art.

ART 280-0 Studio Practice Exploration of varied techniques and strategies geared toward the development of an individualized and self-directed studio practice. Prerequisite: junior standing in the major or consent of instructor.

ART 290-0 Intermediate Special Topics in Art Studio course focusing on a topic or theme of special interest in contemporary art. Content varies. Prerequisites vary with topic.

ART 310-0 Digital Art Exploration and production of digital art, including web-based works and/or computer-based interactive works. Prerequisite: 210 or consent of instructor.

ART 322-1,2 Advanced Painting Development of painting skills and personal artistic vision. Prerequisite: 222.

ART 340-0 Installation Art Exploration of installation art in any media, including video, photography, painting, light, sound, and sculptural materials, in works that expand the physical boundaries of art beyond the discrete object. Prerequisite: 140 or consent of instructor.

ART 372-0 Art Theory and Practice Seminar Variable topics addressed in a seminar format. Prerequisites: vary with topic.

ART 380-0 Studio Critique Development of a self-motivated individual studio practice, a strong portfolio, and critical skills. Students learn to give articulate verbal and written expression to the concerns their art explores. Prerequisite: 280 or consent of instructor.

ART 390-0 Special Topics in Art Studio course focusing on a topic or theme of special interest in contemporary art. Content varies. Prerequisites: vary with topic.

ART 399-0 Independent Study For advanced majors pursuing projects outside the context of regularly offered courses. Prerequisite: consent of department chair.

ASIAN AMERICAN STUDIES

www.asianamerican.northwestern.edu

Asian American studies is a vital component of a liberal arts education that seeks to broaden awareness and appreciation of the world. Asian American studies deepens understanding of the multiracial history and character of the United States and also provides an opportunity to place the American experience within a larger global context.

Northwestern's Asian American Studies Program aims to provide students with an understanding of Asian American experience as fundamental to the ongoing development of American society and linked to the experiences of

other racial minorities in the United States and of Asian migrants across the world. The program thus encourages students to develop informed, far-reaching perspectives that facilitate responsible participation in a rapidly changing world. As an interdisciplinary program, Asian American studies develops traditional investigative, analytic, and critical skills while also promoting the intellectual and creative powers students need to meet the challenges of the 21st century.

Minor in Asian American Studies

The minor in Asian American studies offers an opportunity to pursue a coherent study of Asian American communities and the experiences of Asian Americans in the United States. It also provides a foundation for the interdisciplinary study of race, ethnicity, and migration within the modern global historical development of nationalism, imperialism, and colonialism.

Minor requirements (7 units)

- 6 courses in Asian American studies
  - Must include introductory survey (210), history survey (ASIAN AM 214 or HISTORY 214), or literature survey (ASIAN AM 275 or ENGLISH 275).
  - At most 2 courses from other programs and departments with significant coverage of Asian American issues may be counted toward the 6 courses with permission of the program director.
- 1 course in a discipline other than Asian American studies that focuses on race and ethnicity; it should provide conceptual and comparative breadth concerning a topic related to Asian American studies.
- At least 3 of the 7 courses must be at the 300 level.

Courses

ASIAN AM 203-0 Topics in Social and Cultural Analysis Issues and themes in Asian American society and culture. Recent topics include the second generation and language in Asian America. May be repeated for credit with a different topic.

ASIAN AM 210-0 Introduction to Asian American Studies Origins of the field, emerging trajectories, core concepts, theories and methodologies. Analyzes race, gender, immigration, diaspora, class, labor, and sexuality as primary subjects of the field.

ASIAN AM 214-0 Introduction to Asian American History Introduction to the history of Asians in the United States, with a focus on their impact on American society as well as their experiences within the United States. Taught with HISTORY 214; students may not receive credit for both courses.

ASIAN AM 216-0 Global Asians Survey of Asian diasporas in the United States and elsewhere in the 19th, 20th, and 21st centuries, emphasizing causes of migration, process of settlement, relations with other ethnic groups, and construction of diasporic identities. Taught with HISTORY 216; students may not receive credit for both courses.

ASIAN AM 218-0 Asian-Black Historical Relations in the United States Comparative historical analysis of Asian-black relations in the United States, including racialized and sexualized discourses structuring interracial relations and social, political, and economic location. Slavery, immigration, model minority myth, cross-racial politics. Taught with AF AM ST 218; students may not receive credit for both courses.

ASIAN AM 225-0 Contemporary Issues in Asian American Communities Critical examination of post-1965 Asian American communities in light of demographic, social, racial, and economic trends in the United States and Asia.

ASIAN AM 247-0 Asian Americans and Popular Culture Examination of the place of Asian Americans within American popular culture, historically and today.

ASIAN AM 251-0 The Mixed-Race Experience Exploration of demographic trends in interracial and interethnic marriages in various US Asian, white, and black communities to highlight the complexity of the American experience. Special attention to mixed-race experiences portrayed in film and novels. Taught with AF AM 251; students may not receive credit for both courses.

ASIAN AM 275-0 Introduction to Asian American Literature Introduction to Asian American literature from the late 19th century to the present, covering a range of genres and ethnicities. Taught with ENGLISH 275; students may not receive credit for both courses.

ASIAN AM 304-0 Asian American Women's History Exploration of race, gender, and the contours of US history from the perspective of Asian American women's experiences. Considers migration, exclusion, labor, marriage, family, sexuality, and cross-racial alliances. Taught with HISTORY 304; students may not earn credit for both courses.

ASIAN AM 310-0 Contemporary Asian-Black Relations Divides between Asians and blacks; areas of positive cross-cultural collaboration. Historical analysis of reparations, the 1992 Los Angeles riots, and affirmative action. Cross-racial exchange in youth expressions, popular culture, hip-hop. Taught with AF AM ST 310; students may not receive credit for both courses.

ASIAN AM 335-0 Language in Asian America Survey of linguistic anthropological topics relevant to Asian American communities, including bilingualism, code switching, language socialization, language shift, style, sociolinguistic variation, indexicality, media, and semiotics.Taught with ANTHRO 335; students may not receive credit for both courses.

ASIAN AM 350-0 Asian American Religions Analysis of the role of religion in Asian American communities; how experiences as immigrants and as racial and ethnic minorities

shape religious practices, communities, theologies, and identities.

ASIAN AM 360-0 Asian American Gender and Sexualities Exploration of the intersections of gender, race, and sexuality, the construction of masculinity and femininity, and the role of gender and sexuality in the life experiences of Asian Americans.

ASIAN AM 365-0 Language, Race, and Ethnicity in the United States Analysis of connections between language ideologies, language use, and meanings of race and ethnicity. Bilingualism, immigration, identity, accented English, African American English, language policy, English-only movement, education, social change. Taught with ANTHRO 365; students may not receive credit for both courses.

ASIAN AM 370-0 Global Asian America Exploration of the ideas of diaspora and homeland and their implications for rethinking immigration and migration as they relate to the experiences of Asian Americans.

ASIAN AM 380-0 Topics in Asian American Arts and Performance Analysis of Asian American contributions to the art and culture of the United States. Exploration of the dynamics of race, gender, and class in Asian American dance, theater, and film. May be repeated for credit with different topic.

ASIAN AM 392-0 Seminar in Asian American Studies Seminar on a topic in areas related to Asian American social structure and culture. May be repeated for credit with different topic.

ASIAN AM 399-0 Independent Study in Asian American Studies Readings and conferences on special subjects for students pursuing areas of interest in Asian American studies.

ASIAN AND MIDDLE EAST STUDIES

Northwestern's curricula in Asian and Middle East studies have been reorganized. Relevant courses, majors, and minors are now housed in the following areas:

- Asian Languages and Cultures (below)
  - Minor in Chinese or Japanese language and culture
  - A new major will be developed during the 2013–14 academic year.
- Asian Studies (page 59)
  - Major in Asian studies
  - Minor in Asian studies
- Middle East and North African Studies (page 127)
  - Major in Middle East and North African studies
  - Minor in Middle East and North African studies

ASIAN LANGUAGES AND CULTURES

www.alc.northwestern.edu

The new Department of Asian Languages and Cultures focuses on the study of Asian languages and literatures. It provides students with opportunities to acquire linguistic and transcultural competence and to better appreciate Asia as a dynamic site of international cultural relations. Through its Asian- and English-language courses, the department allows students from across the University to encounter Asian cultures through their own words, images, and concepts.

A new undergraduate major to be developed in 2013–14 will enable students to explore a single Asian culture in depth, compare traditions across Asia, and consider them in relation to those of other world regions.

Minor in Chinese or Japanese Language and Culture

These minors offer a coherent set of courses designed to develop strong language skills in either Chinese or Japanese along with a sense of the cultural context of the language. The minors also offer the opportunity to incorporate study abroad experience for even more intensive encounters with the language and culture.

Minor requirements (8 units)

- 5 language courses
  - 3 200-level Chinese or Japanese courses
  - 2 300-level Chinese or Japanese courses
- 3 courses in literature and/or culture

  Chinese track
  - 1–2 units of Chinese literature in translation (from ASIAN LC/COMP LIT 274-1,2,3)
  - 1–2 units from an Asian studies discipline (e.g., art history, history, political science, religion)

  Japanese track
  - 2 units of Japanese literature in translation (from ASIAN LC/COMP LIT 271-1,2,3 and/or 300-level ASIAN LC or COMP LIT courses in Japanese literature)
  - 1 unit from an Asian studies discipline (e.g., art history, history, political science, religion)
- With the approval of the minor adviser, up to 6 of the units may be taken abroad.

Courses Taught in English

ASIAN LC 271-1,2,3,4 Japanese Literature in Translation A set of 4 courses surveying Japanese literature from the eighth century to the present. Taught with COMP LIT 271; students may not receive credit for both courses.

ASIAN LC 274-1,2,3 Introduction to Chinese Literature Survey of Chinese poetry and fiction from the fifth century B.C.E. to the present. Taught with COMP LIT 274; students may not receive credit for both courses.

ASIAN LC 290-0 Introductory Topics in Asian Languages and Cultures Content and prererequisites vary. May be repeated for credit with change of topic.

ASIAN LC 390-0 Advanced Topics in Asian Languages and Cultures Content and prerequisites vary. May be repeated for credit with change of topic.

ASIAN LC 399-0 Independent Study Reading and conferences on special subjects for advanced undergraduates. Open only with consent of director of undergraduate studies and instructor.

Chinese Courses

All Chinese language courses offer two tracks: regular courses for mainstream students and accelerated courses for students who come from Chinese-speaking homes. Mandarin-speaking students from mainland China, Taiwan, Singapore, or Hong Kong should join the accelerated courses.

CHINESE 111-1,2,3 Chinese I Speaking, aural comprehension, reading, writing of basic vernacular Chinese. Both standard and simplified characters involving about 1,500 compounds.

CHINESE 115-1,2,3 Chinese I—Accelerated Similar to 111-1,2,3 but for heritage speakers or students with equivalent language proficiency.

CHINESE 121-1,2,3 Chinese II Conversation, aural comprehension, writing based on reading Chinese stories, poems, stories of ballets, historical and cultural texts. Prerequisite: 111-3 or equivalent.

CHINESE 125-1,2,3 Chinese II— Accelerated Similar to 121-1,2,3 but for heritage speakers or students with equivalent language proficiency. Prerequisite: 115-3 or equivalent.

CHINESE 211-1,2,3 Chinese III Readings from the works of contemporary Chinese writers. Discussion and writing based on the reading materials. Prerequisite: 121-3 or equivalent.

CHINESE 215-1,2 Chinese III—Accelerated Similar to 211-1,2,3 but for heritage speakers. Prerequisite: 125-3 or consent of instructor.

CHINESE 215-3 Chinese III—Accelerated: Globalization and Popular Culture Includes contemporary topics and media other than literature—notably cinema, video, and music. Offered spring quarter only. Prerequisite: 125-3 or consent of instructor.

CHINESE 311-1,2,3 Chinese IV: Modern Literature Advanced reading and writing skills and Chinese literature. Prerequisite: 211-3 or equivalent.

CHINESE 315-1,2,3 Chinese IV—Accelerated: Classical Literature Study of classical Chinese poems, prose, dramas, and novels from 400 B.C.E. to 1900. Prerequisite: 215-3 or equivalent.

CHINESE 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Chinese. Prerequisite: consent of instructor.

Hindi Courses

Hindi language offerings include two tracks, regular and accelerated, at the first-year level only.

HINDI 111-1,2,3 Hindi I A 3-course introduction for basic literacy and oral proficiency.

HINDI 115-1,2,3 Hindi I—Accelerated Course is offered every other year for students who come from a Hindi-speaking background but have no or limited literacy skills in the language. The three quarters cover the grammar and material from Hindi 111-1,2,3 and Hindi 121-1 with much more speaking in class. Admission by instructor's permission only.

HINDI 121-1,2,3 Hindi II A 3-course sequence developing literacy and interactive oral proficiency. Prerequisite: 111-3 or equivalent.

HINDI 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Hindi. Prerequisite: consent of instructor.

Japanese Courses

JAPANESE 111-1,2,3 Japanese I A 3-quarter sequence of beginning college-level Japanese, covering speaking, aural comprehension, and reading and writing skills. Introduces the Hiragana and Katakana syllabaries and Kanji (characters).

JAPANESE 121-1,2,3 Japanese II A 3-quarter continuation of 111, covering speaking, aural comprehension, and reading and writing skills. Prerequisite: 111-3 or equivalent.

JAPANESE 211-1,2,3 Japanese III A 3-quarter intermediate-level sequence in which speaking, aural comprehension, and reading and writing skills are developed. Readings about and discussions of Japanese sociocultural issues. Prerequisite: 121-3 or equivalent.

JAPANESE 311-1 Japanese IV: Reading Modern Japanese Literature in Japanese Focus on learning pre-1946 orthography and reading of original texts of modern short stories. Translation skills are emphasized; discussion in English. Prerequisite: 211-3 or equivalent.

JAPANESE 312-1 Japanese IV: Contemporary Japanese Literary Works for Reading and Discussion Focus on reading contemporary Japanese poems, essays, nonfiction, and novels; discussion in Japanese. Prerequisite: 211-3 or equivalent.

JAPANESE 313-1 Japanese IV: Japanese Newspaper Reading and News Listening Focus on reading Japanese newspaper articles and debating the issues discussed in Japanese. Develops news listening skills. Prerequisite: 211-3 or equivalent.

JAPANESE 314-1 Japanese IV: Japanese Essay Writing Focus on refining writing skills—narrative, descriptive, persuasive, and argumentative. Review of grammar and expressions through writing clinics. Prerequisite: 211-3 or equivalent.

JAPANESE 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Japanese. Prerequisite: consent of instructor.

Korean Courses

Both first- and second-year Korean language courses offer regular and accelerated tracks. Accelerated courses are for Korean heritage students.

KOREAN 111-1,2,3 Korean I A 3-course introduction to basic literacy and oral proficiency for true beginners.
KOREAN 115-1,2,3 Korean I—Accelerated A 3-course introduction to literacy and oral proficiency for Korean heritage students with knowledge of the Korean alphabet.
KOREAN 121-1,2,3 Korean II Development of literacy and interactive proficiency skills. Prerequisite: 111-3 or equivalent.
KOREAN 125-1,2,3 Korean II—Accelerated Development of literacy and interactive proficiency to the advanced level. Class for Korean heritage students with oral and aural proficiency and some reading and writing skills. Prerequisite: 115-3 or equivalent.
KOREAN 215-1, 2, 3 Korean III Advanced Korean language course designed to develop language proficiency. Study of literature, contemporary culture in the media, and topics in the news facilitates understanding of Korean culture and society. **1.** Introduction to Korean literature. **2.** Contemporary culture in the media. **3.** Topics in the news. Prerequisite: 121-3, 125-3, or consent of instructor.
KOREAN 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Korean. Prerequisite: consent of instructor.

ASIAN STUDIES

www.asian-studies.northwestern.edu

The Asian Studies Program offers individualized, interdisciplinary study of the languages, histories, societies, and cultures of the peoples of Asia, past and present. Through the study of a relevant language (Chinese, Hindi, Japanese, or Korean) and coursework in history, the humanities, and the social sciences, students gain a sophisticated critical understanding of a specific Asian region (East, South, or Southeast) or country. They also learn to examine the world and themselves through the lens of another language and culture. The program encourages in-depth study while also promoting more general inquiry into fundamental issues, such as cultural difference and its social and political implications and the significance of the transcultural and transnational flow of people and ideas.

Asian studies students hone their aptitude for analyzing problems, conducting research, and presenting ideas in writing and in speech and thus succeed in a wide range of careers, including law, medicine, business, media, government, education, and nonprofit work. Others go on to graduate study. Some graduates work primarily overseas.

The program offers a major and a minor. Study of a relevant language is required for the major and encouraged but not required for the minor. Approved courses are listed on the program website. Students should contact the program director for further information about requirements.

Major in Asian Studies

Major requirements (17 units)

- 6 language courses in Chinese, Hindi, Japanese, or Korean beyond the first year; native-speaker proficiency does not count for course credit
- 11 additional courses chosen from the approved list
  - 9 distributed among three disciplinary categories
    - 3 in social sciences chosen from 290-3, 390-3, and courses in anthropology, economics, linguistics, political science, psychology, and sociology
    - 3 in history; may include 290-4 and 390-4
    - 3 in humanities chosen from 290-5,6, 390-5,6, and courses in art history, art theory and practice, comparative literary studies, philosophy, and religious studies
  - 2 additional courses from any of the three disciplinary categories
  - At least 6 must focus on one of three culturally differentiated areas—East Asia, Southeast Asia, or South Asia—typically corresponding to the language specialization.
  - At least 2 must be research courses related to the major, including seminars, independent study, or a senior thesis.
- At most 2 courses may be double-counted toward another major.
- The major also requires a study abroad experience in Asia. Students who for compelling reasons are unable to study abroad may petition for a waiver by writing to the program director by junior year.

Minor in Asian Studies

Minor requirements (8 units)

- Chosen from the approved list.
- Typically at least 2 courses are selected in each of the three disciplinary categories: social sciences, history, and humanities.
- At least 4 courses must relate to one of three culturally differentiated areas: East Asia, Southeast Asia, or South Asia.
- Students who satisfactorily complete two years of language study in Chinese, Hindi, Japanese, or Korean may complete the minor with only 6 disciplinary courses. (Native-speaker proficiency does not count for course credit.)

Honors in Asian Studies

Majors with strong academic records and an interest in pursuing honors should secure a faculty adviser and submit an honors application, including a brief research proposal, to the program office by the first week of spring quarter of junior year. (Those studying abroad have another two weeks.) Accepted students complete a thesis, normally through three quarters of senior-year independent study

(399), which can count for credit in the relevant disciplinary category.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program website, visit the program office, and see Honors in the Major on page 38.

Courses

ASIAN ST 290-3,4,5,6 Introductory Topics in Asian Studies Content and prererequisites vary. Course number indicates distribution requirement area in which a course counts. May be repeated for credit with change of topic.

ASIAN ST 390-3,4,5,6 Advanced Topics in Asian Studies Content and prererequisites vary. Course number indicates distribution requirement area in which a course counts. May be repeated for credit with change of topic.

ASIAN ST 399-0 Independent Study Reading and conferences on special subjects. For advanced undergraduates; requires permission of director of undergraduate studies and instructor.

ASTRONOMY

See Physics and Astronomy.

BIOLOGICAL SCIENCES

www.biosci.northwestern.edu

The science of biology constitutes the study of organisms at all levels of complexity and in all their diversity. The Program in Biological Sciences provides a broad, modern curriculum in the life sciences leading to a bachelor of arts degree. To majors it offers focused concentrations and the potential to do laboratory research projects.

The goal of a baccalaureate degree program in biological sciences at a research university is to develop and enhance the intellectual and creative potential of life sciences students. To this end, the program includes the following:

- A foundation in mathematics, chemistry, and physics
- A core curriculum introducing fundamental areas of biological science
- Concentrations that subsequently focus students' interests
- Opportunities to participate in research

Because biology is grounded in the principles of chemistry, mathematics, and physics, all majors must complete the courses listed under related courses below. Freshman students usually complete 100-level chemistry and most or all of the math and statistics requirements; in spring quarter they take BIOL SCI 215. Sophomores take BIOL SCI 216, 217, 218, 220, 221, and 222 concurrently with CHEM 210-1,2. BIOL SCI 341, 342, or 391 is usually taken in junior year. The program's core courses address the central topics in contemporary biology with the goal of preparing students for further study in either the biological sciences or professional school. BIOL SCI 220, 221, and 222 constitute laboratories that provide students with an appreciation of the discipline as an experimental science.

The continuing expansion of knowledge in biology makes it difficult to master all areas in a four-year curriculum. Thus, the junior and senior years are designed to permit students to explore a focused area in the biological sciences that builds on the principles of the core. To provide a variety of coherent pathways, five areas of concentration have been designed. A student's concentration will be noted on the transcript; only one concentration may be noted.

Students have the opportunity to conduct a research project in the laboratory of a faculty sponsor with whom they design a plan of study. The sponsor may be a Northwestern faculty member in any department who is engaging in biological research. Research interests of many faculty are discussed on the biological sciences website.

Declared biological sciences majors are assigned specific faculty advisers. Majors pursuing independent research also have research supervisors.

Major in Biological Sciences

Program courses (10 units)

- 8 core courses: 215, 216, 217, 218, 220 (.34 unit), 221 (.34 unit), 222 (.34 unit), and 1 of 341, 342, or 391
- 1 300-level BIOL SCI elective (not 398 or 399)
- 3 concentration courses
  - *Biochemistry:* 309, 321, 361
  - *Genetics and molecular biology:* 315, 390, 395
  - *Neurobiology:* 302, 306, and 1 of 303, 304, 305, 324, 326, 377
  - *Physiology:* 325, 355, 358
  - *Plant biology:* 330, 349, and 1 of 316, 335, 346, 350

Related courses *(Units depend on chemistry and mathematics sequences taken. Laboratory components of general and organic chemistry courses require separate registration and bear separate credit; see the chemistry section for details.)*

- CHEM 101, 102, and 103 *or* 171 and 172
- CHEM 210-1,2 *or* 212-1,2
- MATH 220 and 224 *or* 212, 213 and 214
- 1 statistics course
- PHYSICS 125-1,2,3, 130-1,2,3, or 135-1,2,3

Biological Sciences Second Major for ISP Students

The Integrated Science Program is a highly selective BA program in Weinberg College (see Integrated Science Program). Students majoring in ISP who wish to complete a second major in biological sciences should fulfill the following requirements instead of those listed above. They may not substitute ISP 398 for any biological sciences or chemistry course in the ISP curriculum and must take the following courses:

- CHEM 212-2
- The 3 relevant courses for the chosen concentration in biological sciences

Honors Program in Medical Education Students

For information on the Honors Program in Medical Education, see page 11. Waiver of the 300-level elective course is the only HPME waiver that may be applied toward the biological sciences major.

Honors in Biological Sciences

Majors with strong academic records and an interest in pursuing honors should inform the program honors coordinator in October of senior year of their intention to write a thesis. Students will ordinarily register for an initial quarter of 398 no later than fall quarter of senior year.

Seniors may be recommended to the college for graduation with honors if they have completed at least 2 quarters of 398 or 399, have written an approved honors thesis based on their independent study, and have sufficiently high grades.

For more information consult the biological sciences website and see Honors in the Major on page 38.

The Teaching of Biological Sciences

Weinberg College students pursuing a major in biological sciences who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Courses

BIOL SCI 101-0 Biology in the Information Age Fundamentals of the scientific process. Choice of term project or tutorial.

BIOL SCI 103-0 Diversity of Life Comparative survey of organisms, emphasizing adaptation and phylogenetic relationships. Particular emphasis on animals.

BIOL SCI 104-0 Plant-People Interactions Biology and history of the interaction of humans and flowering plants.

BIOL SCI 109-0 The Nature of Plants Plant adaptations for growth, survival, and reproduction. Plant defense against herbivory, pollination, and seed dispersal.

BIOL SCI 112-0 Biotechnology and Society Examination of modern biotechnology and its interaction with human society.

BIOL SCI 115-0 Genetics and Molecular Biology Principles of inheritance; meiosis and mitosis; transcription and translation; basics of natural selection. With laboratory. Prerequisite: CHEM 103 or 172.

BIOL SCI 116-0 Cell Biology Maintenance, growth, movement, and death of cells. Compartmentalization and transportation of proteins within cells. With laboratory. Prerequisite: CHEM 103 or 172.

BIOL SCI 117-0 Physiology Organization and functioning of the major organ systems in mammals. With laboratory. Prerequisite: CHEM 103 or 172.

BIOL SCI 160-0 Human Reproduction Basic biology of reproduction; relation between hormones, emotions, intelligence, and behavior; related policy issues.

BIOL SCI 164-0 Genetics and Evolution Principles of inheritance as they apply to evolution.

The 200-level curriculum changed in 2012.

BIOL SCI 202-0 Human Evolutionary Biology Human biological adaptations from an evolutionary perspective across a range of bodily systems. Prerequisite: 103, 115, 164, or 215.

BIOL SCI 213-0 Undergraduate Laboratory Teaching Assistantship (0 credit) Prerequisite: consent of instructor.

BIOL SCI 215-0 Genetics and Molecular Biology Principles of inheritance; gene function; mechanisms by which DNA is replicated, transcribed into RNAs, and translated into proteins; basics of the process of natural selection. Prerequisite: CHEM 102 or 172.

BIOL SCI 216-0 Cell Biology Mechanisms that cells use to compartmentalize and transport proteins, to move, to regulate growth and death, and to communicate with their environments. Prerequisite: CHEM 103 or 172.

BIOL SCI 217-0 Physiology Organization and functioning of the major organ systems in mammals. Prerequisites: MATH 220; CHEM 103 or 172.

BIOL SCI 218-0 Biochemistry Basic concepts in biochemistry, emphasizing the structure and function of biological macromolecules, fundamental cellular biochemical processes, and the chemical logic in metabolic transformations. Prerequisites: 116 or 216, CHEM 210-1.

BIOL SCI 220-0 Genetic and Molecular Processes Laboratory (.34 units) Laboratory techniques and experiments in fundamental aspects of transmission genetics and molecular biology. Prerequisite: CHEM 103 or 172.

BIOL SCI 221-0 Cellular Processes Laboratory (.34 units) Laboratory techniques and experiments in fundamental aspects of cell biology. Prerequisite: CHEM 103 or 172.

BIOL SCI 222-0 Physiological Processes Laboratory (.34 units) Experiments, and some independent projects, to elucidate the functioning of organisms at cellular, tissue, and organ system levels. Prerequisites: MATH 220; CHEM 103 or 172.

BIOL SCI 240-0 ISP Molecular and Cell Biology Cell biology, transcription, translation, regulation of gene expression. Prerequisite: ISP standing.

BIOL SCI 241-0 ISP Biochemistry Synthesis and metabolism of organic molecules; structure and function of proteins. Prerequisites: 240, CHEM 212-1, and ISP standing.

BIOL SCI 301-0 Biochemistry Biochemistry with focus on metabolism, energetics, and control mechanisms. Prerequisites: 210-2; CHEM 210-2 or 212-2.

BIOL SCI 302-0 Fundamentals of Neurobiology I Cellular and biochemical approaches to the nervous system, focusing on neuron structure and function. Prerequisites: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.

BIOL SCI 303-0 Molecular Neurobiology Mechanisms of signal transduction and synaptic plasticity; basic neurochemistry. Prerequisite: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.

BIOL SCI 304-0 Developmental Neurobiology Cellular aspects of nervous system development; relationship between structure and function. Prerequisites: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.

BIOL SCI 305-0 Neurobiology Laboratory Hands-on experience in the performance of experiments in cellular neurophysiology. Prerequisite: 302.

BIOL SCI 306-0 Fundamentals of Neurobiology II Integrative approach toward understanding functioning of mammalian central nervous system. Prerequisite: 302.

BIOL SCI 309-0 Principles of Biochemistry Macromolecules, membrane structure, membrane transport, signal transduction, metabolic transformations, and carbohydrate metabolism. Prerequisites: 215, 216, 217, and 218; CHEM 210-2 or 212-2.

BIOL SCI 310-0 ISP Quantitative Biochemistry and Molecular Biology Protein interaction with small molecules; protein tertiary structure determination. Prerequisite: 241.

BIOL SCI 311-0 ISP Neurobiology Detailed look at membrane properties of single neurons and synaptic transmission. Prerequisites: 240, 241.

BIOL SCI 312-0 Ecosystem Ecology Fundamental processes of ecosystem ecology, with an emphasis on terrestrial ecosystems in the context of global change. Prerequisite: 210-3 or 215.

BIOL SCI 313-0 Quantitative Methods for Ecology and Conservation Approaches, methods, and techniques for analyzing datasets in ecology and conservation biology. Prerequisites: 210-1, 215, or ENVR SCI 202; a course in statistics.

BIOL SCI 314-0 Mind and Brain Neural transmission; how neural dysfunction can translate into cognitive abnormality. Prerequisites: 210-3 *or* 215, 216, 217, and 218.

BIOL SCI 315-0 Cell Biology Relationship of shape, structural dynamics, and function with the cellular state and gene expression; cell-to-cell communication. Prerequisite: 210-3 or 216.

BIOL SCI 316-0 Spring Flora Life cycles, vegetative and reproductive structures, and adaptations for pollination and fruit/seed dispersal of the wildflowers, trees, and shrubs of oak woodland. Prerequisite: 330.

BIOL SCI 317-0 Molecular Ecology Ecological processes and concepts in the context of evolutionary theory, population genetics, and molecular biology. Prerequisites: 210-3 or 215.

BIOL SCI 318-0 Assembly of Neural Circuits Cellular and molecular processes in the generation of selective connections in the developing brain, including the role of activity-dependent plasticity. Prerequisite: 302.

BIOL SCI 319-0 Biology of Animal Viruses Virus structure, synthesis of viral nucleic acids and proteins, the interaction of the viral and cellular genomes. Prerequisites: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.

BIOL SCI 320-0 Animal Behavior Evolutionary study of animal behavior, emphasizing theory but using field data to test or illustrate aspects of theory. Prerequisites: 210-1 *or* 215 and 217.

BIOL SCI 321-0 Physical Biochemistry Thermodynamic laws, diffusion, chemical equilibria, kinetics, and statistical thermodynamics. Prerequisites: 210-1,2,3 *or* 215, 216, 218, 220, and 221; CHEM 103 or 172; MATH 224; PHYSICS 125-1, 130-1, or 135-1.

BIOL SCI 322-0 Systems and Computational Neuroscience A mathematical and computational approach to how networks of neurons in the brain compute and store information. Prerequisites: 302 or 311; MATH 230, 234, or 281-1,2; MATH 240-0 or 281-3; INTG SCI 101-1,2; and ISP standing.

BIOL SCI 323-0 Bioinformatics: Sequence and Structure Analysis Use of informational and modeling techniques to explore evolutionary and other problems related to the genome. Prerequisites: 218, 301, or 309; aptitude for computing and software.

BIOL SCI 324-0 Neurobiology of Biological Clocks Daily and circadian biological clocks: research regarding their causation and adaptive significance. Prerequisites: 210-3 *or* 216 and 217.

BIOL SCI 325-0 Animal Physiology Physiological principles and mechanisms responsible for the ability of animals to regulate variables in the steady state. Prerequisite: 110-3, 117, 210-3, or 217.

BIOL SCI 326-0 Neurobiology of Learning and Memory Molecular and neural bases of memory. Prerequisite: 210-3, 217, 302, or 311.

BIOL SCI 327-0 Biology of Aging Biological aspects of aging, from molecular to evolutionary. Prerequisites: 210-3 *or* 216 and 217.

BIOL SCI 330-0 Plant Biology Plant structure, physiology, photosynthesis, evolutionary diversity, and ecology. Prerequisites: 210-1,2,3; or 215 and 216.

BIOL SCI 332-0 Conservation Genetics Critical issues in the management and understanding of endangered populations. Prerequisite: 210-1, 215, or ENVR SCI 202.

BIOL SCI 333-0 Plant-Animal Interactions An exploration of the complex mutualisms (e.g., pollination, seed dispersal) and antagonisms (e.g., herbivory, parasitism) among members of these two kingdoms. Prerequisite: 330.

BIOL SCI 334-0 Soils and the Environment: The Earth's Critical Zone Soil development and morphology; physical, chemical, hydrologic, and biological properties of soils. Prerequisite: 210-1, 215, or ENVR SCI 202.
BIOL SCI 335-0 Critical Topics in Ecology and Conservation Seminar discussing historical and modern publications in this field. Prerequisite: 210-1, 215, or ENVR SCI 202.
BIOL SCI 341-0 Population Genetics Processes that affect allele frequency change and thus cause evolution. Prerequisites: 215, 216, 217, and 218; a course in statistics.
BIOL SCI 342-0 Evolutionary Processes Evolutionary mechanisms (natural selection, genetic drift), evolutionary history (speciation, phylogenetics), and adaptations (sex, cooperation, aging, life history). Prerequisites: 215, 216, 217, 218; 1 course in statistics.
BIOL SCI 344-0 Anatomy of Vertebrates Vertebrate phylogeny illustrated via comparative morphology; anatomical/functional and ontogenetic considerations; dissections. Prerequisite: 115, 210-1, or 215.
BIOL SCI 345-0 Topics in Biology Topics vary but always deal with an area of advanced study in the life sciences. With laboratory. May be repeated for credit with different topic. Prerequisites: 115, 116, and 117; 210-3; or 215, 216, and 217.
BIOL SCI 346-0 Field Ecology An intensive experience in field ecological research. Prerequisites: 210-1 or 215; a course in statistics.
BIOL SCI 347-0 Conservation Biology Evolution, ecology, and conservation of patterns of biological diversity. Prerequisites: 210-1, 215, or ENVR SCI 202; a course in statistics.
BIOL SCI 348-0 Plant Population Genetics Evolutionary processes at the plant population level. Prerequisite: 330.
BIOL SCI 349-0 Plant Community Ecology Abundance, distribution, diversity, and scaling in plant communities in space-time. Prerequisite: 330.
BIOL SCI 350-0 Plant Evolution and Diversity Laboratory Introduction to the diversity and evolutionary history of land plants. Prerequisite: 330.
BIOL SCI 353-0 Molecular Biology Laboratory Project-based approach to learning lab skills in eukaryotic molecular biology. Prerequisites: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.
BIOL SCI 355-0 Immunobiology Nature of host resistance; characteristics of antigens, antibodies; basis of immune response; hypersensitivity. Prerequisites: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.
BIOL SCI 356-0 Endocrinology Physiology and biochemistry of hormones and glands of internal secretion in vertebrates; endocrine glands. Prerequisite: 325.
BIOL SCI 358-0 Physiology Laboratory Experiments in several physiological systems. Design, techniques, data analysis, and report writing emphasized. Prerequisite: 325.
BIOL SCI 361-0 Protein Structure and Function Structure and function of proteins; x-ray crystallography and NMR. Prerequisites: 218, 301, or 309; PHYSICS 125-1,2,3, 130-1,2,3, or 135-1,2,3.
BIOL SCI 377-0 Sensory Neurobiology Physiological processes in sensory receptor cells; chemical senses, vision, hearing, and lateral line organs. Prerequisites: 215, 216, 217, 218, 220, 221, and 222.
BIOL SCI 378-0 Functional Genomics Patterns of gene expression and their causes. Prerequisites: 210-3 *or* 215 and 216; a course in statistics.
BIOL SCI 380-0 Biology of Cancer The disease of cancer: causation at the cell and molecular levels; treatment. Prerequisites: 315 or 390.
BIOL SCI 390-0 Molecular Biology Nucleic acid structure; DNA mutation, repair, recombination, replication, restriction, and modification; translation. Prerequisites: 210-3 *or* 215, 216, 217, 218, 220, 221, and 222.
BIOL SCI 391-0 Development and Evolution of Body Plans Molecular mechanisms underlying early embryonic development, including establishment of the body and organogenesis. Discussion of original literature. Prerequisites: 215, 216, 217, and 218.
BIOL SCI 395-0 Molecular Genetics Exploration of recent advances that have revolutionized the fields of gene expression and cell regulation. Discussion of articles and primary research papers. Prerequisite: 390.
BIOL SCI 398-0 Tutorial in Biology Supervised reading and discussion or supervised learning of laboratory techniques. P/N only.
BIOL SCI 399-0 Independent Research Supervised research project. Prerequisite: 398 or previous 399.

BUSINESS INSTITUTIONS

www.wcas.northwestern.edu/bip

The Harvey Kapnick Business Institutions Program aproaches the study of business through a thoughtful investigation of the cultural, political, philosophical, literary, and social consequences of business institutions. Therefore, the program is not meant to serve as narrowly conceived preprofessional training or to function as a business concentration within any single departmental major. Instead the program is conceived as a means to a broad multidisciplinary perspective on a significant area of inquiry in 21st-century society. Students who wish to pursue the minor in business institutions should be open to inquiries grounded in the intellectual approaches of many disciplines.

Minor in Business Institutions

The minor in business institutions requires the successful completion with a grade of C- or above of 10 courses: 4 prerequisite courses, a business tools class, and 5 elective courses. Students must complete at least 2 of the social science prerequisites before declaring the minor.

Interested students should consult with a program adviser. Information is available in the program office, 2010 Sheridan Road.

Prerequisites (4 units)
- 2 economics courses: ECON 201, 202
- 1 course on regulation: ECON 250, 349, 350, 355, or 370, POLI SCI 341, 348, or 375
- 1 course on organizations: SOCIOL 302, 331, or 335
- At least 2 prerequisites must be completed before declaring the minor.

Minor requirements (6 units)
- 1 business tools course: BUS INST 239 or 260
- 5 electives from the approved list on the program website
  - At most 1 internship-related credit
  - At most 2 professional linkage seminar credits
  - With approval of the program director, other courses with a business institutions emphasis may be counted toward this requirement.
  - None of the 6 courses may be double-counted toward any major, minor, or certificate, except as a related course for a major.

Courses

BUS INST 239-0 Marketing Management Basic principles and applications of marketing management; market segmentation, target marketing, brand positioning; survey of market research and consumer behavior; marketing of services, nonprofits, the arts.

BUS INST 260-0 Accounting and Business Finance Introductory survey course in accounting, covering both financial and managerial accounting. Students learn to use the financial statements of an organization for making decisions. Prerequisites: ECON 201, 202, or consent of instructor.

BUS INST 390-0 Special Topics in Business Institutions Investigation of topics of current interest to faculty and students—for instance, the business of fashion.

BUS INST 394-0 Professional Linkage Seminar Content varies. Possible topics include sports marketing and entrepreneurship. Up to 2 professional linkage seminars on different topics may be counted toward the minor.

CATHOLIC STUDIES

See Religious Studies.

CHEMISTRY

www.chem.northwestern.edu

Chemistry is the study of molecular structure, chemical reactions, and the molecular basis of solids, liquids, and gases. Training in chemistry blends descriptive, conceptual, and mathematical elements in both lectures and laboratory work. While developing chemical knowledge is essential, the progressive honing of analytical abilities and application of this knowledge to research are just as important. Courses are carefully designed to give a rigorous introduction to chemistry for both science and nonscience students.

The broad applicability of phenomena and rigorous methodology of chemistry provide a wide range of career options for majors. By offering a foundation in mathematics, physics, and related sciences; a core curriculum introducing the fundamental areas of organic, inorganic, physical, and analytical chemistry; concentrations in six different areas of chemistry; and opportunities to participate in research, the department meets the needs of students with diverse career objectives, including professional chemistry, graduate training, medicine, and teaching. Options are also provided for Northwestern's engineering, biological sciences, and prehealth professional programs.

The chemistry faculty is actively engaged in a wide spectrum of original research in which undergraduates are encouraged to participate along with graduate students and visiting scholars from around the world. Undergraduates have opportunities to use modern instrumentation and to participate in seminars, colloquia, and informal contacts with scholars.

Major in Chemistry

The major is recommended for students planning careers in chemistry. It is suitable preparation for graduate study in chemistry or medical school and for work as a professional chemist. The curriculum includes related courses in mathematics and physics as well as core courses and a concentration in chemistry.

Department courses (17.34–18.68 units)
- 14.34–15.68 core units providing a solid basis in chemistry
  - 101/121, 102/122, 103/123 *or* 171/181, 172/182
  - 220
  - 212-1,2,3/232-1,2 or 210-1,2,3/230-2,3
  - 333
  - 342-1,2,3
  - 350-1,2,3
- 3 concentration courses
  - Areas of concentration draw upon courses within the department as well as in other departments.
  - Concentration courses are typically taken during the final year of undergraduate study.
  - The concentration areas, along with eligible courses, are
    - *Biochemistry:* 305, 316, 329, 414, 435; BIOL SCI 301, 309
    - *Environmental chemistry:* 306, 329, 393; CIV ENV 260, 314, 365, 367
    - *Inorganic chemistry:* 302, 329, 411, 433, 434, 435
    - *Organic chemistry:* 301, 316, 329, 410, 412, 413-1,2, 414, 415, 418
    - *Physical chemistry:* 303, 329, 442-1,2, 443, 444, 445, 448
    - *Materials/nanotechnology:* 307, 308, 329, 360; MAT SCI 201, 301, 331, 333, 370

– *Self-designed concentration:* If the concentrations above do not meet their interests, students may design a concentration with approval of the director of undergraduate studies in chemistry. A concentration may consist of 3 courses from the areas above or with a common theme.

Related courses *(units depend on mathematics courses taken)*
- MATH 220 and 224 *or* 212, 213, and 214; 230 and 234 *or* 281-1,2 *or* 285-2,3 *or* 290-2,3 *or* 291-2,3
- PHYSICS 125-1,2,3 or 135-1,2,3

Minor in Chemistry

The minor in chemistry allows majors in other fields to complete a significant portion of the coursework required for the chemistry major. It allows the flexible selection of coursework from the traditional subdisciplines of organic, inorganic, physical, and analytical chemistry.

Prerequisites
- 103/123 or 172/182 or equivalent
- Chemistry courses at the 300 level may have additional chemistry, physics, and/or mathematics prerequisites.

Minor requirements (6 units plus additional units for required labs)
- 6 200- or 300-level courses exclusive of 201, 398, or 399
  - Life science majors and premedical students are advised to take 210-1,2,3/230-2,3 or 212-1,2,3/232-1,2 and 3 additional courses.
  - Physical science majors are advised to take 342-1,2,3 and 3 additional courses.
  - Students with interests in materials science, earth and planetary science, or environmental science should take 210-1,2/230-2,3 and 333 and 3 additional courses.
  - Other programs for the minor may be designed with departmental approval to suit individual needs; interested students should contact the director of undergraduate studies in chemistry.

Chemistry Second Major for ISP Students

The Integrated Science Program is a highly selective BA program in Weinberg College (see Integrated Science Program). Students majoring in ISP who wish to complete a second major in chemistry must take these courses:
- *Core program:* 212-1,2,3/232-1,2, 220, 333, 348, 350-1,2,3
- *Concentration:* 2 courses from a selected area

Honors Program in Medical Education Students

Chemistry majors who are also participating in the HPME program are permitted two waivers in their major. Only one of these waivers may be used for a core program course; the second waiver may be used for a concentration course.

Four-Year BA/MS

Students who have done outstanding work during their first three years and who have a professional interest in chemistry are eligible to apply for the four-year BA/MS program. Application should be made during spring quarter of junior year. By the end of the third year the applicant should have completed nearly all of the 300-level course requirements, all or nearly all of the Weinberg College requirements, and at least 1 term of independent study. To fulfill the MS requirements, students must take 9 graduate courses and submit a senior thesis. Applicants should submit to the director of undergraduate studies in chemistry a course plan for the fourth year, a brief description of proposed research, an unofficial transcript, and a letter of support from the research adviser. For more information see Accelerated Master's Programs on page 39.

Honors in Chemistry

Majors who have done outstanding work in the classroom and research laboratory may be eligible for graduation with honors in chemistry. Students who intend to submit a senior thesis should send an e-mail message (including the name of the research adviser) to the director of undergraduate studies by fall of senior year. To be eligible for honors, a student must meet minimum GPA requirements, engage in original research during at least two quarters of 399, and write a senior thesis on this research. The 399 credits are not required for and do not count toward the chemistry major.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of Chemistry

Weinberg College students pursuing a major in chemistry who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

General Chemistry, Advanced Placement, and Course Credit

Entering students may receive advanced placement in chemistry by means of the College Board's AP Chemistry examination or the department's placement examination taken on entry to Northwestern. Depending on their scores, they will be advised to register in 101; 171 (with credit for 101); or 210 or 212 (with credit for 101, 102, and 103). Students may not start any general chemistry sequence with 102 or 172 regardless of their AP credit.

Questions should be directed to the director of undergraduate studies in chemistry.

Students with AP credit for 101 may subsequently take 171 for credit, but they may not take both courses for credit at the University. Students may not receive credit for both 102 and 171 or for both 103 and 172. Similarly, students with AP credit for the lab course 121 may take 181 for credit but may not take both courses for credit at the University, and they may not receive credit for both 122 and 181 or for both 123 and 182.

The laboratory components of general and organic chemistry courses require separate registration and bear separate credit. When such a course is listed as a prerequisite for another course, the associated lab is also a prerequisite.

Courses Primarily for Freshmen and Sophomores

CHEM 101-0 General Chemistry Descriptive chemistry, elements and compounds; basic chemical calculations, mole problems, stoichiometry, and solution concentrations; gas laws; thermochemistry; quantum theory and electronic structure of atoms; periodic properties of the elements; nuclear chemistry; chemical bonding. Must be taken concurrently with 121.

CHEM 102-0 General Inorganic Chemistry Descriptive chemistry, inorganic reactions; chemical bonding; condensed phases; introduction to chemical equilibria; phase equilibria; solutions and colligative properties; metal complexes. Must be taken concurrently with 122. AP credit for 101 does not allow registration for 102. Prerequisite: 101 (C- or better).

CHEM 103-0 General Physical Chemistry Chemical equilibrium; equilibria in aqueous solution; thermodynamics; chemical kinetics; electrochemistry and oxidation-reduction reactions; solid-state chemistry; industrial chemical processes. Must be taken with 123. A grade of C- or better in 103 required to enroll for any higher-level chemistry course. Prerequisites: 102 (C- or better); MATH 220.

CHEM 121-0 General Chemistry Laboratory (0.34 unit) Chemical analysis of real samples using basic laboratory techniques, including titration, colorimetric analysis, density measurements, and atomic spectroscopy. Planning, data collection, interpretation, and reporting on these experiments. Must be taken concurrently with 101.

CHEM 122-0 General Inorganic Chemistry Laboratory (0.34 unit) Chemistry laboratory techniques applied to materials science and nanotechnology. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with 102. Prerequisite: 101 (C- or better).

CHEM 123-0 General Physical Chemistry Laboratory (0.34 unit) Chemistry laboratory techniques applied to biosensor technology using concepts of acid-base chemistry, kinetics, and the like. Design of a biosensor. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with 103. Prerequisite: 102 (C- or better).

CHEM 171-0 Accelerated General Inorganic Chemistry Review of mole problems and stoichiometry; descriptive chemistry, elements, compounds, and inorganic reactions; gas laws; phase equilibria and colligative properties; chemical equilibrium; aqueous equilibria; topics in chemical bonding and molecular structure. Must be taken concurrently with 181. Prerequisite: department placement exam or appropriate AP credit.

CHEM 172-0 Accelerated General Physical Chemistry Thermodynamics and equilibrium; chemical kinetics and mechanism; electrochemistry; electronic structure of the atom and quantum theory; advanced topics in chemical bonding; coordination compounds; solid-state chemistry; nuclear chemistry. Must be taken concurrently with 182. Prerequisites: 171 (C- or better); MATH 220.

CHEM 181-0 General Chemistry Laboratory (0.34 unit) Laboratory techniques for studying chemical analysis and chemical reactions relevant to environmental or materials research. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with 171. Prerequisite: appropriate AP credit.

CHEM 182-0 General Inorganic Chemistry Laboratory (0.34 unit) Study of the physical chemistry (acid-base chemistry, kinetics, etc.) behind the operating principles of biosensors. Planning, data collection, interpretation, and reporting on these experiments. Must be taken concurrently with 172. Prerequisite: 171 (C- or better).

CHEM 201-0 Chemistry of Nature and Culture Chemistry for the nonscientist. Chemicals commonly encountered in everyday life. With laboratory.

CHEM 210-1,2,3 Organic Chemistry No P/N registration. **1.** Basic concepts of structure, stereochemistry, and reactivity of organic compounds. The chemistry of hydrocarbons and alcohols. Prerequisites: 103 or 172 (C- or better). **2.** The chemistry of aromatic, carbonyl, and nitrogen compounds; characterization of organic substances by chemical and spectral methods; reaction mechanisms. Must be taken concurrently with 230-2. Prerequisite: 210-1 (C- or better). **3.** The chemistry of polyfunctional compounds of biological and medicinal interest. Modern organic synthesis, bioorganic chemistry, and recent developments in organic chemistry. Must be taken concurrently with 230-3. Prerequisite: 210-2 (C- or better).

CHEM 212-1,2,3 Organic Chemistry Primarily for chemistry majors and students in ISP. Similar to 210-1,2,3 except with concurrent laboratory courses 232-1,2 only in the first and second quarters. No P/N registration. Prerequisites: 103 or 172 (C- or better) and consent of department, enrollment in ISP, or department placement.

CHEM 220-0 Introductory Instrumental Analysis An introduction to basic laboratory techniques in analytical

chemistry and spectroscopy. Topics include infrared and UV-visible spectroscopy, gas and liquid chromatography, elemental and thermal analysis, simple x-ray diffraction, error analysis, and literature-searching techniques. Prerequisite: 103 or 172 or equivalent.

CHEM 230-2 Organic Chemistry Laboratory I (0.34 unit) Instruction in experimental techniques of modern organic chemistry emphasizing chemical separations, spectroscopic characterization, and reactions of alkanes, alkenes, alkyl halides, alcohols, carbonyls, esters, and aromatic compounds. Must be taken concurrently with 210-2. Prerequisite: 210-1 (C- or better).

CHEM 230-3 Organic Chemistry Laboratory II (0.34 unit) Experimental techniques of modern organic chemistry emphasizing chemical separations, spectroscopic characterization, and reactions such as amide synthesis, Grignard reaction, aldol condensation, Robinson annulation, and Diels-Alder reaction. Must be taken concurrently with 210-3. Prerequisite: 210-2 (C- or better).

CHEM 232-1 Organic Chemistry Laboratory I (0.34 unit) For ISP students and chemistry majors. Molecular modeling, unknown identification by spectroscopic methods, and experimental techniques of modern chemistry emphasizing reactions of alkanes, alkenes, alkyl halides, alcohols, and carbonyls. Must be taken concurrently with 212-1. Prerequisite: 103 or 172 (C- or better) or equivalent.

CHEM 232-2 Organic Chemistry Laboratory II (0.34 unit) For ISP students and chemistry majors. Techniques of modern organic chemistry including NMR spectroscopy and reactions such as electrophilic aromatic substitution, esterification, Grignard reaction, aldol condensation, Robinson annulation, and Diels-Alder reaction. Must be taken concurrently with 212-2 (C- or better). Prerequisite: 212-1 (C- or better).

Courses Primarily for Juniors and Seniors

CHEM 301-0 Principles of Organic Chemistry An introduction to the field of physical organic chemistry. Topics include bonding and structure, conformational analysis, stereochemistry, acids and bases, reactivity, and reaction mechanisms. Taught with 401. Prerequisite: 212-3; 210-3 and 1 quarter of physical chemistry; or consent of instructor.

CHEM 302-0 Principles of Inorganic Chemistry Topics in advanced inorganic chemistry. Taught with 402. Prerequisite: 333 or consent of instructor.

CHEM 303-0 Principles of Physical Chemistry An overview of advanced topics in physical chemistry. Taught with 403. Prerequisite: 342-1,2,3.

CHEM 305-0 Chemistry of Life Processes Topics in the chemistry and biochemistry of life processes. Taught with 405. Prerequisite: 210-3; 212-3 and 1 biochemistry course; or consent of instructor.

CHEM 306-0 Environmental Chemistry Topics in the physical chemistry of the environment. Taught with 406. Prerequisites: 210-3 or 212-3; MATH 234, 250; PHYSICS 135-1,2; or consent of instructor.

CHEM 307-0 Materials and Nanochemistry Introduction to frontier research at the interface of chemistry and materials science. Taught with 407. Prerequisite: 212-3 or 210-3.

CHEM 308-0 Design, Synthesis, and Applications of Nanomaterials Fabrication, chemical synthesis, assembly, and characterization of controlled-dimensionality materials, including metals, semiconductors, oxides, polymers, and mesoporous scaffolds. Interfacial phenomena and particle stability, nano forms of carbon, and material design.

CHEM 316-0 Medicinal Chemistry: The Organic Chemistry of Drug Design and Action Introduction to principles of drug design and mechanisms of drug action from a chemical viewpoint. Historical introduction, drug design and development, receptors, enzymes and enzyme inhibitors, DNA, drug metabolism, and prodrugs. Prerequisite: 210-3, 212-3, or consent of instructor.

CHEM 329-0 Analytical Chemistry Principles and applications of analytical methods, with emphasis on advanced separation science, dynamic electrochemistry, and advanced mass spectrometry. No P/N registration. Prerequisites: 342-1 or -2.

CHEM 333-0 Inorganic Chemistry Descriptive chemistry of some important elements. Current concepts and models of chemical bonding. Prerequisites: 2 200- or 300-level chemistry courses.

CHEM 342-1 Thermodynamics Laws of applications of thermodynamics. Thermochemistry, chemical potentials, solution thermodynamics, nonideal gases. Prerequisites: 103 or 172 (C or better); MATH 230; PHYSICS 135-1,2 (PHYSICS 135-2 may be taken concurrently).

CHEM 342-2 Quantum Mechanics and Spectroscopy Quantum mechanics with emphasis on atomic and molecular electronic structure. Electronic, vibrational, rotational, and magnetic resonance spectroscopy. Prerequisites: MATH 230 (234 recommended also); PHYSICS 135-1,2.

CHEM 342-3 Kinetics and Statistical Thermodynamics Chemical kinetics, including experimental techniques and theories of rate processes. Statistical mechanics, including Boltzmann distribution, partition functions, and applications to thermodynamics. Prerequisites: 342-1,2.

CHEM 348-0 Physical Chemistry for ISP Gas laws and properties; kinetic theory; first, second, and third laws; phase equilibria; mixtures, phase diagrams, statistical thermodynamics, kinetics. Prerequisites: ISP enrollment; 172; MATH 281-1,2,3; or consent of department.

CHEM 350-1 Advanced Laboratory 1 Advanced laboratory techniques in synthetic and analytical chemistry and spectroscopy: mass spectrometry, chromatography, NMR spectroscopy, and organic synthesis techniques. Prerequisites: 220 and 212-3 or equivalent.

CHEM 350-2 Advanced Laboratory 2 Advanced laboratory techniques in synthetic and analytical chemistry and spectroscopy, polymer characterization methods,

electrochemistry, x-ray crystallography, atomic spectroscopy, and inorganic synthesis techniques. Prerequisites: 333 and 350-1 or equivalent.

CHEM 350-3 Advanced Laboratory 3 Advanced laboratory techniques in synthetic and analytical chemistry and spectroscopy: infrared and Raman spectroscopy, electronic spectroscopy, fast kinetics, organic and inorganic synthesis techniques in a self-guided project. Prerequisites: 342-2 or equivalent and 350-2.

CHEM 360-0 Nanoscale Patterning: Top-Down Meets Bottom-Up Introduction to current problems in nanoscale science and technology; hands-on experience with nanoscale characterization tools and bench-top nanoscale experiments. With laboratory. Prerequisite: 103 (C- or better) or 172.

CHEM 393-0 Green Chemistry Practices of environmentally benign chemistry as applied to the chemical industry. Introduction to the concept and discipline of green chemistry; growth and expansion of the discipline in historical context from its origins in the early 1990s to the present. Prerequisite: 210-3 or 212-3.

CHEM 398-0 Undergraduate Seminar Advanced work for superior students through supervised reading, research, and discussion. Prerequisite: consent of department.

CHEM 399-0 Independent Study Faculty-directed research. Must be taken P/N for first 2 quarters. Prerequisite: consent of department.

CHICAGO FIELD STUDIES

www.internships.northwestern.edu

Chicago Field Studies offers programs that combine Northwestern seminars with internships at Chicago-area organizations. It has helped students secure internships at more than 500 organizations since 1969. Affiliated with many Weinberg departments, the Center for Civic Engagement, and the Center for Leadership, CFS offers programs every quarter on a variety of subjects, such as law, civic engagement, humanities, public health, business, social justice, and the modern workplace.

CFS programs are open to students in any school and major. Admission is by application only, and students must attend an information session before applying. More information can be found on the CFS website.

Major/Minor Credit

A number of departments and programs allow students to use CFS courses to fulfill major or minor requirements. The type and number of credits applicable, if any, are determined by the student's department.

Full-Time Programs

Field Studies in the Modern Workplace

This full-time program focuses on Chicago history and workplace culture. Students intern 24 to 36 hours a week in a variety of professional fields (including law and business, although CFS also offers specific legal and business field studies programs). It is offered every quarter, including summer. The program has 2 required courses worth 2 units of credit each: 393-1,2.

Legal Field Studies

This full-time program focuses on contemporary issues and workplace culture in the legal field. Students intern 24 to 36 hours a week in legal organizations. It is offered 1 or 2 quarters a year. The program has 2 required courses worth 2 units of credit each: 394-1,2.

Business Field Studies

This full-time program focuses on contemporary issues and workplace culture in business. Students intern 24 to 36 hours a week in business organizations (primarily finance and marketing). It is offered every quarter, including summer. The program has 2 required courses worth 2 units of credit each: 395-1,2.

Variable-Credit Programs

Field Studies in Social Justice

This part-time program focuses on issues of social justice. Issues vary by quarter (e.g., gender and sexuality, race, class, immigration, environment, sustainability, homelessness, and poverty). Students intern 10 to 30 hours a week in advocacy, policy, and social justice organizations. It is offered 1 or 2 quarters a year. The program has 1 required course, 293, for which credit is variable.

Field Studies in Public Health

This part-time program focuses on critical issues in public health, examining the interplay between the public and the academy. Students intern 10 to 30 hours a week in health- and medicine-related organizations. The program is offered at least twice a year and has 1 required course, 392, for which credit is variable.

Field Studies in Community Research

This part-time program focuses on the field of community research. Students intern 10 to 30 hours a week in a community-based organization. It is offered 1 or 2 quarters a year. The program has 1 required course, 396, for which credit is variable.

Field Studies in Civic Engagement

This part-time program focuses on forms of civic engagement in Chicago and Evanston during an era of renewal of citizenship and public work. Students intern 10 to 30 hours a week in civic, educational, legal, governmental, nonprofit, or community-based organizations. It is offered 1 or 2 quarters a year. The program has 1 required course, 397, for variable units of credit.

Field Studies in Humanities
This part-time program focuses on critical issues in the public humanities, examining the interplay between the public and the humanities. Students intern 10 to 30 hours a week in humanities organizations. It is offered every quarter. The program has 1 required course, 398, for which credit is variable.

Other Programs
CFS periodically develops new programs focusing on different fields and topics, some of which are part-time and carry 1 to 2 units of credit. These programs are described on the CFS website.

Courses for Full-Time Programs

CFS 393-1 Modern Workplace Culture (2 units)
CFS 393-2 Contemporary Issues in the Workplace (2 units)
CFS 394-1 Legal Culture and Process (2 units)
CFS 394-2 Contemporary Issues in Law (2 units)
CFS 395-1 Business Workplace Culture (2 units)
CFS 395-2 Contemporary Issues in Business (2 units)

Courses for Variable-Credit Programs

CFS 293-0 Field Studies in Social Justice (variable units of credit)
CFS 392-0 Field Studies in Public Health (variable units of credit)
CFS 396-0 Field Studies in Community Research (variable units of credit)
CFS 397-0 Field Studies in Civic Engagement (variable units of credit)
CFS 398-0 Field Studies in Humanities (variable units of credit)

CHINESE

See Asian Languages and Cultures.

CLASSICS

www.classics.northwestern.edu

Classics majors and minors study the language, literature, history, and culture of Greek and Roman antiquity. The department offers a wide range of topics and has strengths in literature, theater, mythology, Greek history, and the history of medicine. Students may also study the reception of classical antiquity in medieval through contemporary Western cultures by taking classical traditions courses offered by other departments. The wide range of choices includes philosophy, religion, political theory, art history, film studies, English, and comparative literature.

Classics majors may pursue a concentration in Latin, Greek, or both. For a classics minor, students may choose from a concentration with readings in Latin or Greek or classical studies with sources in English translation only. Additional information about classics programs and courses is available on the department website or in the department office.

Major in Classics

The major in classics offers students three different paths of study. Although no previous knowledge of Latin or Greek is required, all students generally are required to achieve competence in one of these ancient languages in order to work with primary sources in the original. Some may choose to complete advanced work in both languages.

With concentrations in Latin, Greek, or both, the major requirements allow some flexibility. Classics majors develop familiarity with the broad sweep of ancient history and literature and key analytical skills necessary to examine the record of Greek and Roman culture. They complete a demanding and distinctive course of study that stresses the development of important intellectual sensibilities—close reading, analytical clarity, thorough research, evaluation of evidence, logical analysis, effective writing, appreciation of nuance and subtleties, historical variability, and cultural differences. All majors complete a research project under the direction of a faculty member in a small 1-quarter seminar. Seniors pursuing honors will undertake an additional 2 quarters of research.

Each of the three tracks—Greek and Latin, Latin, or Greek—requires a minimum of 12 courses beyond the language prerequisites.

All majors are required to undertake a research project in connection with 395 Research Seminar. Topics vary from year to year. Instruction will be included in the use of traditional as well as digital research tools. Students may petition the director of undergraduate studies to substitute research conducted for a study abroad program.

Major requirements: Greek and Latin concentration (12 units)

- **Prerequisites:** Either GREEK 201-2 and LATIN 101-3 or LATIN 201-2 and GREEK 101-3 (or equivalent placements—see page 70)
- 3 foundation courses in the first language (Greek or Latin) at the 201-3 level or above
- 3 foundation courses in the second language (Greek or Latin) at the 200 or 300 level
- 6 additional courses
  - CLASSICS 211, 212, 395
  - 3 additional Greek, Latin, or classics courses (excluding CLASSICS 110), at least 2 of which must be at the 300 level (may include 1 classical traditions course with consent of the director of undergraduate studies)

Major requirements: Latin concentration (12 units)

- **Prerequisite:** LATIN 201-2 or equivalent placement (see page 70)
- 3 language foundation courses in Latin at the 201-3 level or above

- 9 additional courses
  - CLASSICS 211, 212, 395
  - 6 additional Latin, Greek, or classics courses (excluding CLASSICS 110), at least 3 of which must be at the 300 level (may include Greek language courses at any level and up to 2 classical traditions courses with consent of the director of undergraduate studies)

Major requirements: Greek concentration (12 units)
- **Prerequisite:** GREEK 201-2 or equivalent placement (see below)
- 3 language foundation courses in Greek at the 201-3 level or above
- 9 additional courses
  - CLASSICS 211, 212, 395
  - 6 additional Greek, Latin, or classics courses (excluding CLASSICS 110), at least 3 of which must be at the 300 level (may include Latin language courses at any level and up to 2 classical traditions courses with consent of the director of undergraduate studies)

Minor Concentrations in Classics

Students may earn a minor in Latin, Greek, or classical studies. Each option allows students either to survey aspects of classical culture and traditions or to take a more focused cluster of courses. Unlike the Greek and Latin minors, the classical studies minor does not require study of an ancient language. Instead, it provides a framework for examining any aspect of Greek and Roman antiquity or its traditions and reception in medieval through contemporary Western culture.

Students majoring in classics may also earn a minor in classical studies, provided they do not double-count courses toward both the major and the minor.

Minor requirements: Latin concentration (6 units)
Prerequisite: LATIN 101-3 or equivalent placement (see next column)
- 3 Latin courses at the 200 or 300 level
- 3 additional Latin and/or classics courses (excluding CLASSICS 110), 1 of which must be at the 300 level (may include 1 classical traditions course with consent of the director of undergraduate studies)

Minor requirements: Greek concentration (6 units)
Prerequisite: GREEK 101-3 or equivalent placement (see next column)
- 3 Greek courses at the 200 or 300 level
- 3 additional Greek and/or classics courses (excluding CLASSICS 110), 1 of which must be at the 300 level (may include 1 classical traditions course with consent of the director of undergraduate studies)

Minor requirements: classical studies (6 units)
- 2 courses from CLASSICS 210, 211, 212, 260 (classics majors may substitute additional 200- or 300-level courses in classics, classical traditions, Greek, or Latin)
- 4 additional classics, classical traditions, Greek, or Latin courses, at least 2 of which must be at the 300 level and none at the 100 level

Honors in Classics

Majors with strong academic records and an interest in pursuing honors should speak with the department's honors coordinator during spring quarter of junior year. They should come with ideas about a topic for honors work and the name of a faculty member with whom they propose to work. (Interested students completing a junior year abroad should be in contact with their intended faculty advisers during spring quarter of junior year.) By the end of reading week of spring quarter, they must submit to the honors coordinator a short research proposal supported by a preliminary bibliography. During senior year students should enroll in 2 quarters of CLASSICS 399, which may count toward the major, and complete a senior thesis.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the department website or the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of Latin

Weinberg College students pursuing a major in classics who also wish to be certified for secondary teaching of Latin are urged to contact the Office of Student Affairs in the School of Education and Social Policy as early as possible in their academic careers. For information about teaching careers in Latin and opportunities for mentoring and classroom observation, see the director of undergraduate studies in the Department of Classics.

Study Abroad

The department strongly encourages students to undertake study abroad for a summer, a term, or the academic year at, for example, the Intercollegiate Center for Classical Studies in Rome, Arcadia University in Athens, or the summer program at the American School of Classical Studies in Athens. Interested students should consult with the director of undergraduate studies in fall of the previous year to ensure sufficient time to prepare applications and plan for appropriate credit toward the major.

Language Placement

Students must either complete the 100-level language sequence before enrolling in GREEK 201 or LATIN 201 or test into the 200-level courses. Completion of 201-3 or permission of the instructor is a prerequisite for enrollment in 300-level language courses. Placement results may not be counted for credit toward the total number of courses required, e.g., the 6 additional courses for the

major. More advanced coursework must be completed instead.

Department Courses

Courses with Readings in Latin

LATIN 101-1,2,3 Elementary Latin Classical Latin vocabulary, grammar, and syntax with graded readings for translation.

LATIN 201-1,2,3 Introduction to Latin Literature Grammar and vocabulary review. Readings in Cicero, Virgil, and Catullus; emphasis on literary analysis. Prerequisites: 101-1,2,3 or department placement.

LATIN 310-0 Readings in Latin Literature Selected topics and authors including Plautus, Cicero, Horace, Ovid, Tacitus, and Apuleius. Prerequisites: 201-1,2,3 or consent of instructor. May be repeated for credit with different topics.

Latin 313-0 Advanced Latin Syntax and Composition Rapid review of Latin morphology and basic grammar, followed by careful study of the syntax of Latin prose and by practice in prose composition. Prerequisite: 201-3 or equivalent.

LATIN 399-0 Independent Study Individual program of study under the direction of a faculty member. For advanced students only. Permission of department required.

Courses with Readings in Greek

GREEK 101-1,2,3 Elementary Greek Vocabulary, forms, and syntax of Attic Greek.

GREEK 201-1,2,3 Introduction to Greek Literature Review of basic grammar and vocabulary. Representative selections from Greek authors in their historical and cultural contexts.

GREEK 201-4 Introduction to Greek Literature—Intensive For students who have completed GREEK 201-1 or equivalent. Review of ancient Greek grammar and syntax and development of reading skills to prepare for third-year level. Four classes a week. Students may not receive credit for both 201-4 and 201-2,3.

GREEK 301-0 Readings in Greek Literature Selected authors and topics. Topics recently offered include Aeschylus's *Oresteia*, the Greek novel, Hellenistic epigrams, Herodotus, Thucydides, and Aristophanes. Prerequisites: 201-1,2,3 or consent of instructor. May be repeated for credit with different topics.

GREEK 399-0 Independent Study Individual program of study under the direction of a faculty member. For advanced students only. Permission of department required.

Courses with Readings in English

These courses offer an understanding of classical culture and its influence in history, literature, and art. There are no prerequisites in Greek or Latin.

CLASSICS 110-0 Scientific Vocabulary through Classical Roots Greek and Latin etymology in the vocabulary of the sciences. Designed primarily for science or medical students. Self-paced independent study.

CLASSICS 210-0 The World of Homer An introduction to the history and material culture of Geometric and Archaic Greece. Society, economy, art, and archaeology of the Greek world and Homeric epic. Taught with HUM 205; students may not receive credit for both courses.

CLASSICS 211-0 Ancient Athens: Democracy, Drama, Civilization History, literature, philosophy, and art in ancient Athens.

CLASSICS 212-0 Rome: Culture and Empire Development and character of the Roman Republic and Empire, emphasizing political and social institutions. Roman origins of Europe's politics, religion, literature, and ideas.

CLASSICS 245-0 Classics and the Cinema Analysis of how literary and social/political assumptions intersect in the reception of two related dramatic forms, one originating in 5th-century Greece, the other in 20th-century United States.

CLASSICS 260-0 Classical Mythology An introduction to Greek and Roman traditional narratives. Emphasis on the social, political, and religious values that they engage.

CLASSICS 310-0 Archaeology of the Ancient Mediterranean Content varies; may be repeated for credit with different topic. Recent topics include archaeology and nationalism, archaeology of the theater, and archaeology of empire. Prerequisite: Any CLASSICS 200-level course, selected courses in anthropology and art history, or permission of instructor.

CLASSICS 320-0 Topics in Ancient History Content varies; may be repeated for credit with different topic. Recent topics include Greek music and the city, Aristotle and democracy, and ancient Greek law.

CLASSICS 321-0 Roman History Selected topics in Republican or Imperial history.

CLASSICS 330-0 Ancient Economy Preindustrial Mediterranean economies of ancient Greece and Rome. Farming, transportation, settlement patterns, capitalism and trade, slavery; course ends with a rustic Roman banquet.

CLASSICS 342-0 Early European Medicine Greco-Roman origins of European medical thought from the cult of Asclepius through the Renaissance to Harvey; emphasis on ethical ideas, strengths, and weaknesses of Greek science.

CLASSICS 345-0 Greek Tragedy Readings in the plays of Aeschylus, Sophocles, and Euripides. Emphasis on Greek drama's social and political context and treatment of mythical material.

CLASSICS 350-0 Greek and Latin Literature Content varies; may be repeated for credit with different topic. Recent topics include metamorphosis from Homer to Kafka, Roman comedy, and Roman literature and imperialism.

CLASSICS 360-0 Origins of Greek Democracy Emergence of the world's first democracies in archaic Greece, 750–460

B.C.E. Topics include the rise of the city-state, tyranny, Sparta, the effects of military reform, the invention of written law, and the development and consequences of democratic ideology.

CLASSICS 395-0 Research Seminar Development of critical reading and writing skills and acquisition of information literacy as applied to resources in classics. Required for the major. Prerequisite: junior or senior standing.

CLASSICS 397-0 Exhibiting Antiquity: The Culture and Politics of Display Examination of the construction of Mediterranean antiquity through modes of reception since 1750. Analysis of programs of collecting and display and the intersection of institutional and scholarly agendas. Taught with ART HIST 318 and HUM 397; students may receive credit for only 1 of these courses.

CLASSICS 399-0 Independent Study Individual program of study under the direction of a faculty member. For advanced students only. Permission of department required.

Classical Traditions Courses

Offered in departments other than classics, classical traditions courses give significant attention to Greek and/or Roman antiquity (history or literature) in translation. They may be used to satisfy certain major and minor requirements. Recently offered courses include

- ART HIST 224 Introduction to Ancient Art
- ART HIST 310-1 Ancient Art: Greek Art and Architecture
- ART HIST 310-2 Ancient Art: Roman Art and Architecture
- COMM ST 394 Rhetoric: Democracy and Empire
- COMP LIT 211 Topics in Genre
- COMP LIT 390 Topics in Comparative Literature
- ENGLISH 311 Studies in Poetry: Theory and Practice of Poetry Translation
- ENGLISH 312 Studies in Drama: Ancient Greek Theater and the Modern Stage
- ENGLISH 383 Literary Theory from Plato to Sidney
- GERMAN 325 The Greeks in German Culture
- HISTORY 333 The Age of the Renaissance
- HUMANITIES 201 Thinking through and across Traditions: Epic Literature and Orature
- ITALIAN 265 Body and Soul from Rome to the Renaissance
- PHIL 210-1 History of Philosophy: Ancient Philosophy
- PHIL 310 Studies in Ancient Philosophy
- POLI SCI 301 Ancient Political Thought
- THEATRE 341-1 Acting II: Analysis and Performance: Greek Tragedy

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

COGNITIVE SCIENCE

www.cogsci.northwestern.edu

Cognitive science is the scientific study of the mind with the goal of understanding the nature of thought. Students learn the ways in which converging sources of evidence may be integrated to discover the mechanisms underlying the complex adaptive properties of human cognition. The major in cognitive science gives a broad foundation in this interdisciplinary field, encompassing cognitive psychology, linguistics, artificial intelligence, neuroscience, and related disciplines. Required introductory courses survey basic phenomena and approaches; basic methodology courses impart the methods of cognitive science; core courses provide foundations of disciplines within cognitive science; and elective courses allow students to pursue more advanced study in particular disciplines. A proseminar focuses on ongoing research in the field by Northwestern faculty.

For additional information about the Program in Cognitive Science, see the program director.

Major in Cognitive Science

Major requirements (16 units)

- 3 introductory courses: 207, 210, 211
- 3 basic methodology courses: EECS 110 or 111; PSYCH 201, 205
- 3 core courses: 1 course each from three of the following areas:
  - *Artificial intelligence:* EECS 348
  - *Cognitive neuroscience:* PSYCH 212, 361
  - *Cognitive psychology:* PSYCH 228
  - *Learning sciences:* LOC 213, 313
  - *Linguistics:* LING 250, 260, 270
- 1 advanced proseminar: 366 (ideally should be taken in sophomore year)
- 6 advanced electives, at least 3 in a concentration listed below and at least 2 outside that area, chosen from
  - *Artificial intelligence:* EECS 325, 337, 338, 344, 348, 349, 371, 372/472, 432, relevant sections of 395
  - *Cognitive neuroscience:* PSYCH 312-2, 321, 324, 361, 365, 367, 368, relevant sections of 358, 460, 470; CSD 303, 310; BIOL SCI 302, 306, 314, 377
  - *Cognitive psychology:* PSYCH 333, 334, 335, 344, 346, 362, 367, 368, 461, 466, relevant sections of 358, 460
  - *Communication sciences and disorders:* CSD 301, 303, 306, 309, 342, 392, 406, 452, 453, 454, relevant sections of 451
  - *Culture and cognition:* ANTHRO 389, relevant sections of 390, 395; ECON 330; PSYCH 334, 344, 414; LING 341; relevant sections of LOC 351
  - *Learning and instruction:* CSD 303, 306, 342, 373, 392; LOC 313 (if not counted as a core course); LRN SCI 401, 425, 426, 429, relevant sections of 451
  - *Linguistics:* LING 300, 311, 315, 316, 317, 321, 330, 333, 334, 341, 342, 350, 360, 361, 370, 371, 372, 373

- *Music cognition:* MUS THRY 251, relevant sections of 335, 336, 435, 436; MUSIC ED 437
- *Philosophy:* PHIL 255, 325, 327, 330, 335, 350, 353, 426
- Other 300- and 400-level courses may be counted as advanced electives with consent of the cognitive science adviser.
  - Independent study (399) in cognitive science or in one of the departments listed above, which is strongly recommended, may count as an advanced elective.
  - For students pursuing honors, the second quarter of the senior thesis seminar (398-2) may count as an advanced elective.

- At most 5 courses counted toward the cognitive science major may be double-counted toward another major. Courses used to meet major requirements may not be double-counted toward a minor.

Minor in Cognitive Science

The minor in cognitive science broadens the academic background of students majoring in related fields, providing them with the methods and foundations for understanding cognitive issues in an interdisciplinary framework.

Minor requirements (8 units)

- 2 introductory courses chosen from 207, 210, 211
- 2 basic methodology courses, at least 1 from outside the student's major, chosen from PSYCH 201, 205; EECS 110, 111
- 4 additional courses
  - Must be chosen from at least two areas. (For available areas, see the advanced electives for the major.)
  - At least 3 must be at the 300 level.
  - At least 3 must be outside the student's major department or program.
  - At least 1 must be chosen from these courses:
    - *Artificial intelligence:* EECS 348
    - *Cognitive neuroscience:* PSYCH 212, 361
    - *Cognitive psychology:* PSYCH 228
    - *Learning sciences:* LOC 213, 313
    - *Linguistics:* LING 250, 260, 270

Honors in Cognitive Science

Majors with strong academic records are invited to apply for the honors program in winter of junior year by contacting the director of undergraduate studies. Applications are due in spring of junior year. Accepted students complete a research project and write a thesis under the guidance of a faculty sponsor from one of the disciplines within cognitive science. They enroll in 398-1,2 in fall and winter quarters of senior year and may take 399 in spring quarter; they may count 1 of these 3 courses as an advanced elective for the major. Early in spring quarter of senior year, they present a paper on their research to the cognitive science community.

Students whose projects, theses, and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies and see Honors in the Major on page 38.

Courses

COG SCI 207-0 Introduction to Cognitive Modeling Introduction to artificial intelligence and cognitive science from a nontechnical perspective. Fundamental questions concerning thinking, beliefs, language understanding, education, and creativity.

COG SCI 210-0 Language and the Brain The study of language and its biological basis from linguistic, psychological, and neuroscientific perspectives.

COG SCI 211-0 Learning, Representation, and Reasoning Interdisciplinary study of the nature of the mind with emphasis on learning, representation, and reasoning.

COG SCI 366-0 Cognitive Science Proseminar New and ongoing research by Northwestern faculty. Prerequisite: consent of instructor.

COG SCI 398-1,2 Senior Thesis Seminar Independent research for a senior thesis under the direction of department faculty. By invitation only.

COG SCI 399-0 Independent Study Faculty-directed research. Consent of instructor required.

COMPARATIVE LITERARY STUDIES

www.complit.northwestern.edu

The Comparative Literary Studies Program is an interdepartmental, interdisciplinary program for the study of literature across national and linguistic lines. Those who work in the field of comparative literature hold that language is not an indifferent medium of expression but an integral dimension of every expressive act. Drawing on faculty from the various literature departments as well as from disciplines such as art history, film studies, music, and philosophy, the CLS program examines literary texts within the context of diverse literary traditions and other cultural phenomena. CLS encourages students not only to read and interpret works of literature but also to reflect on the assumptions, methods, and goals that shape literary and other humanistic studies.

In contrast to studying one culture's literature over a specific time period, CLS juxtaposes literatures of different cultures and epochs, studying the themes, conventions, and movements shared by distinct literary traditions as well as those features that distinguish them from each other. Building on Northwestern's traditional strengths in European and North American literatures, CLS now also offers programs of study in the literatures of East Asia, the Middle East, Africa, and Latin America. By engaging in cross-disciplinary scholarship across languages and historical eras, students encounter the literary achievements of

people with vastly different histories, frames of cultural reference, and poetic traditions.

Their course of study provides CLS students with a range of innovative theoretical approaches to literary texts, movements, and genres, along with a strong commitment to traditional literary interpretation, philological methods, and critical analysis. In considering texts ranging from the classics of ancient Greek and Roman civilizations to contemporary critical theory, students not only learn to understand specific literary works but also raise questions about their relations to other forms of discourse and about the nature of literature itself. To this end, the CLS program emphasizes the study of various types of specifically literary theory (such as structuralist, poststructuralist, psychoanalytic, sociopolitical, and new historical) and of the theoretical and methodological concerns of other disciplines (such as anthropology, history, philosophy, gender and sexuality studies, and sociology).

Finally, comparative literary studies considers literary texts in relation to other forms of creative production. The relationship of literature to other arts, such as music, the fine arts, and new media, is an important focus of interest in many courses, and students are encouraged to take classes in other disciplines.

Major in Comparative Literary Studies

Students pursuing a program in comparative literature need to be acquainted with at least two literary traditions. They choose a first literature, normally that written in their native tongue, and a second literature written in another language. They take at least 2 courses in each, as well as at least 1 course in non-Western literature either in translation or in the original language.

Introductory CLS courses provide students with a range of theoretical approaches to literary texts in particular and the study of culture in general. Advanced CLS courses allow students to use their linguistic skills to further explore literary themes, movements, genres, and periods on a comparative basis.

Majors in CLS choose a concentration by spring of junior year in consultation with the director of undergraduate studies. Each concentration consists of 3 courses, of which 1 is a CLS "gateway" to the concentration. Examples of concentrations include the following; others may be created in consultation with the director of undergraduate studies.

- Literature and media (202 or 206 plus 2 courses on media from radio/television/film or any literature department)
- Literature and philosophy (207/PHIL 220 plus 2 relevant philosophy courses)
- Critical theory (202 or 207/PHIL 220 plus 2 courses in theory from CLS, other literature departments, or political science)
- Literature and the arts (375 plus 2 courses in music, art history, theater, or performance)
- Translation studies (311 plus 2 courses dealing with the practice of translation and/or issues related to translation)
- Advanced comparative literature (3 additional 300-level courses in the first or second literature, CLS, or any mix thereof)
- Gender, sexuality, and literature (205 plus 2 courses on the representation of gender in literature and film from gender and sexuality studies or any literature department)

All majors are required to take 398 in fall quarter of senior year, during which they write a substantial senior paper (often based on a previous paper written for another course).

Major requirements (14 units)

- 3 core COMP LIT courses chosen from 201, 202, 205, 206, 207/PHIL 220, 211
- 2 courses in the student's first literature, at least 1 at the 300 level
- 2 courses in the student's second literature taught in the original language, at least 1 at the 300 level
  - A modification may be approved if the relevant department or program does not offer a course at that level.
  - Students whose first language is one other than English may fulfill this requirement with English or American literature courses.
- 1 course in a non-Western literature (either in translation or in the original)
- 3 COMP LIT courses at the 300 level, of which 1 must be 398
- 3 courses in an area of concentration, of which 1 is a "gateway" to the concentration (see examples above)
- Courses may count in more than one category but must total at least 14.
- At most 2 courses counted toward the comparative literary studies major may be double-counted toward another major.

Minor in World Literature

The minor in world literature, like the major in comparative literary studies, examines literature beyond the boundaries of one national or linguistic tradition. It is designed for students who either do not have the language skills necessary for the major or are particularly interested in non-Western literatures, which currently are taught at Northwestern primarily in translation. Unlike the major in comparative literary studies, the minor in world literature does not have a language requirement. Students are encouraged to read literary texts in the original language but can also take courses where literature is read in English translation.

The minor allows students to study literatures from different parts of the world as well as different periods. Students take courses from at least two different cultural traditions and are encouraged to examine the relations between them—particularly between traditions of Europe and North America and those of the Middle East, Asia, Africa, and South America. In so doing students discover how literary texts cross national boundaries and thus become part of "world literature." This crossing often involves some kind of translation, so the minor, while allowing students to read literary texts in English translation, also makes translation one of its objects of investigation.

Minor requirements (7 units)

- At least 2 COMP LIT courses, of which 1 is 201 and the other is a 300-level course.
- 5 additional literature courses from at least two different cultural and linguistic traditions.
  - Courses may be from CLS, English, or any of the foreign language departments or area-studies programs.
  - At least 2 courses must be at the 300 level.

BA/MA Program

Students with a strong record in their major courses and an interest in graduate study are eligible to apply for the BA/MA program in comparative literature once they are within four courses of completing their undergraduate degrees. The application requires a statement of purpose, a plan of study, and two letters of recommendation from department faculty.

BA/MA students fulfill MA requirements by choosing 9 graduate courses in consultation with the director of graduate studies. These may be from CLS, the student's first and/or second literature, and/or another discipline of interest (such as philosophy or film studies). They must include 410 and, during the final quarter, 590, in which the MA thesis is written. Three of the 9 units may count toward the undergraduate major.

Honors in Comparative Literary Studies

Majors with strong academic records may be recommended to pursue honors based on the strength of their senior essays. Recommended students expand their senior essay into a senior thesis (25–30 pages long) during 1 quarter of independent study (399), preferably in winter quarter. The 399 enrollment does not count toward the 14 courses required for the major. Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program website and Honors in the Major on page 38.

Study Abroad

The Program in Comparative Literary Studies encourages all majors who qualify to consider a year or a term of study abroad as juniors.

Courses Primarily for Freshmen and Sophomores

COMP LIT 201-0 Reading World Literature Introduction to a diverse range of important works of world literature and central debates and questions about the idea of "world literature." Content varies.

COMP LIT 202-0 Interpreting Culture Introduction to the theory and practice of interpreting "cultural texts"—the literary and other texts through which human culture imposes structures of meaning on the world.

COMP LIT 205-0 Gender, Sexuality, and Representation Representations in literature and film within their historical, social, and political contexts. Theories of reading and spectatorship in relation to gender and sexuality.

COMP LIT 206-0 Literature and Media Examination of the relationship between "literature" and "media" with particular focus on material changes to the production of literature and the impact of new technologies of transmission on the production and definition of literature.

COMP LIT 207-0 Introduction to Critical Theory Focus on the related ideas of crisis, criticism, and critique in philosophical, literary, social, political, and cultural contexts. Taught with PHIL 220; students may not receive credit for both courses.

COMP LIT 210-0 The Bible as Literature Selected books of the Hebrew bible and New Testament studied from a literary perspective; issues of plot, character, genre, narrative strategy, and theories of interpretation. Taught with ENGLISH 220; students may not receive credit for both courses.

COMP LIT 211-0 Topics in Genre Analysis of major literary genres, such as epic, drama, lyric poetry, novel, and autobiography. Study of particular examples, with focus on historical development, formal features, and social context. May be repeated for credit with change of topic.

Courses Primarily for Juniors and Seniors

Comparative literary studies and language majors read the texts in their language of expertise whenever the course material allows.

COMP LIT 301-0 Practices of Reading Theory and practice of reading literature through the juxtaposition of critical, theoretical, and literary texts; special emphasis on the conflict of interpretations between competing practices of reading.

COMP LIT 302-0 Major Periods in World Literature Literary writings of a historical period, such as the European Renaissance; classical Chinese or Japanese; or the "Age of Empires." Content varies; may be repeated for credit with different topic.

COMP LIT 303-0 Literary Movements Study of movements, such as realism, modernism, futurism, or postmodernism, with special attention to their broad cultural and historical contexts. Content varies; may be repeated for credit with different topic.

COMP LIT 304-0 Studies in Theme Use and variation of a literary theme (such as the city) or topos (such as recognition) in various times and cultures. Content varies; may be repeated for credit with different topic.

COMP LIT 311-0 Theory and Practice of Poetry Translation Introduction to theoretical approaches to literary translation and to the practice of poetry translation.

COMP LIT 312-0 Authors and Their Readers Study of the work of a major author in terms of its critical reception. Content varies; may be repeated for credit with different topic.

COMP LIT 313-0 Texts and Contexts Intensive study of a major work in relation to an array of different kinds of contextual material. Content varies; may be repeated for credit with different topic.

COMP LIT 375-0 Literature and Its Others Study of the relation of literature to other arts, media, or disciplines. Content varies; may be repeated for credit with different topic.

COMP LIT 383-0 Special Topics in Theory For students with previous study of criticism and literary theory. Content varies. May be repeated for credit with different topic.

COMP LIT 390-0 Topics in Comparative Literature Content varies—for example, problems of literary translation, literature and psychoanalysis. May be repeated for credit with different topic.

COMP LIT 398-0 Senior Seminar Tools and techniques for writing sustained scholarly essays. Required of senior majors in comparative literary studies. Prerequisite: consent of program adviser.

COMP LIT 399-0 Independent Study (1–3 units)

Courses on Non-Western Literature in Translation

COMP LIT 271-1,2,3,4 Japanese Literature in Translation A set of 4 courses surveying Japanese literature from the eighth century to the present. Taught with ASIAN LC 271; students may not receive credit for both courses.

COMP LIT 274-1,2,3 Introduction to Chinese Literature Survey of Chinese poetry and fiction from the fifth century B.C.E. to the present. Taught with ASIAN LC 274; students may not receive credit for both courses.

COMP LIT 275-0 Arabic Literature in Translation Introduction to Arabic literary background; survey of literary genres from the pre-Islamic period to the present. Taught with MENA 275; students may not receive credit for both courses.

COMP LIT 276-0 African Literature in Translation Continental African literature. Content varies. May be repeated for credit with different topic. Taught with AF ST 276; students may not receive credit for both courses.

COMP LIT 278-1,2 Modern Hebrew Literature in Translation History of Hebrew literature. **1.** The European period. **2.** The Israeli period. Taught with JWSH ST 278; students may not receive credit for both courses.

COMP LIT 279-0 Modern Jewish Literature A study of modern European, American, and Israeli Jewish literature in its historical context. Taught with JWSH ST 279-0; students may not receive credit for both courses.

Relevant Courses in Other Departments

For descriptions of the following courses in literature in translation, consult the relevant department listings.

- CLASSICS 210, 211, 212, 245, 260, 320, 350
- FRENCH 276, 277, 278, 279, 374, 375, 376, 378
- GERMAN 226, 228, 230, 232, 234, 236, 238, 240, 246, 322, 324, 328, 330, 334, 336
- ITALIAN 275, 380
- JWSH ST 379
- SLAVIC 210-1,2,3, 211-2, 310, 311, 314, 318
- SPANISH 223, 225, 230, 231, 232, 323, 397
- PORT 380, 396

COMPUTER SCIENCE

www.eecs.northwestern.edu

The Program in Computer Science offers students the opportunity to study computer science within the context of Weinberg College's focus on liberal arts and sciences, as distinct from the engineering context in the McCormick School's Department of Electrical Engineering and Computer Science. The computer science requirements are identical in the two programs. Faculty and courses for the program are drawn from the McCormick EECS department, which has extensive computing facilities for student use.

Computer science is a highly interdisciplinary field. The department maintains links with other programs at Northwestern, including cognitive science, psychology, learning sciences, communication studies, radio/television/film, computer engineering, and the Transportation Center.

The computer science requirements include the following five parts. Undergraduates are encouraged to participate in research projects and to take advanced courses.

- Background or related courses: fulfill the general requirements of the University and school and provide the necessary background for study in computer science
- Core courses: what the faculty expects every CS graduate to know
- Breadth requirements: areas of computer science to which every CS graduate should be exposed
- Depth requirements: opportunities to explore one or two areas in detail
- Project: exposure to significant development and/or research work

For more information on the EECS department and its course offerings, see the McCormick School chapter

of this catalog. Students are urged to speak regularly with advisers and to consult the EECS website (www.eecs.northwestern.edu) for a detailed curriculum document.

This major was formerly known as computing and information systems.

Major in Computer Science

Program courses (19 units)

- EECS 101 (recommended) or an additional breadth course from the list below
- 5 core courses: EECS 111 (students without programming experience may want to first take 110, ideally in the Python programming language), 211, 212, 213, 214
- 5 breadth courses, 1 from each of the following five areas (see the EECS website for changes to this list):
  - *Theory:* EECS 328, 335, 336, 356
  - *Systems:* EECS 303, 322, 339, 340, 343, 345, 346, 350, 358, 361, 397, 440, 441, 442, 443, 450, 464
  - *Artificial intelligence:* EECS 325, 337, 344, 348, 349, 360
  - *Interfaces:* EECS 330, 332, 351, 352, 370
  - *Software development:* EECS 338, 394
- 6 depth courses: 3 each from two of the following areas (see the EECS website for changes to this list):
  - *Theory:* EECS 328, 335, 336, 356, 357, 457, 459, MATH 308
  - *Systems:* EECS 322, 339, 340, 343, 345, 350, 358, 361, 440, 441, 442, 443, 450, 464
  - *Artificial intelligence:* EECS 325, 337, 344, 348, 349, 360
  - *Interfaces:* EECS 330, 332, 351, 352, 370
  - *Security:* EECS 322, 339, 340, 343, 345, 350, 440, 441, 443, 450
  - Students should consult with advisers about depth areas. It is possible to petition for a single 6-course depth area.
- 2 project courses: 2 quarters of 399 or others from the department's project course list
- EECS 395 and 399 sections may be used for breadth and depth requirements if appropriate; consult program advisers for information.

Related courses *(units depend on mathematics sequence taken)*

- *Mathematics:* MATH 220 and 224 (or 212, 213, and 214), 230, and 240
- *Probability and statistics:* STAT 210 or MATH 310-1

Physics or biological sciences courses are recommended to satisfy the Weinberg College natural sciences distribution requirement.

Computer Science Second Major for ISP Students

The Integrated Science Program is a highly selective program in Weinberg College. Students majoring in ISP may complete a second major in computer science through a curriculum tailored specifically to their needs:

- EECS 101 (recommended) or an additional breadth course from the list above
- Core requirements: same as for major (5 courses)
- Breadth requirements: same as for major (5 courses)
- Project: 2 quarters of ISP 398 or EECS 399 (Projects must be approved by advisers in both ISP and CS.)

Minor in Computer Science

The program offers a minor in computer science for students who wish to develop a strong competence in computer science while majoring in another area.

Prerequisites

- MATH 220 and 224 (or 212, 213, and 214), 230, and 240

Minor requirements (9 units)

- EECS 101 (recommended) or an additional breadth course from list under the major
- 5 core courses: same as for major
- 3 breadth courses: 1 in each of three breadth areas listed under the major

Honors in Computer Science

Outstanding students majoring in computer science may be considered for program honors. For information on criteria and procedures, contact the program director. and see Honors in the Major on page 38.

CRITICAL THEORY

www.wcas.northwestern.edu/criticaltheory

Over the past three decades the term "critical theory" has come to designate, particularly in the United States, a kind of interdisciplinary interrogation of the premises, concepts, and categories that structure and sustain academic disciplines. That interrogation often opens new avenues for thought and research. Ideas from such thinkers as Kant, Nietzsche, Benjamin, Adorno, Horkheimer, Habermas, Foucault, and Derrida are investigated and elaborated on in areas as diverse as philosophy, literary studies, art history, film studies, history, political theory, religion, and race and gender studies. Critical theory is therefore not limited to a particular field or even to specific content; it is involved wherever methods, concepts, and social formations are not simply taken for granted but subjected to systematic and rigorous critical reflection.

The minor in critical theory is an interdisciplinary program of study enabling undergraduates to acquire understanding of critical theory's many dimensions and fields of application. It aims to give students a chance to develop their interests in various dimensions of critical theory, with particular emphasis on literary theory, continental philosophy, and political theory.

Minor in Critical Theory

Minor requirements (6 units)

- COMP LIT 207/PHIL 220
- 5 interdisciplinary 300-level courses approved by the program, including
  - At least 1 course, usually COMP LIT 390, taught by a visiting professor in critical theory
  - At least 1 course each in literary theory, political theory, and philosophy
  - A list of approved courses may be obtained from the program director or by consulting the program website.

EARTH AND PLANETARY SCIENCES

www.earth.northwestern.edu

The earth and planetary sciences study the past, present, and future of the earth and other planets. Earth and planetary scientists address fundamental scientific questions important for understanding the earth and society's connection to it. Courses in the degree program focus on physical, chemical, and biological processes spanning vast spatial and temporal scales, from the atomic to the interplanetary and from the origin of the solar system to the modern day. The program provides preparation for graduate study as well as a variety of careers in the earth sciences and beyond, including environmental consulting, energy exploration and production, natural resources management, law, and medicine.

Majors are involved in the full spectrum of departmental activities beyond coursework, including research, seminars, field trips, and social functions. Many do research projects with faculty and graduate students that lead to honors theses and scientific publications.

Major in Earth and Planetary Sciences

The academic program covers traditional geologic studies through the latest advances in earth science education. Courses may include theory, descriptive studies, computer modeling, laboratory exercises, and field training. Recommended concentrations reflect key disciplinary areas: general geoscience, geophysics, earth materials, geochemistry, earth history and paleobiology, climate science, and planetary science. Each concentration has a common set of prerequisite courses, core courses, and electives. The broadest concentration, general geoscience, offers the most breadth and thus is recommended for students not yet familiar with specific subfields.

Concentrations do not constitute rigid programs of study. Students may alter the course content of their majors as their interests develop or design their own programs in consultation with a department adviser and with approval from the director of undergraduate studies.

Examples of concentrations include the following:

- *General geoscience:* 300, 310, 320, 330, 340
- *Geophysics:* 4 courses from 320, 321, 323, 324, 325, 326, 327, 328, 351
- *Earth materials:* 300, 301, 302, and 2 courses from 310, 312, 313, 320, 323, 326
- *Geochemistry:* 310, 312, 313, 314, 315
- *Earth history and paleobiology:* 320, 330, 331, 340, 351
- *Climate science:* 316, 326, 340, 341, 351
- *Planetary science:* 300, 316, 324, 351, ASTRON 220

Major requirements

Department courses (8 or 9 units, *depending on concentration***)**

- 3 200-level courses: 201, 202, 203
- 4 or 5 additional 300-level courses, depending on concentration
- 1 research course: 398 or 399

Related courses *(Units depend on chemistry and mathematics sequences taken and concentration chosen.)*

- CHEM 101/121, 102/122, and 103/123 *or* 171/181 and 172/182
- MATH 220 and 224 *or* 212, 213, 214; 230 (the geophysics concentration requires 234, 240, and 250 as well)
- PHYSICS 135-1,2,3
- 2 additional courses at the 200 level or higher in math, science, or social science (1 of which may be 326) in all concentrations except geophysics

Minor in Earth and Planetary Sciences

The minor offers students in any major outside the department a flexible path to improved knowledge of earth and planetary sciences. With faculty advisers, students select paths that emphasize such fields as physical geology, geochemistry, geophysics, or a combination of these.

Minor requirements (6 units)

- 201, 202 (350 may be substituted for 202)
- 4 300-level courses in the department, 1 of which may be 398 or 399; 1 400-level course may be substituted with permission

Earth and Planetary Sciences Second Major for ISP Students

The Integrated Science Program is a highly selective BA program within Weinberg College. Students majoring in ISP who wish also to complete a major in earth and planetary sciences must take 201 and 3 300-level courses in addition to 350. These requirements replace the usual major requirements noted above.

Honors in Earth and Planetary Sciences

Majors with strong academic records and an interest in pursuing honors should discuss possible projects with an appropriate faculty member or the director of undergraduate studies as early as possible, but no later than fall of senior year. After a proposed project is approved by the undergraduate adviser, the research is conducted as 2

quarters of 399 or in 1 quarter of 399 and 1 quarter of a 400-level course; the student prepares a thesis based on this research. One quarter of 399 counts toward the major requirements; the second quarter of thesis work (399 or a 400-level course) does not.

Students whose projects and grades meet department criteria are recommended to the college for graduation with honors. For more information, students should contact the director of undergraduate studies or their research advisers and see Honors in the Major on page 38.

Introductory Courses

EARTH 103-0 Geologic Hazards Examination of the principal sources of natural hazards (earthquakes, volcanoes, tsunamis, hurricanes, tornadoes) in the framework of modern geological theories. Lectures and discussion.

EARTH 105-0 Climate Catastrophes in Earth History Introduction to the fundamental components of the earth system that control climate and an exploration of how today's climate is changing and how climate has changed (sometimes catastrophically) in the geologic past. Lectures and discussion.

EARTH 106-0 The Ocean, the Atmosphere, and Our Climate The role of the world's oceans in the earth's climate system. Properties of the oceans and marine life. Interaction of oceans, atmosphere, and land. Lectures and discussion.

EARTH 108-0 Geological Impacts on Civilization Impacts of geological processes and materials upon human civilizations. Geological, archaeological, and historical records. Societal responses to disasters, environmental changes, resource distributions, etc. Ancient and modern examples. Lectures and discussion.

EARTH 110-0 Exploration of the Solar System Origin of the solar system; accretion and differentiation of planets and satellites; early history of the moon; missions and discoveries; exoplanets. Lectures and discussion or lab.

EARTH 111-0 Human Dimensions of Global Change Natural and human causes of climate and environmental changes on land, in waters, and in the atmosphere. The earth system on long and short timescales. Lectures and discussion.

EARTH 114-0 Evolution and the Scientific Method Review of evolutionary theory and its scientific, philosophical, social, and religious impacts. Lectures and tutorials.

EARTH 201-0 Earth Systems Revealed Rocks, minerals, earth surface and interior processes, basic field methods. Required weekend field trip.

EARTH 202-0 Earth's Interior The earth as a planet: origin, composition, and evolution of the solar system and the earth; internal structure of the earth; plate tectonics. Prerequisites: MATH 224, PHYSICS 135-1, and CHEM 101; or consent of instructor.

EARTH 203-0 Earth System History Evolution of the earth system and its record through geological time. Interactions among the atmosphere, hydrosphere, sediments, and life on earth. Prerequisite: 201 or consent of instructor.

Advanced Courses

EARTH 300-0 Earth and Planetary Materials Mineralogy of the earth and planets from atomic to continental scales, focusing on structure, composition, identification, and physical properties of minerals as they pertain to geological and societal applications. Prerequisites: 201, CHEM 103, MATH 220, and PHYSICS 135-1; or consent of instructor.

EARTH 301-0 Petrology: Evolution of Crustal and Mantle Rocks Origin, composition, and classification of igneous, metamorphic, and sedimentary rocks. Application of laboratory characterization and basic thermodynamics to interpreting observed rock textures and mineral assemblages in terms of geological processes. Prerequisite: 300 or consent of instructor.

EARTH 302-0 Physics and Thermochemistry of the Earth's Interior Finite strain theory, solid solution thermodynamics, phase transitions, subduction zone processes, seismic velocity structures, mineral equations of state. Prerequisite: 301 or consent of instructor.

EARTH 310-0 Introductory Aqueous Geochemistry The geochemistry of rivers, groundwater, lakes, and seawater. Topics include thermodynamics, kinetics, acids and bases, pH and alkalinity, carbonate equilibria, redox chemistry, chemical weathering, and numerical modeling. Prerequisites: 201 and CHEM 103; or consent of instructor.

EARTH 311-0 Sedimentary Geochemistry Formation and diagenesis of carbonates; geochemistry of organic matter; petroleum formation; evaporite precipitation; paleoenvironmental reconstruction; isotope, organic, and trace and major element geochemistry. Prerequisites: 201, 330, and CHEM 103; or consent of instructor.

EARTH 312-0 Stable Isotope Geochemistry Fractionation and distribution of stable isotopes (C,H,N,O,S) in the biosphere, hydrosphere, atmosphere, and geosphere. Isotopic biogeochemistry, environmental problems, and global climate change. Prerequisite: 201 and 310; or consent of instructor.

EARTH 313-0 Radiogenic Isotope Geochemistry Application of radiogenic isotopes to problems in geochemistry, petrology, hydrology, oceanography, ecology, and environmental science. Includes radioactive decay, nucleosynthesis, cosmochemistry, geochronology, and mixing processes, and numerical modeling. Prerequisite: CHEM 103 or consent of instructor.

EARTH 314-0 Organic Geochemistry The sources and fates of organic matter in the natural environment; global cycling of organic carbon; applications to the study of modern and ancient environments. Prerequisites: 1 quarter of earth or environmental science and 1 quarter of chemistry. Taught with CIV ENV 314; students may not receive credit for both courses.

EARTH 316-0 Earth's Changing Climate Fundamental controls on earth's climate system; global warming and cooling; atmospheric chemistry and role of biogeochemical

cycles of land, ocean, and biosphere; major paleoclimatic events, such as Pleistocene glaciations. Prerequisite: 201 or consent of instructor.

EARTH 317-0 Biogeochemistry The cycling of biogenic elements (C,N,S, Fe, Mn) in surficial environments. Emphasis on microbial processes and isotopic signatures. Prerequisites: 1 quarter of chemistry plus 1 quarter of geoscience, environmental science, or biology. Taught with CIV ENV 317; students may not receive credit for both courses.

EARTH 320-0 Global Tectonics Kinematics of plate tectonics. Geometry, determination, and description of plate motions. Paleomagnetism, marine magnetism, and hot spots. History of ocean basins and mountain-building processes. Prerequisites: 202 and PHYSICS 135-2; or consent of instructor.

EARTH 321-0 Reflection Seismology Acquisition, processing, and interpretation of reflection data. Hydrocarbon prospecting, structural geology, tectonics, stratigraphy, and deep continental reflection profiling. Prerequisites: 202, MATH 230, and PHYSICS 135-1; or consent of instructor.

EARTH 322-0 Computer Methods in Earth and Planetary Sciences Introduction to computer methods for analyzing geophysical and geochemical data. Data formats and manipulation, Unix, MATLAB, computer programming, shell scripting, Generic Mapping Tools, Seismic Analysis Code, visualization, Python, parallel processing.

EARTH 323-0 Seismology and Earth Structure Elastic theory, seismic waves, seismometers and seismograms, ray paths, travel times; internal structure of the earth; field seismology. Prerequisites: 202, MATH 250, and PHYSICS 135-2; or consent of instructor.

EARTH 324-0 Earthquakes and Tectonics Earthquakes: location, characteristics, origin, mechanism, and relation to plate motions; seismic hazard. Prerequisites: 202, MATH 250, and PHYSICS 135-2; or consent of instructor.

EARTH 325-0 Tectonophysics Quantitative kinematics of distributed deformation within plate boundary zones; gravity field and geoid; principle of isostasy; flexure of the crust and lithosphere. Prerequisites: MATH 250 and PHYSICS 135-2; or consent of instructor.

EARTH 326-0 Data Analysis for Earth and Planetary Sciences Types and characteristics of earth science data, development and applications of model types, observational and systematic sources of uncertainties and their characterization, spatial and temporal predictions.

EARTH 327-0 Geophysical Time Series Analysis Analysis of seismic and other geophysical data. Sampling, windowing, discrete and fast Fourier transforms, z-transforms, deconvolution, and filtering. Prerequisites: 202 and MATH 250; or consent of instructor.

EARTH 328-0 Tectonics and Structural Geology Deformation of rock masses: strain, fracture, slip, stress, and rheologic regimes; rock structures; folds, faults, foliations; seismic parameters in tectonic studies; orogenic belts and their tectonic evolution. Lectures and lab. Prerequisites: 201, MATH 240, and PHYSICS 135-1; or consent of instructor.

EARTH 329-0 Mathematical Inverse Methods in Earth and Environmental Sciences Theory and application of inverse methods to gravity, magnetotelluric, seismic waveform, multilateration, and other integrated data. Nonlinear, linearized, underdetermined, and mixed-determined problems and solution methods, such as regularized least-squares and neighborhood algorithms. Prerequisite: MATH 230, STAT 232, or equivalent; MATH 240 or STAT 320-1,2 recommended.

EARTH 330-0 Sedimentary Geology Sedimentary rocks; stratigraphy; local, regional, and global correlation. Ancient depositional systems; facies analysis in context of tectonic, eustatic, and climatic controls on deposition. Prerequisite: 201 or consent of instructor.

EARTH 331-0 Field Problems in Sedimentary Geology Field methods in stratigraphy and sedimentology; interpretation of depositional systems, facies models, and sequence stratigraphy based on field observations. Includes 3½-week late-summer field trip to Colorado and Utah. Prerequisite: 330.

EARTH 340-0 Paleobiology Major fossil groups; origin and evolution of life; speciation and mass extinction; evolution of communities and ecosystems. Application of paleobiologic methods to paleoenvironmental reconstruction. Prerequisite: 105, 106, 201, or 203; or consent of instructor.

EARTH 341-0 Quaternary Climate Change: Ice Ages to the Age of Oil Methods for reconstructing and dating past environmental changes, causes of natural climate change, and major climate events of the Quaternary through the present. Their relevance for understanding current climate change. Prerequisite: 201 or consent of instructor.

EARTH 342-0 Topics in Contemporary Energy and Climate Change Interdisciplinary course examining global energy use and associated challenges, including the history of energy use, the science of climate change, and technological, economic, and environmental aspects of various energy sources. Prerequisite: senior standing in the physical sciences or engineering or permission of instructor. Taught with ISEN 410; students may not receive credit for both courses.

EARTH 350-0 Physics of the Earth for ISP Solid-earth geophysics: the earth's gravity field, the earth's magnetic field, interior of the earth, heat flow, elementary wave propagation, plate tectonics. Prerequisites: second-year standing in ISP or comparable background in mathematics and physics; consent of both instructor and ISP director.

Earth 351-0 Forming a Habitable Planet Formation and evolution of planets permitting life; global geophysical and geochemical processes critical in our planet's development; prospects for life within our solar system and beyond;

exoplanet discovery and categorization. Prerequisite: 202, 350, PHYSICS 101, BIOL SCI 103 or 210, or CHEM 101.

EARTH 360-0 Instrumentation and Field Methods Theory and practicum on electronic instrumentation for monitoring and measurement in earth sciences, including data loggers, conceptual design and construction of electronic sensors, signal processing, data management, and network design. Prerequisite: 201 or 202; or consent of instructor.

EARTH 390-0 Special Topics in Earth and Planetary Sciences Topics of current interest to students and faculty. Prerequisites vary. May be repeated for credit with different topic.

EARTH 398-0 Undergraduate Seminar Opportunity for advanced work through supervised reading, research, and discussion. Open only by invitation of the department.

EARTH 399-0 Independent Study Special problems under direct supervision of one or more staff members. Comprehensive report and examination required. Open with consent of department to juniors and seniors who have completed field of concentration in the department.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

ECONOMICS

www.econ.northwestern.edu

The program in economics enables students to understand the basic concepts, theories, and techniques of economics as they apply to economic problems and policies. These may focus on macroeconomics, applied microeconomics, quantitative economics, or economic history. Whatever courses students take, they will become familiar with the way economists think about problems and devise solutions to them. Although the program does not offer specialized professional training in economics, it provides excellent preparation for graduate work in economics, the study of law, and careers in business or government. Students should consult a department adviser about field courses that fit their needs.

Major in Economics

The introductory courses 201 and 202 must be taken first and in that order. STAT 210 and MATH 220 should also be taken early in the program; the former is a prerequisite for 281 and the latter for 310-1. 281 and the intermediate theory courses should be completed before 300-level field courses are taken. Although only MATH 220 is required, majors are strongly urged to take MATH 224, 230, and 240. Majors considering graduate work in economics are strongly advised to take additional mathematics courses and perhaps a second major in mathematics. Students wishing to pursue in-depth study of econometrics may take 381-1,2 without taking 281 first. For students who complete 381-1, 281 will be waived.

Department courses (12 units)

- 3 introductory courses: 201, 202, 281
- 3 intermediate theory courses: 310-1,2, 311
- 6 additional field courses at the 300-level

Related courses *(units depend on mathematics sequence taken)*

- MATH 220 (or 212 and 213)
- STAT 210 or MATH 314
- 3 additional courses in the social sciences, mathematics, history, or statistics, no more than 1 at the 100 level

Minor in Economics

The minor offers training in economic theory through the intermediate level, instruction in quantitative methods of econometrics, and opportunity for advanced work in students' areas of interest. The introductory and intermediate courses are the same as those in the major, except that only 2 of the intermediate theory courses are required (310-1 and 310-2 or 311). As in the major, MATH 220 and STAT 210 must be taken early in the program because they are prerequisites for required courses. Students wishing to pursue in-depth study of econometrics may take 381-1,2 without taking 281 first. For students who complete 381-1, 281 will be waived.

Minor requirements (8 units)

- 3 introductory courses: 201, 202, 281
- 2 intermediate theory courses: 310-1; 310-2 or 311
- 3 additional field courses at the 300 level

Four-Year BA/MA

The department offers a four-year BA/MA for outstanding students in economics. Graduate-level courses in economic theory are required. Interested students should consult the director of undergraduate studies in sophomore year. For more information see Accelerated Master's Programs on page 39.

Honors in Economics

By invitation only, majors with strong academic records may pursue departmental honors by completing one of the following three options in addition to the regular requirements of the major: 398-1,2; 2 quarters of 399; or 2 400-level field courses in economics. None of these courses counts toward the major requirements. Under each option, candidates must submit a thesis presenting original research.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. Interested students should consult with the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of Economics

Weinberg College students pursuing a major in economics who also wish to be certified for secondary teaching of

economics with history must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Courses Primarily for Freshmen and Sophomores

ECON 201-0 Introduction to Macroeconomics Scarcity and choice; elements of demand and supply, determinants of aggregate output, employment, inflation, growth, and international balance of payments.

ECON 202-0 Introduction to Microeconomics Consumers' and producers' influence on structure of output and prices and distribution of income. Social efficiency in resource allocation. Government impact on allocative efficiency and distributive equity. Prerequisite: 201.

ECON 213-0 Economics of Gender Analysis of gender differences in employment and earnings. Family, labor market, discrimination, segregation, historical and international conditions, and antidiscrimination legislation.

ECON 250-0 Business and Government Survey of the functions, origins, and evolution of government control over business decisions in the American economy. Emphasis on the modern structure of government regulation with attention to remote origins. Prerequisite: 202.

ECON 270-0 Introduction to Environmental Economics Economics of the environment, the extraction of natural resources, and energy generation. Public policy solutions to problems of externalities, public goods, and common property. Assessing the value of environmental amenity. Prerequisite: 202.

ECON 281-0 Introduction to Applied Econometrics Estimation and analysis of a variety of empirical econometric models. Descriptive statistics, univariate regression, multiple regression, simultaneous equations, and forecasting. Prerequisites: 201; 202; MATH 220; STAT 210 or equivalent.

ECON 310-1,2 Microeconomics 1. Consumer behavior and the theory of demand; production, cost, supply functions; competitive equilibrium; monopoly. Prerequisites: 201, 202, MATH 220. **2.** Social choice theory, applications of elementary game theory, general equilibrium in perfectly competitive markets, and the economic consequences of uncertainty and imperfect information. Prerequisite: 310-1.

ECON 311-0 Macroeconomics Macroeconomics and monetary policy. Behavior of the economy as a whole. Income, inflation, unemployment, and growth; consumption, investment, and rate of interest; monetary and fiscal policy. Prerequisites: 201, 202, MATH 220.

Courses Primarily for Sophomores, Juniors, and Seniors

ECON 307-0 Economics of Medical Care Effects of medical care on health; health insurance, public and private demand for medical care, and the market for medical care; regulation of hospitals and physicians; roles of nonprofit and for-profit organizations; technological change. Prerequisites: 281, 310-1.

ECON 308-0 Money and Banking Nature of money and bank credit. Development, functions, and operation of monetary standards and credit systems. Banking and credit policies; price levels. Interrelationships of domestic and foreign monetary systems. Prerequisites: 281, 310-1, 311.

ECON 309-0 Elements of Public Finance Theory and practice of public finance. Welfare aspects of taxation and public expenditure decisions. Budgeting, public investment, external costs and benefits, and public debt. Prerequisites: 281, 310-1,2.

ECON 315-0 Topics in Economic History Topics vary: for example, the decline of European feudalism, Malthusianism, convertibility and free trade, constant wage shares during growth, the origins of the welfare state. Prerequisites: 281, 310-1, 311.

ECON 316-0 Advanced Topics in Macroeconomics Topics may include growth, business cycles, unemployment and job search, monetary economics, macroeconomic policy, intertemporal choice, and general equilibrium. Prerequisites: 281; 310-1,2; 311; MATH 224 and 230.

ECON 318-0 History of Economic Thought Development of economic thought from the advent of the mercantilists to the formation of current schools of economics. Prerequisites: 281, 310-1,2, 311.

ECON 323-1,2 Economic History of the United States Economic development of the United States with emphasis on changing structure and performance of the economy. **1.** Colonial period to 1865. **2.** 1865 to the present. Prerequisites: 281, 310-1, 311.

ECON 324-0 Western Economic History Western European developments, 1750 to the present: demographic, technical, social, and economic change. Prerequisites: 281, 310-1, 311.

ECON 325-0 Economic Growth and Development Macroeconomic aspects of long-term patterns of economic development. The effects of investment, education, population, and technological change on economic growth. Prerequisites: 281, 310-1,2, 311.

ECON 326-0 Economics of Developing Countries Structure, performance, and problems of developing economies. Topics may include land use, labor, migration, credit, insurance, and famine. Prerequisites: 281, 310-1,2, 311.

ECON 330-0 Behavioral Economics Understanding how people make choices in economic situations. Incorporation of psychology and/or sociology into economics. Topics may include perceptions, judgment, biases, and social pressure. Prerequisites: 281, 310-1,2.

ECON 331-0 Economics of Risk and Uncertainty Models of decision making under uncertainty. Use of these models to understand economic phenomena such as investment in financial assets, insurance, contracting, and auctions. Prerequisites: 281, 310-1,2.

ECON 335-0 Political Economics Social choice theory. Voting theory. The analysis of political motivations and policy outcomes. Application of formal theory to contemporary and historical public policy decisions. Prerequisites: 281, 310-1,2.

ECON 336-0 Analytic Methods for Public Policy Analysis Formulation of objectives, structuring decision problems, choices under uncertainty, interactive decisions, and the impact of organizational structure on project outcomes. Prerequisites: 281, 310-1,2.

ECON 337-0 Economics of State and Local Governments Economic functions and financing of state and local governments in theory and practice; costs and demands for local public services; role of government finance in urban and regional growth. Prerequisites: 281, 310-1,2.

ECON 339-0 Labor Economics Survey of economic problems growing out of employment relationships; theories and processes of wage and employment determination, income distribution, and the role of trade unions and issues of economic security. Prerequisites: 281, 310-1,2, 311.

ECON 340-0 Economics of the Family Application of microeconomic theory to the analysis of family issues: marriage, cohabitation, the decision to have children, divorce, credit and insurance, and legacies. Prerequisites: 281, 310-1,2.

ECON 341-0 Economics of Education The economic analysis of education, including return to schooling, education and economic growth, education production functions, school financing, vouchers, charter schools, and accountability. Prerequisites: 281, 310-1,2.

ECON 342-0 Economics of Gender Analysis of gender differences in employment, earnings, and division of household labor. Family, labor market, discrimination, segregation, historical and international conditions, and antidiscrimination legislation. Prerequisites: 281, 310-1.

ECON 349-0 Industrial Economics Price and efficiency performance of American industries representative of various types of market structures and practices. Prerequisites: 281, 310-1,2.

ECON 350-0 Monopoly, Competition, and Public Policy Present public policy and unsettled issues with respect to structure and practices of industrial markets; concentration, vertical integration, and forms and effectiveness of competition. Prerequisites: 281, 310-1,2.

ECON 351-0 Law and Economics The impact of judicial decisions and statutory enactments—including corporate law and antitrust and regulation statutes—on economic behavior and markets. Prerequisites: 281, 310-1,2.

ECON 354-0 Issues in Urban and Regional Economics Factors affecting the spatial distribution of economic activity. Applications of economic analysis to problems of urban areas such as housing markets, zoning restrictions, and racial patterns of employment and housing. Prerequisites: 281, 310-1,2.

ECON 355-0 Transportation Economics and Public Policy The demand for alternative modes by passengers and shippers. Cost of providing transportation, competition, regulation, optimal pricing, subsidies, congestion pricing, and urban transit. Prerequisites: 281, 310-1,2.

ECON 359-0 Economics of Nonprofit Organizations The economic rationale for the nonprofit sector in a mixed economy. Topics include the objectives and behavior of nonprofit organizations, competition with commercial firms, volunteerism, and charitable donation. Prerequisites: 281, 310-1,2.

ECON 360-1 Foundations of Corporate Finance Theory How corporations allocate resources over time as facilitated by capital markets. Theory of asset evaluation, economic analysis of uncertainty, and capital budgeting and capital structure decisions. Prerequisites: 281, 310-1, 311. Should not be taken by students who have taken IEMS 326 or KELLG FE 310.

ECON 360-2 Investments The range of financial instruments available to investors. Optimal portfolio strategies in bonds and stocks from the perspectives of individual and institutional investors. Prerequiste: 360-1. Not for students who have taken KELLG FE 312.

ECON 361-0 International Trade International and interregional trade. Factors influencing trade in goods and services between areas. Reasons for and effects of impediments to trade, such as transport costs, tariffs, quotas, and voluntary export restrictions. Prerequisites: 281, 310-1,2; 311.

ECON 362-0 International Finance Determination of exchange rates, balance of payments, and international asset flows and prices; international transmission of macroeconomic disturbances. Prerequisites: 281, 310-1, 311.

ECON 370-0 Environmental and Natural Resource Economics Externalities and the role of property rights, pollution, waste disposal, common property problems, renewable resource management, nonrenewable resource use and depletion, recyclable resources, water allocation, and management of public lands. Prerequisites: 281, 310-1,2.

ECON 380-1,2 Game Theory 1. Noncooperative game theory, with applications to industrial organization, auctions, and theories of the firm. Prerequisites: 310-1,2; 311; MATH 224, 230. Should not be taken by students who have completed MATH 364. **2.** Cooperative and noncooperative game theory and decision making under uncertainty. Prerequisite: 380-1 or consent of instructor.

ECON 381-1,2 Econometrics 1. Probability and distribution theory, statistical inference, simple and multiple regression, specification error and multicollinearity, heteroskedasticity and serial correlation, measurement error, dummy variables. Prerequisites: 310-1 (310-2, 311 recommended); MATH 230, 234, 240, and 314 (or equivalent).

2. Hypothesis testing, estimation with deficient data, distributed lags, panel data, simultaneous equation systems, limited dependent variables. Prerequisite: 381-1 (310-2, 311 recommended).

ECON 398-1,2 Senior Seminar For students of superior ability. Original research on a topic of interest to the student, culminating in a senior thesis. By department invitation only. Grade of K given in 398-1. Prerequisites: 281; 310-1,2; 311; MATH 224, 230; at least 4 300-level economics electives.

ECON 399-0 Independent Study Advanced work through reading, research, and discussion to build on economics coursework taken by the student. Project to be decided by mutual agreement with a faculty member.

ENGLISH

www.english.northwestern.edu

The Department of English values various kinds of critical inquiry and creativity. While some courses emphasize the formal qualities of literary works, others address such questions as what counts as "literary," or how to characterize the relationships among literature, culture, and politics. Classes might discuss psychoanalysis, race and gender, or the history of the book. Texts examined also vary, as do their assumptions, methods, and emphases, but all courses stress close reading and careful analysis of texts, whether written or visual, in general and the written word in particular. Reflecting both range and specificity, the curriculum enables each student to pursue an area of interest within a broader understanding of literary history and the range of literary study.

In its creative writing courses the department offers training in verse, fiction, and creative nonfiction. Virtually all courses also include practice in the writing of clear, concise, and persuasive expository prose.

Rigorous training in thinking and writing is valuable for any career, including law, IT, finance, and business as well as writing, publishing, and the teaching of English at all levels. Courses in English and American literature also help students to hone their skills as critical citizens of global communities.

The department takes pride in its diversity of perspectives. In addition to teaching classes in the department, English faculty contribute substantially to the course offerings in theater, drama, comparative literature, and American, African American, Asian American, Latina and Latino, and gender and sexuality studies. Professors have taught courses in conjunction with the Newberry Library and other Chicago institutions.

Majors in English

A complete description of undergraduate English major programs may be obtained from the department office and website. Detailed descriptions of courses offered each quarter are published in "English Notes," available year-round on the department website. In addition, a tentative list of course offerings for the following year is available each spring. Writing courses (206, 207, and 208) and other courses whose content varies (e.g., 307, 313, 348, 378) may be repeated, but only with the consent of the department. English majors may ask any member of the department to serve as their academic advisers. A quarterly meeting with advisers to discuss course selection and progress is strongly recommended.

English Major in English and American Literature

Department courses (14 units)

- 2 introductory courses: 210-1,2 or 270-1,2
- 298
- 11 additional courses
  - 10 at the 300 level or above
  - At least 8 English department courses, or literature courses offered by related departments, or courses taught by English department faculty through other departments or programs and dealing substantially with literary works originally written in English (i.e., not in English translation)
  - At least 3 must be on works written before 1830.
  - At least 3 must be on works written after 1830.
  - At least 1 in American literature
  - At least 1 exploring transnationalism and textual circulation
  - At least 1 exploring identities, communities, and social practice
  - At least 1 research seminar (397)
  - Up to 2 on works not originally written in English

English Major in Creative Writing

Students may also apply to major in creative writing. Admission to the writing major is competitive, based on a manuscript of creative work from 206, 207, or 208. The major offers an apprenticeship in the writing of poetry, fiction, and creative nonfiction. A strong literature component and a course in the history and culture of literary production anchor the writing within a context of general literacy.

The department accepts applications to the creative writing major early each spring.

Department courses (13 units)

- 2 introductory courses: 206; 207 or 208
- 11 additional courses
  - 1 yearlong theory and practice sequence counting as 3 units: 393, 394, or 395
  - 392
  - 207 or 208, whichever the student has not taken
  - 6 300-level English department literature courses
    - 2 must be on works written before 1830.
    - 2 must be on works written after 1830.

Related courses (2 units)
- Chosen from fields outside of literature but still related to the student's demonstrated interests within the major.
- Selected with the advice and consent of the student's writing major adviser.

Minors in English

The department offers a minor in literature and two minor tracks in creative writing; all offer experience in reading literary texts and writing critical analysis. Students pursuing any of these minors will be permitted to preregister in the department after declared English majors do so.

Requirements: minor in literature (7 units)
- 2 introductory courses: 210-1,2 or 270-1,2
- 298
- 4 300-level courses
  - 2 on works written before 1830
  - 2 on works written after 1830
  - 1 may be in comparative literary studies.

Requirements: sequence-based minor in creative writing (7 units)
- 206; 207 or 208
- 1 advanced writing sequence counting as 3 units: 393, 394, or 395 (admission by application only)
- 2 300-level English-department literature courses
  - 1 on works written before 1830
  - 1 on works written after 1830

Requirements: cross-genre minor in creative writing (7 units)
- 206; 207 or 208
- 3 courses (2 from one genre and 1 in a cross-genre) chosen from 306, 307, 308, WRITING 301, 302, 303
- 2 300-level English department literature courses
  - 1 on works written before 1830
  - 1 on works written after 1830

Honors

Honors in Literature

To prepare to apply to the honors program, all literature majors take 397, which provides an opportunity to complete a 12- to 15-page essay. Independent study courses, as well as other designated 300-level English courses, offer the opportunity to complete substantive research papers. Literature majors with strong academic records may apply during spring of junior year for admission to the 2-quarter senior thesis sequence (398-1,2), which meets the following fall and winter quarters. (The sequence does not count toward the English major.) Accepted students are expected to produce a senior thesis of about 40 pages. Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information, including funding opportunities, visit the honors in English literature website and see Honors in the Major on page 38.

Honors in Creative Writing

Creative writing majors who are completing the yearlong theory and practice sequence in poetry, fiction, or creative nonfiction and who have kept up with their other writing major requirements may apply to work toward honors during senior year. Applications are submitted early in spring quarter of junior year. Over 2 quarters of 399 (fall and winter), admitted students work one on one with a faculty mentor to complete a significant writing, creative media, or literary translation work; 399 does not count toward requirements for the major. Students whose projects and grades meet department criteria are recommended to the college for graduation with honors. For more information see the director of creative writing or a creative writing adviser, view the honors in creative writing website, and see Honors in the Major on page 38.

The Teaching of English

Weinberg College students pursuing a major in English who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Related Programs

Literature courses appear in the curricula of African American studies, American studies, Asian American studies, comparative literary studies, drama, and gender and sexuality studies. Students also may pursue creative writing in courses offered by the Center for the Writing Arts.

Courses in Composition

See also the Writing Program.

ENGLISH 105-0 Expository Writing Emphasizes all phases of the composition process, research methods, and critical thinking. Careful review of student papers and reports. May be repeated for credit with different topic.

ENGLISH 106-1,2 Writing in Special Contexts (.5 unit) An introduction to expository writing similar to 105 but paired with a course in another discipline.

ENGLISH 205-0 Intermediate Composition Expository writing at an intermediate level. Emphasis on techniques for writing clearly, precisely, and persuasively. May be repeated for credit with different topic.

ENGLISH 304-0 Practical Rhetoric The theory of writing and skills that underlie good writing; primarily for teachers in secondary schools and universities.

ENGLISH 305-0 Advanced Composition For students with previous formal training in composition. Admission by

consent of department. May be repeated for credit with different topic.

Courses Primarily for Freshmen and Sophomores

Prospective writing majors must take 206 and either 207 or 208.

ENGLISH 206-0 Reading and Writing Poetry Forms and techniques of verse. May not be taken earlier than spring quarter of freshman year. Seniors may enroll only with department consent.

ENGLISH 207-0 Reading and Writing Fiction Forms and techniques of fiction. Prerequisite: 206.

ENGLISH 208-0 Reading and Writing Creative Nonfiction Forms and techniques of creative nonfiction. Prerequisite: 206.

ENGLISH 210-1,2 English Literary Traditions Chronological survey of British literature in its cultural contexts from Chaucer to the 20th century. **1.** Chaucer to the late 18th century. **2.** Late 18th century through the 20th century.

ENGLISH 211-0 Introduction to Poetry Elements of lyric and narrative poetry, with emphasis on the ways these can create meaning and elicit response.

ENGLISH 212-0 Introduction to Drama Fundamental elements of drama as perceived in performance. How a play communicates from text to stage to audience.

ENGLISH 213-0 Introduction to Fiction How prose fiction, as practiced by various British and American authors from the 18th century to today, creates and communicates meaning.

ENGLISH 220-0 The Bible as Literature Selected books of the Hebrew bible and New Testament studied from a literary perspective; issues of plot, character, genre, narrative strategy, and theories of interpretation. Taught with COMP LIT 210; students may not receive credit for both courses.

ENGLISH 234-0 Introduction to Shakespeare Representative Shakespearean plays.

ENGLISH 270-1,2 American Literary Traditions Representative writers and works of American literature in cultural context. **1.** Puritans to *Moby Dick*. **2.** Mid-19th century to the present.

ENGLISH 273-0 Introduction to 20th-Century American Literature Principal writers and works since World War I.

ENGLISH 275-0 Introduction to Asian American Literature From the early 20th century to the present, covering a range of genres and ethnicities. Taught with ASIAN AM 275; students may not receive credit for both courses.

ENGLISH 277-0 Introduction to Latino Literature Survey of major writers and movements from Spanish colonial era to the present, covering a range of genres and ethnicities. Taught with LATINO 277 and SPANISH 277; students may receive credit for only 1 of these courses.

ENGLISH 298-0 Introductory Seminar in Reading and Interpretation Close reading of literary works in the light of various perspectives in literary study. Declared English majors have enrollment priority. Prerequisite: any 1 of 210-1,2, 270-1,2.

Courses Primarily for Juniors and Seniors

WRITING 301-0 The Art of Fiction See Writing Arts.

ENGLISH 302-0 History of the English Language The English language from the earliest times to today.

WRITING 302-0 The Art of Poetry See Writing Arts.

WRITING 303-0 The Art of Nonfiction See Writing Arts.

ENGLISH 306-0 Advanced Poetry Writing For nonwriting majors with previous formal training in creative writing. May be repeated for credit with different topic. Prerequisite: 206.

ENGLISH 307-0 Advanced Creative Writing For nonwriting majors with previous formal training in creative writing. May be repeated for credit with different topic. Prerequisite: 206.

ENGLISH 308-0 Advanced Creative Nonfiction Writing For nonwriting majors with previous formal training in creative writing. May be repeated for credit with different topic. Prerequisite: 206.

ENGLISH 310-0 Studies in Literary Genres Content varies.

ENGLISH 311-0 Studies in Poetry Content varies.

ENGLISH 312-0 Studies in Drama Content varies.

ENGLISH 313-0 Studies in Fiction Content varies.

ENGLISH 320-0 Medieval English Literature Representative works in their intellectual and cultural contexts.

ENGLISH 322-0 Medieval Drama Study of 15th-century English mystery cycles, miracle plays, and moralities in their cultural context.

ENGLISH 323-1,2 Chaucer 1. *The Canterbury Tales.* **2.** *Troilus and Criseyde* and other works.

ENGLISH 324-0 Studies in Medieval Literature Content varies.

ENGLISH 331-0 Renaissance Poetry English poetry from the Elizabethan period to 1660.

ENGLISH 332-0 Renaissance Drama A survey of English drama (1590–1630) and its cultural contexts.

ENGLISH 333-0 Spenser Spenser's major poetry, with emphasis on *The Faerie Queene*.

ENGLISH 334-1,2 Shakespeare 1. Principal plays up to 1600. **2.** Principal plays after 1600.

ENGLISH 335-0 Milton Milton's poetry, with those parts of his prose that illuminate his poetical and intellectual development.

ENGLISH 338-0 Studies in Renaissance Literature Content varies.

ENGLISH 339-0 Special Topics in Shakespeare Content varies.

ENGLISH 340-0 Restoration and 18th-Century Literature Representative works in their intellectual and cultural contexts.

ENGLISH 341-0 Restoration and 18th-Century Poetry Dryden, Pope, and other poets of the period 1660–1744.

ENGLISH 342-0 Restoration and 18th-Century Drama English drama from 1660 to the end of the 18th century.
ENGLISH 343-0 18th-Century Prose Swift, Johnson, Burke, Gibbon, Wollstonecraft, and other nonfiction prose writers.
ENGLISH 344-0 18th-Century Fiction Writers such as Defoe, Richardson, Smollett, Fielding, Sterne, Burney, Radcliffe, and Austen.
ENGLISH 348-0 Studies in Restoration and 18th-Century Literature Content varies—for example, biography and autobiography, literary careers, literature and social criticism.
ENGLISH 350-0 19th-Century British Literature Representative works in their intellectual and cultural contexts.
ENGLISH 351-0 Romantic Poetry Writers such as Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats.
ENGLISH 353-0 Studies in Romantic Literature Content varies.
ENGLISH 356-0 Victorian Poetry The principal British poets from Tennyson to Hopkins.
ENGLISH 357-0 19th-Century British Fiction Representative novels written between 1800 and 1900.
ENGLISH 358-0 Dickens Representative major works of Charles Dickens.
ENGLISH 359-0 Studies in Victorian Literature Content varies.
ENGLISH 360-0 20th-Century British and American Literature Representative works in their intellectual and cultural contexts.
ENGLISH 361-1,2 20th-Century Poetry 1. Major British poets such as Yeats, Eliot, and Auden. **2.** Major American poets from Frost and Robinson to Crane.
ENGLISH 363-1,2 20th-Century Fiction 1. Major British novelists from Conrad to World War II. **2.** Major American novelists from James to World War II.
ENGLISH 365-0 Studies in Postcolonial Literature Themes, antecedents, and contexts of selected literature produced in societies emerging from colonial rule.
ENGLISH 366-0 Studies in African American Literature Content varies.
ENGLISH 367-0 Postwar British Fiction Representative British novels since 1945.
ENGLISH 368-0 Studies in 20th-Century Literature Content varies.
ENGLISH 369-0 Studies in African Literature 20th-century African literature in English.
ENGLISH 370-0 American Literature before 1914 Intellectual and cultural contexts of American literature from the Puritans to 1914.
ENGLISH 371-0 American Novel Writers such as Cooper, Alcott, Chopin, Hawthorne, Melville, Poe, Twain, James, Howells, Crane, Dreiser, and Wharton.
ENGLISH 372-0 American Poetry Writers such as Freneau, Bradstreet, Bryant, Poe, Whitman, Dickinson, Robinson, and Frost.
ENGLISH 375-0 Topics in Asian American Literature Content varies.
ENGLISH 377-0 Topics in Latino Literature Content varies.
ENGLISH 378-0 Studies in American Literature Content varies.
ENGLISH 383-0 Special Topics in Theory Topics in theory and criticism related to the study of literature and culture. Content varies.
ENGLISH 385-0 Topics in Combined Studies Special topics in literature and related disciplines. Content varies.
ENGLISH 386-0 Studies in Literature and Film Content varies.
ENGLISH 392-0 The Situation of Writing The sociology of writers, writing, publication, dissemination of literature, and reading. Prerequisite: admission to writing major.
ENGLISH 393-F,W,T,S Theory and Practice of Poetry (3 units total) Sequence of 2 15-week courses. **1.** Theory of prosody, including the major forms of poetry in English (accentual-syllabic verse) and minor forms (accentual, syllabic, and free verse). **2.** Intensive writing practice culminating in the production of a long poem. Prerequisite: admission to sequence or writing major.
ENGLISH 394-F,W,T,S Theory and Practice of Fiction (3 units total) Sequence of 2 15-week courses. **1.** Tenets of fictional realism and its substitutes, with practice in different applications of plot, narrative technique, and point of view. **2.** Culminates in the writing of a novella. Prerequisite: admission to sequence or writing major.
ENGLISH 395-F,W,T,S Theory and Practice of Creative Nonfiction (3 units total) Sequence of 2 15-week courses. **1.** Tenets of creative nonfiction, with practice in different styles, form, and modes. **2.** Culminates in the writing of a long creative nonfiction project. Prerequisite: admission to sequence or writing major.
ENGLISH 397-0 Research Seminar For juniors and seniors. Topics vary. Students research and complete an independent term paper related to the topic of the seminar.
ENGLISH 398-1,2 Senior Sequence (literature major) For seniors preparing an honors essay in the literature major. Students pursue individual topics under the direction of a faculty adviser and the departmental honors coordinator. Admission by application. K grade given each quarter pending completion of essay.
ENGLISH 399-0 Independent Study Individual projects with faculty guidance. Open to majors with junior or senior standing and to senior minors. May be elected two times, but only 1 unit at a time. Prerequisite: consent of department or director of writing major.

ENVIRONMENTAL POLICY AND CULTURE

www.wcas.northwestern.edu/epc

The Environmental Policy and Culture Program offers students an interdisciplinary approach to environmental studies, focusing on the social sciences and humanities. Environmental issues and conflicts are among the most important concerns of the 21st century. The minor in environmental policy and culture provides opportunities to engage in scholarly inquiry about managing the natural environment. Courses address issues such as global climate change, efforts to maintain and restore biodiversity, and the reconciliation of development with environmental protection. Courses that fulfill the minor requirements include both those offered by EPC (identified as ENVR POL) and courses from different departments and programs. They fall into three categories: the humanities (largely courses in history, philosophy, and religion), policy (largely courses in the social sciences), and the natural sciences. Although all students who minor in environmental policy and culture take at least 1 relevant course in the natural sciences, the emphasis is on courses in the humanities and social sciences.

Students are encouraged to participate in environmental research at Northwestern. They may take EPC research seminars 395 and 398 and/or pursue independent research projects in 399 under the supervision of faculty affiliated with the program.

Minor in Environmental Policy and Culture

Minors in environmental policy and culture may choose to concentrate in the humanities or social sciences or to take courses in both areas. A list of courses counting toward the minor is available from the program office and the website.

The minor in environmental policy and culture is administered by Weinberg College and affiliated with the cross-school Program in Environmental Science, Engineering, and Policy.

Minor requirements (7 units)

- At least 2 courses chosen from the following:
  - GEOG 211
  - HISTORY 215
  - PHIL 268
  - RELIGION 261
  - POLI SCI 329 or 367 (or sections of ENVR POL 390 cotaught with these courses)
  - SOCIOL 212
- At least 1 natural sciences course chosen from the following (no more than 2 natural sciences courses will be automatically approved for the minor):
  - BIOL SCI 333, 346, 347
  - EARTH 106, 111
  - ENVR SCI 201, 202, 203
- At least 4 of the 7 courses must be at the 300 level; 2 of these must be ENVR POL courses.
- Only 1 quarter of 399 may be counted toward the requirements.
- Exceptions must be approved by the program director.

Courses

ENVR POL 390-0 Special Topics in Environmental Policy and Culture Lecture course on environmental issues of current interest to students and faculty. May be repeated for credit with different topic.

ENVR POL 395-0 Special Topics Seminar Seminar on current environmental issues and problems. Topics vary. May be repeated for credit with different topic.

ENVR POL 398-0 Environmental Policy and Culture Research Seminar For EPC minors. Students choose topic for original research under guidance of course instructor.

ENVR POL 399-0 Independent Study Independent project in student's area of interest. Readings and conferences. Comprehensive term paper required. Prerequisite: consent of program director.

ENVIRONMENTAL SCIENCES

www.envsci.northwestern.edu

The environmental sciences program prepares students to address one of society's greatest challenges: preservation and stewardship of the natural world.

The curriculum synthesizes the natural sciences, engineering, and the social sciences, all of which are important for understanding the environment, the impact human activities have on it, and ways to mitigate and manage such impacts. In the interdisciplinary curriculum, majors learn integrative and quantitative approaches to local and global environmental issues, such as air and water pollution, biodiversity, climate change, energy, human health, and sustainability. The program provides preparation for employment in environmentally oriented firms, companies, and organizations; training for graduate study in diverse environmental disciplines; and preprofessional development for careers in civil service, law, business, and medicine.

The environmental sciences major is administered by Weinberg College and affiliated with the cross-school Program in Environmental Science, Engineering, and Policy.

Major in Environmental Sciences

The major in environmental sciences has two tracks: one in science and one in economic policy. The tracks share foundation courses in science and math and the core curriculum. Advanced coursework differs by track.

Students should plan their academic paths with an environmental sciences adviser soon after identifying their interests in environmental sciences. Foundation courses, many of which are prerequisites for advanced courses, should be completed as soon as possible. Students are encouraged (but not required) to take MATH 230 or PHYSICS 135-1,2,3, especially if they envision graduate

training. Premedical students and students interested in advanced study in environmental biology are advised to take the full 200-level sequence in biological sciences and 2 additional quarters of organic chemistry.

Program courses (11 units)

- 3 core courses: 201, 202, 203
- 8 advanced studies courses
  - At least 6 must be at the 300 level.
  - Students in the science track choose 6 courses from the science list and 2 from the environment and society list.
  - Students in the policy track take ECON 281, 310-1, and 370 plus 5 additional courses, including 4 from the science list.
    - *Science list (up to 2 ENVR SCI 399 research courses may be substituted for courses from this list)*
      ANTHRO 306, 312
      BIOL SCI 313, 316, 330, 332, 335, 341, 346, 347, 349, 350
      CHEM 306, 329, 342-1,2, 393
      CIV ENV 260, 340, 358, 361-1,2, 363, 364, 365, 367, 371, 376
      EARTH 201, 310, 312, 313, 314, 316, 317, 326, 330, 331, 351, 360
      ENVR SCI 390
      GEOG 211, 341, 343
      MECH ENG 241
    - *Environment and society list*
      ANTHRO 310, 383
      CIV ENV 303, 349, 360, 368, 395
      ECON 270, 370
      ENV POL 390, 394, 395
      GEOG 328
      PHIL 268
      POLI SCI 349, 367
      RELIGION 261
      SOCIOL 311, 312

Foundations in science and math *(Units depend on chemistry and mathematics sequences taken.)*
Students should complete the following courses in their first two years:

- MATH 220, 224 *or* 212, 213, 214
- CHEM 101/121, 102/122, and 103/123 *or* CHEM 171/181 and 172/182
- 5 courses chosen from the following, with at least 2 from the same group (labs do not count toward 5-course total):
  - BIOL SCI 215, 216, 217, or 218; to count toward this requirement, 215, 216, and 217 must each be paired with 1 lab course from 220, 221, 222
  - CHEM 210-1,2 with lab course 230-2
  - ECON 201, 202
  - PHYSICS 135-1,2,3
  - STAT 210, MATH 230, 250

Environmental Sciences Second Major for ISP Students

The Integrated Science Program is a highly selective BA program in Weinberg College (see Integrated Science Program). Students majoring in ISP who wish to complete a second major in environmental sciences should fulfill the following requirements instead of those listed above. They may not substitute ENVR SCI 399 or ISP 398 for the ISP-required course MATH 383 and must take the following additional courses:

- 201, 202, 203
- 4 advanced studies courses from the lists above
  - 3 from the science list (may substitute 1 quarter of 399 for 1 of these)
  - 1 from the environment and society list
  - All must be at the 300 level.

Honors in Environmental Sciences

Students with strong academic records and an interest in pursuing honors should approach a faculty member by the end of junior year to discuss possible projects; these may involve field, experimental, or computational research. Research is completed during 2 quarters of 399, which may be counted toward major requirements. Students then prepare a written thesis. Those whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program director and see Honors in the Major on page 38.

Core Courses

ENVR SCI 201-0 Earth: A Habitable Planet Overview of the physical processes governing environmental systems, from lithosphere to hydrosphere to atmosphere. Physical science perspectives on current debates, such as those over water resources, energy, and climate change. Prerequisite: CHEM 103 or equivalent. Taught with CIV ENV 201; students may not receive credit for both courses.

ENVR SCI 202-0 The Health of the Biosphere Population processes in nature; role of human population growth; interactions between populations; major impacts of human populations on the environment. Prerequisite: CHEM 103 or equivalent. Taught with CIV ENV 202; students may not receive credit for both courses.

ENVR SCI 203-0 Energy and the Environment Introduction to the mitigation of environmental impacts and the science and engineering behind sustainable energy production. Prerequisites: CHEM 103, 171, or equivalent, MATH 224 or equivalent. Taught with CIV ENG 203; students may not receive credit for both courses.

Other Courses

ENVR SCI 390-0 Special Topics in Environmental Sciences (1–2 units) Lecture course on environmental science topics of interest to students and faculty. May be repeated for credit with different topic.

ENVR SCI 399-0 Independent Study Independent research on special problems under direct supervision of a faculty adviser. Comprehensive report required. Prerequisite: consent of program director.

ETHICS AND CIVIC LIFE

www.bradyprogram.northwestern.edu

The interdisciplinary Brady Program in Ethics and Civic Life provides students with the opportunity to examine and practice the ethics of citizenship and leadership. The three-year program includes academic, international, and service components. Brady Scholars are selected in spring of freshman year.

As sophomores, Brady Scholars enroll each quarter in a seminar investigating what a good human life is, what a good person is, and what a good society is and asking how we can make our cities, nation, and world better places. Each group of Brady Scholars selects one local community challenge for further study.

In junior year Brady Scholars participate in a study abroad program and, in addition to their regular coursework, learn how the foreign country addresses the challenge selected by their group.

Moral philosophy, global citizenship, and community engagement are integrated for Brady Program seniors when their 16-student class works collectively to provide concrete solutions to a social challenge in Evanston, drawing on their three years of rigorous research and academic study of the challenge. Seniors receive 1 unit of academic credit for 373-1,2.

Courses

Specific topics in the sophomore-year seminars 273-1,2,3 will vary as different professors participate. The senior year community engagement sequence 373-1,2 will relate to the community challenge.

PHIL 273-1 The Good Life
PHIL 273-2 The Moral Life
PHIL 273-3 The Good Society
PHIL 373-1,2 Philosophy and the City (.5 unit each quarter)

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

FRENCH AND ITALIAN

www.frenchanditalian.northwestern.edu

Studies in French and Italian provide unique insights into the language, thought, and character of cultures different from our own. Such knowledge builds an awareness of our own society's diversity and the ways it resembles and differs from others. Proficiency in language and knowledge of culture are keys to careers in communication, media, business, the arts, and academia and are valuable components of any university education.

The department's programs are varied. Language courses, from the elementary through the graduate levels, develop communication skills for functioning at ease with foreign texts or in a foreign environment. Courses in literature and civilization not only broaden and deepen insights into the thought and writing of another culture but also train students to think independently, to organize and analyze materials thoughtfully, and to discuss ideas effectively.

The department offers a minor in French, a major in French studies, MA and PhD programs in French, and a minor and a major in Italian. These may be supplemented by study abroad, which allows students to increase their knowledge of a foreign language and society while continuing university work abroad in a variety of fields. It is not necessary to be a major to participate in these programs.

Resources supporting French and Italian studies include a cutting-edge multimedia learning center with its own film collection and a library whose strengths include 20th-century French and Italian literary and artistic movements as well as francophone African and Caribbean literatures.

French

Major in French

Major requirements (15 units)

- At least 10 courses must be at the 300 level.
  - All majors must take 2 courses from the 310, 312, 314, 316 sequence (at least 1 pre-1800).
  - At least 1 additional 300-level course must be on literature and culture before 1800.
  - All majors must take 396 and 397 during senior year.
- At most 5 courses may be at the 200 level, chosen from
  - 202
  - 203
  - 210 or 211
  - 2 or fewer from 271, 272, 273
- Courses lower than 202 do not count toward the major.
- At most 2 courses may be French department courses taught in English.
- Students studying abroad in France or any other francophone country may receive up to 7 credits (depending on program length) if the content of the courses taken abroad relates in a substantive way to some aspect of French or francophone culture.
- All majors returning from study abroad must take 396 and 397.

Minor in French

The goal of the minor in French is to give students a solid grounding and good fluency in the French language and to provide a basic familiarity with important aspects of French culture and society, enabling them to pursue their interests in French and in countries where French is used.

The minor is designed for students who have a strong interest in French but cannot fulfill the requirements of the French major, either because their knowledge of French was nonexistent or elementary when they came to Northwestern, or because they are engaged in another major that precludes pursuing a second major.

Students choosing to minor in French are assumed to have completed 201 or the equivalent.

Minor requirements (9 units)

- Up to 5 200-level courses chosen from 202, 203, either 210 or 211, and no more than 2 from 271, 272, 273
- At least 4 300-level courses
  - 2 language courses chosen from 301, 302, 303, 305, 309, 391
  - 2 other courses in literature or civilization
    - 1 may be a French department course taught in English.
    - 309 may be counted as a civilization course.
- Students returning from a study abroad program must enroll in at least 1 300-level course in the department other than 301, 302, and 303.

Four-Year BA/MA

The department offers a four-year BA/MA program in French for outstanding undergraduate majors. Interested students should see Accelerated Master's Programs on page 39 and consult with the department chair.

Honors in French

Majors with strong academic records and an interest in pursuing honors should contact the director of undergraduate studies no later than spring quarter of junior year. The honors thesis is produced through 1 or 2 quarters of 399; these 399 enrollments will count toward the 15 required units for the major. The thesis may build on previous work done in a 300-level course.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information see the department website or consult with the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of French

Weinberg College students pursuing a major in French who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Introductory and Intermediate Language Courses

FRENCH 111-1,2,3 Elementary French Conversation, grammar, reading, and writing for beginners. Four class meetings a week.

FRENCH 115-1,2 Intensive Elementary French For students with some previous experience in French. Review and development of skills in speaking, understanding, reading, and writing as preparation for work at the second-year level. Four class meetings a week. Prerequisite: department placement.

FRENCH 121-1,2,3 Intermediate French Grammar review, conversation, reading, and writing. Four class meetings a week. Prerequisite: 111 or 115.

FRENCH 125-1,2,3 Intensive Intermediate French French language and culture: conversation, composition, reading of cultural and literary texts, and grammar review. Three class meetings a week. Prerequisite: 115 or placement.

FRENCH 198-0 Independent Study Credit for 1 quarter only. Approval of department required.

FRENCH 199-SA-1,2 Language and Culture Grammar, conversation, reading, writing, and culture study. Restricted to students in Northwestern's Paris programs. Students completing this course must take a placement exam before continuing French at Northwestern. Prerequisites: none.

FRENCH 201-0 Introduction to French Studies Development of fluency, accuracy, and creativity in speaking, comprehension, reading, and writing French; introduction to social, cultural, and literary topics. Prerequisite: 121-3, 125-3, or department placement.

FRENCH 202-0 Writing Workshop Practical study of French grammar and structure; students develop and improve writing skills through practice in preparing short compositions. Prerequisite: 201, AP score of 4, or consent of department.

FRENCH 203-0 Oral Workshop Practical course to increase listening comprehension, build vocabulary and idiom use, and enhance communication skills. Prerequisite: 201, AP score of 4, or consent of department.

FRENCH 299-SA-1,2 Language and Culture Study of French language and culture in Paris. Restricted to students in Northwestern's Paris programs. Students completing this course must take a placement exam before continuing French at Northwestern. Prerequisite: Weinberg College French language proficiency.

Introductory Literature and Culture Courses

FRENCH 210-0 Reading Literatures in French Study of texts illustrating various genres from the Middle Ages to the present, such as poetry, drama, fairy tale, novel, and autobiography. Prerequisite: 202, AP score of 5 in language, or consent of instructor.

FRENCH 211-0 Reading Cultures in French Introduction to French and/or francophone cultures through study and analysis of major themes, issues, and debates. Prerequisite: 202, AP score of 5 in language, or consent of instructor.

FRENCH 271-0 Introducing the Novel Fundamental concepts and significant achievements of the novel in French. Prerequisite: 210 or 211, AP score of 5 in literature, or consent of instructor. Credit not allowed for both 271 and 278.

FRENCH 272-0 Introducing Theater Basic concepts and representative works of French and/or francophone theater. Principles of tragedy and comedy; contemporary developments. Prerequisite: 210 or 211, AP score of 5 in literature, or consent of instructor. Credit not allowed for both 279 and 272.

FRENCH 273-0 Introducing Poetry in French Reading lyric poetry written in French from the 16th century to the present, focusing primarily on the history of major poetic movements. Credit not allowed for both 273 and 276. Prerequisites: 210 or 211, AP score of 5 in literature, or consent of instructor.

Courses with Readings and Discussion in English

No prerequisite in French; readings, discussions, papers, and examinations in English.

FRENCH 276-0 Poetry in Translation Introduction to French poetry of different periods and genres. Focus is on major themes and trends in French literary history, but students also learn about French versification and poetic forms. Credit not allowed for both 273 and 276.

FRENCH 277-0 Literature of Existentialism Existentialism in its literary, philosophical, and cultural manifestations.

FRENCH 278-0 The Novel in Translation Introduces students to the French novel through analysis of texts from different periods or subgenres. Content varies. Credit not allowed for both 271 and 278.

FRENCH 279-0 Theater in Translation Representative French plays from the 17th through the 20th centuries; basic concepts of genre; social and historical context. Credit not allowed for both 279 and 272.

FRENCH 371-0 Giants, Cannibals, and Critique in the Renaissance Analysis of works of Rabelais and Montaigne and their techniques of satire and social critique. Readings include related selections from Erasmus, More, La Boétie, and others.

FRENCH 374-0 Proust Introduces the works of Marcel Proust, a central figure of European literature and thought.

FRENCH 375-0 French Film Topics in French cinema: for example, French classical cinema, the New Wave, postcolonial French film, the cinema of Marguerite Duras.

FRENCH 376-0 Gender and Sexuality Major trends and perspectives in gender and sexuality studies such as first- and second-wave feminisms, lesbian writers, AIDS literature, queer theory, gender and orientalism, cross-cultural feminism.

FRENCH 378-0 Contemporary Theory Introduction to some major trends in contemporary French theory and the way they have influenced literary studies in the United States.

FRENCH 379-0 Advanced Topics in French Culture and Literature Advanced exploration of special topics in French studies. May be repeated for credit with change of topic. Prerequisite: consent of instructor.

Courses with Prerequisites in French

FRENCH 301-0 Advanced Grammar Review and study of French grammar. Functional implementation of rules through oral and written exercises. Prerequisite: 202 or consent of instructor.

FRENCH 302-0 Advanced Composition Development of written expression organized according to language functions (describing, summarizing, hypothesizing, persuading, etc.) and communicative needs (e.g., social and business correspondence). Prerequisite: 301 or consent of instructor.

FRENCH 303-0 Advanced Conversation Oral practice based on short readings, visual media, and spontaneous scenarios. Prerequisite: 301 or consent of instructor.

FRENCH 305-0 French Phonetics Study of syllabic division, intonation, rhythm, accent, linking, vowels, consonants. Practical exercises to improve pronunciation. Prerequisite: 302 or consent of instructor.

FRENCH 309-0 French in Commerce and Industry Introduction to fundamentals of the French business world in historic, economic, social, and political contexts. Acquisition of language skills for communication in commerce and business. Prerequisite: 302 or consent of instructor.

FRENCH 310-0 Middle Ages and Renaissance Study of literary texts of the French Middle Ages and Renaissance with emphasis on their historical and literary-historical contexts. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 312-0 Classicism and Enlightenment Study of literary texts from Classicism to Enlightenment and the Revolutionary period with emphasis on their philosophical, literary, and cultural contexts. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 314-0 The Age of Revolutions and Colonialism Study of literary texts from the period between the French Revolution and World War I with emphasis on their historical and literary-historical contexts. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 316-0 The Contemporary French-Speaking World Study of literary texts from the 20th and 21st centuries with emphasis on their philosophical, literary, and cultural contexts. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 322-0 Medieval French Narratives Major narrative works of the French Middle Ages in historical context. Content varies; may include epics such as the *Song of Roland*, romances such as Chrétien de Troyes's *Perceval*, and narratives of childhood. Texts read in modern French versions. Prerequisite: 271, 272, or 273 or consent of instructor.

French 333-0 Topics in Renaissance Literature Study of literary and other texts of the French Renaissance with emphasis on their literary, historical, and political contexts. Prerequisites: 271, 272, 273, or consent of the instructor.

FRENCH 335-0 17th-Century Literature Topics and issues related to the literature and culture of 17th-century France. Content varies; topics covered previously include theater and its social and political contexts, the rise of rational thought, and the development of fiction and poetry. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 340-0 Sexual Politics and the Ancien Régime Literary, intellectual, and political role of women in view of the debates generated by the issues of women's power in the public sphere before and during the French Revolution. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 342-0 France in the Age of Scandals Examination of political, financial, and religious scandals that racked 18th-century France. Analysis of writings, especially novels, that both denounced and celebrated scandal. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 344-0 Rousseau and the French Revolution Analysis of Rousseau's political thought and major literary works and their impact on Revolutionary ideology and culture. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 346-0 The Enlightenment and the World Authors such as Rousseau, Diderot, Montesquieu, Graffigny, and Moreau de Saint-Méry in relation to Enlightenment debates about religion, political authority, human nature, colonialism, gender, and slavery. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 350-0 The Novel in French Content varies; may include the novel of the ancien régime, the psychological novel, and the Bildungsroman in France. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 355-0 The Invention of Modernity Study of the origins of modernity in the 19th century, addressing such issues as the rise of mass culture, urbanization, and the beginnings of consumer society. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 360-0 From Modernism to Postmodernism: Experiments in Narrative Form Crises and reinventions of French prose from the modernist moment of the early 20th century to the ambiguities of "engaged" literature of the 1930s to postmodernism. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 362-0 African Literatures and Cultures Major issues, trends, and authors from francophone Africa. Content varies; may include Shahrazade, narratives of gender relations, law and literature, violence, and writing. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 364-0 Caribbean Literatures and Cultures Major issues, trends, and authors from the francophone Caribbean and its diasporas. Content varies; may include creolization in Caribbean women writers; slavery, history, and memory; Caribbean identities. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 365-0 The Maghreb and the Middle East Major issues in the literatures and cultures of North Africa and the Middle East. Content varies. May include exile in writing; politics of language and translation. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 366-0 France and East Asia Interdisciplinary approaches to the history of French–East Asian relations, including French representations of East Asia. May include translation, japonisme, cinema, literary and philosophical avant-gardes, and culture and globalization. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 380-0 Political and Social Thought in France Major political and social trends in France from the ancien régime to the 20th century. Content varies. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 382-0 Literature and Exoticism Various modalities of the rhetoric of exoticism, including orientalism, throughout the history of French literature and in popular culture. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 384-0 Women Writing in French Analysis of texts by women authors with regard to their respective social, cultural, political, and historical contexts. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 386-0 Gender and Writing Issues of gender and sexuality in the production of literary and other creative texts in various historical periods. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 390-0 Topics in Culture Topics, issues, and questions in French and francophone culture. Content varies; may include French and francophone cinema, the intellectual in France. May be repeated for credit with different topic. Prerequisite: 271, 272, or 273 or consent of instructor.

FRENCH 391-0 Theory and Practice of Translation Intensive course integrating previously acquired skills through the comparative study and translation of English and French. Prerequisite: 301, 302, study abroad, or consent of instructor.

FRENCH 396-0 Contemporary Thought in the French-Speaking World An examination of different perspectives and paradigms for understanding literature and culture. Prerequisite: senior status or consent of undergraduate adviser.

FRENCH 397-0 Studies in Literature and Culture In-depth research and analysis of a problem or topic concerning cultural representation. Prerequisite: senior status or consent of undergraduate adviser.

FRENCH 399-0 Independent Study Independent reading and research. Topics arranged through consultation with an instructor and approval of the department.

Italian

Major in Italian Literature and Culture

Major requirements (14 units)

- At least 10 courses offered by the Italian department
  - At most 6 courses taught in English
  - At most 3 200-level courses taught in Italian
- At most 4 courses dealing with Italian culture offered by other departments
  - 1 or more courses on theory and methodology may be counted.
  - Subject to approval of director of undergraduate studies
- At least 8 300-level courses
- 100-level courses do not count toward the major.
- Students studying abroad may substitute for department courses 4 courses whose content relates in a substantive way to some aspect of Italian culture; 4 additional courses taken abroad dealing with Italian culture may be credited as courses offered by other departments. Returning students must take 2 300-level courses in Italian in senior year.

Minor in Italian

Minor requirements (7 units)

- At most 3 courses taught in English
- At most 2 200-level courses taught in Italian
- At least 4 300-level courses.
- Students returning from study abroad must take at least 1 300-level course in Italian in senior year.

Honors in Italian

Majors with strong academic records and an interest in pursuing honors should contact the director of undergraduate studies no later than spring quarter of junior year. The honors thesis is produced through 1 or 2 quarters of 399; these 399 enrollments will count toward the 14 required units for the major. The thesis may build on previous work done in a 300-level course or, with consent of the instructor, in a graduate seminar.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information see the department website, consult with the director of undergraduate studies, and see Honors in the Major on page 38.

Courses Taught in Italian

Prerequisites for all 300-level courses taught in Italian: 2 200-level courses in Italian or consent of instructor.

ITALIAN 101-1,2,3 Elementary Italian Emphasis on oral communication, supported by grammar, composition, reading. Four class meetings a week. Prerequisite: none.

ITALIAN 102-1,2,3 Intermediate Italian Grammar review, conversation, composition, and readings in modern prose and drama. Four class meetings a week. Prerequisite: 101-3 or equivalent.

ITALIAN 103-1 Italian for Musicians Italian language course for musicians, focusing on developing comprehension and pronunciation skills for operatic performance. Analysis of libretti and scores of Italian operas. Prerequisite: 101-2 or equivalent.

ITALIAN 133-1,2,3/134-1,2,3 Intensive Italian Intensive double course covers two years of Italian language, the equivalent of 101 and 102, in a single academic year. Students enroll concurrently in 133 and 134 and receive 2 credits a quarter. Four two-hour class meetings a week. Prerequisite: none.

ITALIAN 201-0 Italian through Media Issues from Italian media; frequent oral and written reports: for instance, America in Italian media, advertising, immigration, youth culture. Students produce a newspaper or newscast at the end of the quarter. Prerequisite: 102-3 or 133-3/134-3 or equivalent.

ITALIAN 202-0 Italian through Performance Students develop and perform original material on video or live. Content may derive from television, theater, opera, and commedia dell'arte. Prerequisite: 102-3 or 133-3/134-3 or equivalent.

ITALIAN 203-0 Creative Writing in Italian A course meant to improve written Italian through exercises and experiments in a variety of genres and styles. Prerequisite: 102-3 or 133-3/134-3 or equivalent.

ITALIAN 204-0 Introducing Italian Literature An introduction to the history, genres, and themes of Italian literature. Course content may vary, focusing on reading, comprehension, and interpretive skills. Prerequisites: 102-3 or equivalent proficiency.

ITALIAN 205-0 Reading Italian Cities An approach to Italian culture and civilization through an exploration of representative Italian cities. Prerequisite: 102-3 or 133-3/134-3 or equivalent proficiency.

ITALIAN 206-0 Business Italian Introduction to the business and economic environment in Italy. Study of business practice and development of linguistic skills necessary for professional communication.

ITALIAN 207-0 Conversation in Italian Introduction to Italian culture. Emphasizes group activities and focuses on listening comprehension and speaking skills. Prerequisite: 102-3 or 133-3/134-3 or equivalent proficiency.

ITALIAN 304-0 Modern Italian Cultural Studies Culture of Italy from World War II to the present. Novels, films, popular culture.

ITALIAN 306-0 Borders and Margins Italian literary practice in contact with groups that Italy has defined as other—either beyond or within its geographical boundaries.

ITALIAN 347-0 Visual and Literary Culture in Italy Interdisciplinary course on Italian culture from the Middle Ages to the present. Each week pairs an artist with an author—for instance, Giotto/Dante, Michelangelo/Vittoria Colonna, Caravaggio/Galilei, De Chirico/Pirandello, Fellini/Flaiano.

ITALIAN 348-0 The Italian Novella Exploration of Italian culture through the form of the novella from the Middle Ages to the present. Each week is devoted to a groundbreaking author, such as Boccaccio, Sacchetti, Basile, Pirandello, Flaiano, and Calvino.

ITALIAN 349-0 Topics in Italian Culture and Literature Advanced exploration of special topics in Italian studies.

ITALIAN 399-0 Independent Study Supervised independent reading. Consult the director of undergraduate studies.

Courses with Readings and Discussion in English

No prerequisites in Italian.

ITALIAN 230-0 Italian Theatre and Performance Introduction to drama and performance in Italy.

ITALIAN 250-0 Topics in Italian Culture and Literature Cross-disciplinary exploration of a defined topic in Italian studies as it interacts with other cultural and literary traditions—for example, aspects of love. May be repeated for credit with change of topic.

ITALIAN 251-0 Introduction to Italian Cinema: Passion and Defiance Introduction to postwar Italian cinema, with an emphasis on textual analysis and film criticism.

ITALIAN 265-0 Body and Soul from Rome to the Renaissance Comprehension of the human body and soul in Italy from Augustan Rome to the Renaissance, as seen in literary and religious authors. Readings include Ovid, St. Paul, Gnostics, St. Francis, "dolce stil novo," Boccaccio.

ITALIAN 270-0 Michelangelo and the Italian Renaissance A close examination of Michelangelo's life and work in the broader context of Italian Renaissance culture.

ITALIAN 275-0 Dante's Divine Comedy Introduction to the *Divine Comedy*, its artistic and intellectual achievement, and its cultural and historical context.

ITALIAN 277-0 Neorealism and International Film: Framing Reality Exploration of Italian neorealism and its influence on European (especially the French New Wave), New Latin American, West African, and Indian cinema.

ITALIAN 350-0 Advanced Topics in Italian Culture and Literature Advanced exploration of special topics in Italian studies determined by the research interests of a visiting scholar. May be repeated for credit with change of topic. Prerequisite: consent of instructor.

ITALIAN 351-0 Advanced Italian Cinema: Powers of Form In-depth exploration of postwar Italian cinema. Focus on specific filmmakers (for instance, Antonioni, Visconti, Pasolini) and/or topics relevant to students within the larger field of cinema and media studies. Prerequisite: 251 or consent of instructor.

ITALIAN 360-0 From the Avant-Garde to the Postmodern Major authors and movements animating the modern and contemporary literary scene. Content varies—for example, futurism, feminist Italian fiction, and intellectuals and politics from D'Annunzio to Pasolini, Calvino, Eco, and the postmodern.

ITALIAN 374-0 Love and Sexuality in the Early Modern Period Analysis of how love and sexuality work as generalized symbolic media of communication in early modern Italian society and culture.

ITALIAN 377-0 Gender and Sexuality in 20th-Century Italian Culture Interdisciplinary course on gender and visual practices in Italy (photography, film, television, and video). Prerequisite: 251 or consent of instructor.

ITALIAN 378-0 Against Acting: Spectacle and Performance in Italy Contemporary theater and performance in Italy from the '70s to the present, with attention to sociopolitical context and trends in European art. Prerequisite: consent of instructor.

GENDER AND SEXUALITY STUDIES

www.genderstudies.northwestern.edu

The Gender and Sexuality Studies Program is a dynamic interdisciplinary program that draws on faculty and courses from more than 20 departments and several schools—including Weinberg College, the School of Communication, the School of Law, the Feinberg School of Medicine, and the Henry and Leigh Bienen School of Music. The program offers a major and a minor for Northwestern undergraduates, as well as a certificate for graduate students. It includes 11 core faculty members with joint appointments as well as affiliated faculty. Faculty teach courses and pursue research in the history and theory of gender, feminism, women's studies, and sexuality studies, including gay, lesbian, and queer studies.

The many approaches, methods, and topics in gender and sexuality studies at Northwestern are united in focusing on gender, sex, and sexuality as key but often underexamined categories in history, scholarly study, and daily life. At the same time, they attend to questions of identity and sexual politics in ways that do not take for granted the particular sex/gender categories of the modern Western world.

A full range of courses is offered, from freshman seminars to graduate courses. They provide information and analysis of culture, society, history, and politics, often from a transnational and international perspective. Each year a number of undergraduate majors choose to write honors theses in gender and sexuality studies.

Major in Gender and Sexuality Studies

Program courses (11 units)

- 2 core courses: 220, 230
- 2 theory courses: 381, 397
- 2 research courses: 350-3,4, or 6; 396
- 5 additional courses, including
  - At least 3 at the 300 level
  - At least 1 with a historical focus (e.g., 233, 321, 324)
  - At least 1 with a transnational focus (e.g., 240, 341, 353, 363, 380, 382)

Related courses (4 units)
- At least 2 at the 300 level
- From at least 2 different departments or programs
- Courses co- or cross-listed in gender and sexuality studies may be counted. Other ourses that focus on gender and/or sexuality but are not co- or cross-listed may be approved by the director of undergraduate studies.

Minor in Gender and Sexuality Studies

Minor requirements (7 units)
- 2 core courses: 220, 230
- 5 additional courses
  - At least 2 must be at the 300 level.
  - At least 1 must represent a humanities-based approach to gender and sexuality studies (e.g., 231, 233, 321, 324, 361).
  - At least 1 must represent a social science–based approach to gender and sexuality studies (e.g. 232, 331, 351, 353).
- All courses must be from or co- or cross-listed in gender and sexuality studies.

Honors in Gender and Sexuality Studies

Majors with strong academic records and an interest in pursuing honors should contact the honors coordinator in junior year. To receive honors, seniors must enroll in 396 in fall quarter, submit a senior thesis proposal to the honors coordinator at the end of the quarter, and identify a faculty member as thesis adviser. Accepted students complete 2 quarters of 398 (does not count toward the major) and produce a senior thesis. Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information, consult the director of undergraduate studies and see Honors in the Major on page 38.

Courses

GNDR ST 220-0 Sexual Subjects: Introduction to Sexuality Studies Survey of sexuality studies across a range of disciplines. Introduction to major theoretical and methodological approaches. Epistemology, morphology, history, subjectivity/identity, race formation, gender, social organization, and regulation.

GNDR ST 230-0 Roots of Feminism Introduction to milestone texts in the development of 200 years of British, European, and American feminist thought, with particular attention to emerging arguments and strategies around issues of gender and sexuality.

GNDR ST 231-0 Gender, Sexuality, and Representation Representations in art and literature within their historical, social, and political contexts. Theories of spectatorship, resistance, and revision.

GNDR ST 232-0 Sexuality and Society Examination of the role of sexuality in the cultural, economic, political, and social organization of the United States. Sex work, sex tourism, sexual migration, LGBT social movements, and moral panics. Taught with SOCIOL 232; students may not receive credit for both courses.

GNDR ST 233-0 Gender, Politics, and Philosophy Role of gender difference in the main political-philosophical traditions: social contract, liberalism, republicanism, socialism-Marxism, critical theory. Classics of feminist and political thought (Wollstonecraft, Mill, Taylor, Engels) and contemporary debates. Taught with PHIL 230; students may not receive credit for both courses.

GNDR ST 240-0 Gender Studies for a Small Planet Transnational and global perspectives on gender and sexuality.

GNDR ST 250-0 Gender Issues in Science and Health Aspects of gender in the cultures of science and medicine.

GNDR ST 321-0 Gender, Sexuality, and History Historical considerations of gender and/or sexuality. Topics may cover different historical time periods. Content varies by quarter; may be repeated for credit with different topics.

GNDR ST 324-0 US Gay and Lesbian History Social, cultural, and political history of same-sex desire in the United States, emphasizing the last 150 years. Taught with HISTORY 324; students may not receive credit for both courses.

GNDR ST 331-0 Sociology of Gender and Sexuality Gender and issues of social reproduction and social change, with an emphasis on sexuality and reproduction.

GNDR ST 332-0 Gender, Sexuality, and Health Health-related topics concerning gender and/or sexuality. Topics include reproductive health, HIV/AIDS, the women's health movement, environmentalism, and eating disorders. Content varies by quarter; may be repeated for credit with different topics.

GNDR ST 341-0 Transnational Perspectives on Gender and Sexuality Studies of gender and sexuality in relation to globalization or non-US/non-Western cultures. Content varies by quarter; may be repeated for credit with different topics.

GNDR ST 350-3,4,6 Research Seminar in Gender and Sexuality Studies Students research and complete a research paper or project on a topic of choice. Course number indicates distribution area in which a seminar counts. May be repeated for credit with change of topic.

GNDR ST 351-0 Gender, Sexuality, and Public Policy Studies of legal systems and public policy. Specific topics may include domestic violence and abortion legislation. Content varies by quarter; may be repeated for credit with different topics.

GNDR ST 352-0 Gender, Sexuality, and Political Theory Studies in political theory relating to gender and sexuality. Content varies by quarter; may be repeated for credit with different topics.

GNDR ST 353-0 Gender and Citizenship Examinations of conventional conceptions of political participation and counter-public spheres informed by feminist activism and feminist and gender theory.

GNDR ST 361-0 Gender, Sexuality, and Literature Studies of literary texts in the context of gender theory, feminism, or sexuality studies. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 362-0 Gender, Sexuality, and Drama Studies in gender and/or sexuality in the context of theater and drama in or across historical periods. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 363-0 Postcolonial Studies and Gender and Sexuality Postcolonial approaches to literature and theory. Topics include orientalism and diaspora theory as they relate to gender and sexuality. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 371-0 Gender, Sexuality, and Popular Culture Cultural studies perspective on selected topics in popular culture as they relate to gender and/or sexuality. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 372-0 Gender, Sexuality, and Performance Selected topics concerning theories of performance in relation to gender and/or sexuality. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 373-0 Gender, Sexuality, and Film Primary emphasis on representations of gender and sexuality in film and film theory. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 374-0 Gender, Sexuality, and Digital Technologies Theories concerning gender and sexuality in digital representations, particularly Internet related. Content varies by quarter. .
GNDR ST 375-0-0 Internship in Gender and Sexuality Studies Field research and practical work experience in activist organizations; biweekly meeting with the instructor and other interns for discussion of internship experiences and common readings. Prerequisite: consent of instructor.
GNDR ST 380-0 Black Feminist Theories Introduction to black feminist studies and its impact in the late 20th century.
GNDR ST 381-0 Queer Theory Survey of queer theories and methodologies. Fulfills the major's theory requirement. Content varies by quarter. Prerequisite: introductory course in gender and sexuality studies or course in literary theory.
GNDR ST 382-0 Race, Gender, and Sexuality Literature and theory concerned primarily with the intersections of race and/or ethnicity and gender and sexuality. Content varies by quarter; may be repeated for credit with different topics.
GNDR ST 390-0 Topics in Gender and Sexuality Studies Topics vary—for example, masculinity; gender, race, and reproduction; gender, law, and public policy; Asian American women's history; women artists and their publics. May be repeated for credit with different topics.
GNDR ST 396-0 Research Methods in Gender and Sexuality Studies Introduction to research methods in the interdisciplinary study of gender and sexuality.
GNDR ST 397-0 Feminist Theory Survey of gender and feminist theory. Content may vary by quarter. Fulfills the major's theory requirement.
GNDR ST 398-0 Senior Research Seminar Students work with an adviser and begin research on a senior thesis project, meeting on a reduced schedule over two quarters. Prerequisite: consent of instructor.
GNDR ST 399-0 Independent Study Individual tutorials or research projects. Prerequisite: consent of instructor.

GEOGRAPHY

www.geography.northwestern.edu

The Program in Geography offers three types of courses to students who seek a knowledge of the physical earth and its various modes of human occupancy. Introductory courses develop global perspectives on environments that are relevant to many social and physical science fields. Courses in regional geography present a unique way of understanding how nature and culture have interacted over time to give character to specific places or regions. Advanced courses focus on the concepts and techniques of professional geography, especially on the construction of maps and on the uses of maps in solving geographical problems.

Programs of study may lead to an adjunct major or a minor in geography. In addition to the following requirements, students majoring in geography also must complete a major in a related social or natural science field.

Adjunct Major in Geography

Program courses (6 units)

- 211 or 235; 240; 341 or 343
- 3 additional geography courses, including 1 unit of research (399)
- All adjunct majors require completion of a stand-alone major also. Students majoring in geography also must complete a major in a related social or natural science field. Program courses for the geography adjunct major may not be double-counted toward other majors.

Related courses *(units depend on mathematics sequence taken)*

- ECON 201, 202
- MATH 220, 224 (or equivalent)
- STAT 210 (or equivalent)

Minor in Geography

The minor in geography supplements the academic programs of students who major in related social and natural sciences by training them in the theory and method of geographical analysis.

Prerequisites
- MATH 220, 224 (or equivalent)
- STAT 210 (or equivalent)

Minor requirements (6 units)
- 211 or 235, 240, 341 or 343
- 3 additional courses approved by the geography program adviser

Honors in Geography

Geography majors do not need to formally apply to be considered for honors. All majors are required to take 1 unit of independent study (399). Those with strong academic records and an interest in pursuing honors must take an additional unit of 399 to more fully develop a senior project. This second 399 may count toward the major. Students whose projects and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program director and see Honors in the Major on page 38.

Introductory Courses

GEOG 211-0 World Biogeography Geography of the world's major ecosystems based on the global climate model. Physical processes of soil formation and vegetation development in various ecosystems. Human impacts on natural systems resulting from past and present land-use practices.

GEOG 235-0 Atmosphere and Climate Nature and composition of the atmosphere, principles of atmospheric motion, global circulation model, cyclonic storms; climates and climatic change.

GEOG 240-0 Economic Geography Population, natural resources, land use, commodity production, and trade, with an emphasis on the world scale. Industrial location theory and global economic structures.

Regional Geography Courses

GEOG 312-0 Geography of Chicago and Its Region Chicago as an example and model of city form. Physical environments of the Chicago region and their influence on settlement. Evolution of the geography of Chicago and its suburbs from the 19th century to the present, with an emphasis on recent trends. Prerequisite: junior standing.

GEOG 313-0 North America Detailed study of the regional geography of the United States and Canada. The regional distribution of landform types. Patterns of culture, history, and economic development that underlie the distribution of distinctive lifeways in the two countries.

Advanced Courses

GEOG 328-0 The Human Use of the Earth Geography of the earth's natural environments as modified by human agency. Natural versus anthropogenic environmental change. Processes of habitat alteration in hunter-gatherer societies. Impacts of modern agriculture and forestry.

GEOG 341-0 Principles of Cartography Design, construction, and use of thematic maps for effective presentation of spatial data. Typography and symbolization. Coordinate systems and map projections. Prerequisites: MATH 220 and 224.

GEOG 343-0 Geographic Information Systems Methods and techniques of digital cartography; encoding and analysis of spatial information; applications to archaeology, environmental sciences, and business geographics. Prerequisite: 341.

GEOG 399-0 Independent Study Independent research projects. Open to qualified advanced students with consent of department.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

GERMAN

www.german.northwestern.edu

With comprehensive courses in German and English, the German department affords students the opportunity to learn the German language; to understand the significance of German literature, thought, and culture in their European and global contexts; to study abroad at a variety of places and levels; and to pursue serious research in modern European thought and culture. Curricular offerings include

- A rigorous introduction to the German language, which can be used to fulfill the college language requirement. Multimedia materials, cultural experiences, and literary readings cultivate awareness of the differences in written and spoken German in various countries and highlight the impact of the Germanic languages in European and global contexts.
- A broad exposure to language, literature, culture, and history, with emphasis on the modern period from the 18th-century Enlightenment to the present. Majors and minors can pursue their interests in areas of concentration, including business studies, German-Jewish studies, history and culture, literature and media, or critical theory.
- Courses taught in English, giving those not proficient in German a basis for understanding the literary, philosophical, and cultural life of German-speaking countries.
- Opportunities for students to enhance their command of German and their cultural awareness of its literature and culture through study abroad in Berlin, Freiburg, Munich, Vienna, or Zurich.

Students in the department are regularly accepted into internship programs and graduate programs in a variety of disciplines, as well as prestigious postgraduate programs of the Fulbright Commission, the German Academic Exchange Service, and the Austrian-American Educational Commission.

Major in German

Courses for German majors are designed to provide near-native fluency in the language as well as knowledge of the basic canon of modern (post-1750) German literature and of modern German/central European history and culture. In addition, courses in a concentration, chosen with the adviser, allow students to focus on a particular interest.

Prerequisite

- 102-1,2,3 or equivalent proficiency

Department courses (12 units)

- 8 core courses, from list posted on the department website
  - 4 German-language courses in advanced language and media
    - 2 at the 200-level
    - 2 at the 300-level
  - 4 German-language courses in literature, culture, history, and politics
    - 2 at the 200-level
    - 2 at the 300-level
- 4 courses in an individual concentration; must be approved by the adviser
  - At most 2 taught in English
  - At most 3 in a complementary language, such as Yiddish, Turkish, or Czech
  - May be offered by other departments or programs.
- Majors returning from a study abroad program must enroll in at least 1 300-level German-language course in the department.

Related courses (2 units)

- Chosen from history, philosophy, religion, or other relevant areas.
- Must be approved by the adviser and complement the concentration.

Minors in German

The Department of German offers minors in German, German studies, and business German. Each minor consists of 8 courses. The minors are designed to help students develop a coherent set of courses in accordance with their own interests in German language, literature, thought, culture, politics, and business practices.

Minor requirements: German (8 units)

- Prerequisite: 102-1,2,3 or equivalent proficiency (does not count toward the 8 courses)
- 3 German-language courses in advanced language and introductory culture, from list posted on the department website
  - 2 at the 200-level
  - 1 at the 300-level
- 3 German-language courses in literature and media, from list posted on the department website
  - 2 at the 200-level
  - 1 at the 300-level
- 2 courses making up an individual concentration developed with the undergraduate adviser; may be taught in English
- Minors returning from a study abroad program must enroll in at least 1 300-level German-language course in the department.

Minor requirements: German studies (8 units)

- Prerequisite: 102-1,2,3 or equivalent proficiency (does not count toward the 8 courses)
- 2 German-language courses in advanced language and introductory culture, from list posted on the department website
- 6 courses making up an individual concentration developed with the undergraduate adviser
  - Relevant courses are offered in such diverse areas as gender studies, philosophy, sociology, and economics.
  - At most 3 courses may be in a complementary language, such as Yiddish, Turkish, or Czech.
- Minors returning from a study abroad program must enroll in at least 1 300-level course in the department.

Minor requirements: business German (8 units)

- Prerequisite: 102-1,2,3 or equivalent proficiency (does not count toward the 8 courses)
- 3 German-language courses in advanced language and introductory culture, from list posted on the department website
  - 2 at the 200-level
  - 1 at the 300-level
- 3 courses in business German: 209, 309-1,2
- 2 courses making up an individual concentration developed with the undergraduate adviser; may be taught in English
- Minors returning from a study abroad program must enroll in at least 1 300-level German-language course in the department.

Business German Examinations

Students completing a major with a concentration in business German or a minor in business German may take one or both of the internationally recognized business German examinations offered through Northwestern. Business German credentials are important in today's job market for two reasons: German is a leading language in the European market, and German corporations have more than 2,500 subsidiaries and affiliates in the United States that employ nearly 600,000 Americans.

Students successfully completing 1 quarter of 209 may take the Zertifikat Deutsch für den Beruf, an examination developed jointly by the Goethe-Institut and the Deutscher Volkshochschulverband. Students successfully completing German 309-1,2 may take the Prüfung Wirtschaftsdeutsch International, an examination developed by the Goethe-Institut, the Association of German

Chambers of Industry and Commerce, and the Carl Duisberg Centers.

For additional information on these examinations, see the German department website.

Honors in German

Majors with strong academic records and an interest in pursuing honors should contact the honors director in spring of junior year. They may qualify for departmental honors by completing 2 quarters of 398 or 399; 2 quarters of 400-level courses; or 1 quarter of 398 or 399 and 1 quarter of a 400-level course. These courses may count toward the major. Students must present a research paper at the end of their second quarter of honors study.

Students whose research paper and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies. Also see the German department website and Honors in the Major on page 38.

The Teaching of German

Weinberg College students pursuing a major in German who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Study Abroad

The Department of German works carefully with students to integrate a period of study in Germany, Austria, or Switzerland into their overall academic plans. By interacting with native German speakers and travelers, students typically return with a much firmer grasp of both written and spoken German as well as a more balanced international perspective. Students who have special interests and needs are welcome to investigate other programs and discuss them with the departmental study abroad adviser.

Courses Taught in German

GERMAN 101-1,2,3 Beginning German This sequence emphasizing the four modalities—speaking, listening comprehension, reading, and writing—offers students a systematic introduction to German language and culture. No prerequisite in German.

GERMAN 102-1,2,3 Intermediate German This sequence offers students a systematic review of German language and culture. The class fosters learning in the four modalities: speaking, listening comprehension, reading, and writing. Prerequisite: 101-3 or equivalent.

GERMAN 115-0 Intensive Beginning German through Musical Journeys in Vienna Interdisciplinary course offering musically interested students the opportunity to acquire German language skills through an immersion in the musical and cultural history of Vienna.

GERMAN 201-0 Focus Reading: Perspectives on German Life and Culture Course for students who would like to explore German texts in more depth. Examines contemporary German culture. Prerequisite: 102-2. Does not count for the language requirement.

GERMAN 203-1 Focus Speaking: Current German-American Images Practical training in listening comprehension and speaking. Focuses on descriptions and comparisons. Prerequisite: 102-2. Does not count for the language requirement.

GERMAN 203-2 Focus Speaking: Documenting Past, Present, and Future Practical training in listening comprehension and speaking. Focuses on retelling past events and on present and future events. Prerequisite: 102-2. Does not count for the language requirement.

GERMAN 205-1 Focus Writing: Berlin—Faces of the Metropolis Development of written proficiency in German through analysis and production of portraits, descriptions of places, narratives, and newspaper reports. Prerequisite: 102-3.

GERMAN 205-2 Focus Writing: Identities in Flux; German, European, and Transatlantic Perspectives Development of written proficiency in German through work with reviews of films and cultural events, reports, argumentative essays, advertisements, and interpretations of literary works. Prerequisite: 102-3.

GERMAN 207-0 Current Events in German Media Exploration of current events in a variety of German media (newspapers, TV, Internet, etc.). Topics include politics, music, film, sports, and literature. Prerequisite: 102-3.

GERMAN 209-0 German in the Business World German language study oriented toward business-related communication situations, such as social interactions with customers, business travel, and basic business letters. Prepares students for the Zertifikat Deutsch für den Beruf exam. Prerequisite: 1 200-level course in German.

GERMAN 211-0 German Culture through Film Introduction to 20th-century German cinema. Discussion of German identity, culture, history, and politics. Course emphasizes cultural knowledge and German language skills. Prerequisite: 1 200-level course in German.

GERMAN 221-1 Introduction to Literature, 1800–1900 Introduces students to representative texts and writers of 19th-century German literature and familiarizes them with literary analysis and genres. Prerequisite: 1 200-level course in German.

GERMAN 221-2 Introduction to Literature, 1900–45 Introduces students to representative German texts and German writers of the first half of the 20th century, when the First World War, the Weimar Republic, and the Third Reich marked the demise of the German Empire. Prerequisite: 1 200-level course in German.

GERMAN 221-3 Introduction to Literature, 1945–Today Introduces students to representative short stories by major German-speaking authors writing since 1945. The stories selected represent a dynamic period in German literature and highlight important social, political, and intellectual issues. Prerequisite: 102-3.

GERMAN 223-0 Contemporary Austrian Literature Overview and introduction to contemporary Austria—the land, its people, and cultural institutions—through newer writers such as Hackl, Handke, Haslinger, Helfer, Jelinek, Nöstlinger, Reichart, Schlag, and Turrini. Prerequisite: 1 200-level course in German.

GERMAN 245-0 Special Topics in German Literature and Culture Studies of a major author, a prominent theme in German literature or culture, a movement, or a genre. May be repeated for credit with different topic. Prerequisite: 1 200-level course in German.

GERMAN 303-0 Speaking as Discovery: Exploring Standpoints, Developing Arguments, Expressing Points of View A course to improve German listening comprehension and speaking skills to the advanced level. Uses current cultural texts, films, and television broadcasts. Prerequisite: high-intermediate skills in listening, reading, and speaking German.

GERMAN 305-0 Writing as Discovery: Communicating Correctly, Clearly, and Persuasively Practice of advanced and sophisticated structures of written German through a series of linguistic exercises, including a biographical piece of writing. Prerequisite: high-intermediate skills in listening, reading, and speaking German.

GERMAN 307-0 Current Events and Issues in German-Language Media Current political, socioeconomic, and cultural events in Germany and Europe. Topics from German-language media, including newspapers, magazines, Internet sources, and news broadcasts. Discussion of journalistic differences among media sources. Prerequisite: high-intermediate skills in listening, reading, writing, and speaking.

GERMAN 309-1 Advanced Business German: Understanding the German Economy Students acquire a solid understanding of Germany's economy, its current problems, German business practices, and differences from the US system. Begins preparation for the internationally recognized exam Prüfung Wirtschaftsdeutsch International. Prerequisite: high-intermediate skills in reading, writing, and speaking.

GERMAN 309-2 Advanced Business German: German for Marketing and Management Students gain skills to function in a multitude of German business contexts, such as management and marketing. They also increase their cross-cultural knowledge and intercultural competency. Course prepares students for the internationally recognized exam Prüfung Wirtschaftsdeutsch International. Prerequisite: high-intermediate skills in reading, writing, and speaking.

GERMAN 321-1 Reason, Revolution, and Despair: Lessing to Büchner Discussion of key texts in German intellectual history from the Enlightenment to the prerevolutionary period in the 1830s. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 321-2 Myth and Disenchantment: Nietzsche to Brecht Discussion of key texts to acquaint students with the literature and thought, events and ideologies that helped shape German cultural, political, and social life during a period that saw the rise and final collapse of the imperial tradition, a short-lived experiment with democracy (the Weimar Republic, 1918–33), and the rise of the Nazi state. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 321-3 Recoveries and Transitions: Böll to the Present Examination of the relationship of literature and film to the sociopolitical sphere since 1945. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 323-0 Rhyme and Reason: German Poetry since 1700 Introduction to German poetry from the early 18th century to the present. Concentrates on the main formal categories of poetry (meter, rhyme, verse, and poetic genres) as well as the main topics and themes of German poetry. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 327-0 Expressionism: Modernity, Madness, Eros, and Revolution Focuses on German Expressionism in its most extreme literary and artistic reactions to the impact of modernity, war, and revolution and on the individual and collective experience in Berlin from 1910 to 1920. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 329-0 Brecht: Theater, Film, and Media in the 1920s Introduction to Bertolt Brecht's theater in the 1920s and early 1930s during the Weimar Republic. Historical critical review of the still-evolving media of film and radio. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 331-0 Memory and Representation in Postwar Literature Examination of the role of German literature and art in the creation of historical consciousness in the postwar period. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 333-0 Postwar to Post-Wall GDR Literature Study of the literature and culture of the German Democratic Republic within social, political, and historical contexts. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 335-0 Minority Voices in Germany Study of minority literatures in Germany (including Turkish, Italian, Afro German, and Jewish) within social, political, and historical contexts. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 337-0 Science and Culture in Germany, 1780–1880 Exploration of key texts popularizing major scientific innovations—such as rational mechanics, analytical chemistry,

thermodynamics, and evolutionary biology—in their cultural context. Prerequisite: high-intermediate skills in speaking and advanced skills in reading and writing.

GERMAN 345-0 Topics in German Literature and Culture In-depth study of topics in German literature and/or pivotal periods in German culture. May be repeated for credit with different topics. Prerequisite: advanced skills in speaking, reading, and writing.

GERMAN 398-0 Undergraduate Seminar (1–3 units) Advanced work through supervised reading, research, and discussion. Prerequisite: advanced skills in speaking, reading, and writing.

GERMAN 399-0 Independent Study Open to outstanding German majors with senior standing. Prerequisite: advanced skills in speaking, reading, and writing.

Yiddish language courses have moved to Jewish studies.

Courses with Readings and Discussion in English

No prerequisites in German.

GERMAN 222-0 German History 1789–1989 Survey of German political, economic, social, intellectual, and diplomatic history from the consolidation of the nation in the aftermath of the French Revolution to reunification at the end of the Cold War.

GERMAN 224-0 Contemporary Germany The German political, social, and cultural scene after 1945. May be repeated for credit with different readings.

GERMAN 226-0 New Voices in German Literature An introduction to contemporary German literature in English translation. Topics vary and may include the contemporary historical novel, short story, novel, or memoir.

GERMAN 228-0 German Film In-depth study of German films and cultural background. Topics may vary—for example, the pioneer film or "new" German cinema. May be repeated for credit with different topic.

GERMAN 230-0 Berlin and the Culture of Democracy History and culture of the city from 1900 to the present, including the Weimar period, Nazi regime, the divisions of the Cold War, and the newly unified capital.

GERMAN 232-0 The Theme of Faust through the Ages Faust theme in literature and music through shifting intellectual and social climates from the 16th century to the present.

GERMAN 234-1 Jews and Germans: An Intercultural History I Exploration of Jewish encounters with German culture. German Jewry from the 18th century to the end of the 19th century, when Jews were granted legal standing as German citizens.

GERMAN 234-2 Jews and Germans: An Intercultural History II Jewish culture–German culture exploration. German-speaking Jewry from the late 19th century to 1933.

GERMAN 236-0 Kafka and Nietzsche Exploration of two key figures in German modernity. Analysis of the relation between philosophy and literature; inquiry into the idea of the "ascetic ideal."

GERMAN 238-0 Turn-of-the-Century Vienna: In Search of New Values Literature and thought of fin de siècle Vienna and their impact on modern consciousness. Fiction, poetry, essays, and plays by Freud, Schnitzler, Wittgenstein, Hofmannsthal, Musil, Karl Kraus, and Schoenberg.

GERMAN 242-0 Imagining Modern Jewish Culture in German and Yiddish History and character of Yiddish and the development of modern German culture in general and German-Jewish culture in particular. Appreciation of the variety of "Judaisms" imagined and reimagined during modern European history. Taught with JWSH ST 242; students may not receive credit for both courses.

GERMAN 246-0 Special Topics in German Literature and Culture Topics vary—for example, the fairy tale, Germanic mythology. May be repeated for credit with different topic.

GERMAN 266-0 Introduction to Yiddish Culture: Images of the Shtetl Analysis and discussion of the literary, visual, and filmic images of the communal life developed by Eastern European Jews and inseparably associated with them. Taught with JWSH ST 266 and YIDDISH 266; students may receive credit for only 1 of these courses.

GERMAN 272-0 Luther's Reformation and Transformation of the West Examination of Luther's work in the context of his life and times. Introduces basic dimensions of Western thought, showing how theology relates to broader cultural, political, social, and aesthetic issues. Taught with RELIGION 272; students may not receive credit for both courses.

GERMAN 322-0 German Contributions to World Literature Topics vary—for example, Rilke's poetry; Nietzsche's influence on literature; Thomas Mann; Hesse, the German novel, and the mystic tradition; German intellectual history. May be repeated for credit with different topic.

GERMAN 324-0 Modern German Drama From the perspective of the stage as a "moral institution," plays by authors ranging from Heinrich von Kleist to Peter Weiss.

GERMAN 326-0 German Cultural Studies Exploration of key concepts, major figures, and cultural and literary themes in German studies and interdisciplinary fields such as music, art, political science, media studies, and popular culture.

GERMAN 330-0 Introduction to Yiddish Literature and Culture Traces the history of Yiddish literature and culture from the 17th century to the late 20th century, focusing on three Yiddish "classic" writers: S. Y. Abramovish *(Mendele the Bookseller)*, Y. L. Peretz, and Sholem Aleichem. The course provides insight into Jewish life in Eastern Europe.

GERMAN 334-0 Writers and their Critics Study of the texts of leading writers in German through a discussion of the criticism these texts have evoked. Emphasis on 20th- and 21st-century criticism.

GERMAN 346-0 Topics in German Literature and Culture In-depth study of topics in German literature and/or

pivotal periods in German culture. May be repeated for credit with different topics.

GERMAN 348-0 Stylistics: Workshop in Literary Translation Exploration of stylistic issues in the German-to-English translation of literary works in a variety of genres. Different approaches to style and to literary texts examined through analysis of register, metaphor, repetition, iconicity, and ambiguity.

GERMAN 366-0 The Rise and Fall of Modern Yiddish Culture Analysis of major representatives of Yiddish literature, with particular attention to how their work relates to other modernist traditions. Taught with JWSH ST 366 and YIDDISH 366; students may receive credit for only 1 of these courses.

GLOBAL HEALTH STUDIES

www.wcas.northwestern.edu/globalhealth

Global health problems are of concern to policy makers, public health professionals, and those who work for international agencies. Solving these problems requires not only financial resources but, more important, a deep understanding of the interaction of domestic and global forces and the cultural and political realities that affect the design and implementation of solutions in specific settings. The interdisciplinary Global Health Studies Program is designed to provide skills for dealing with complex international health issues. Students learn about domestic and international approaches to international crisis management as well as about perspectives on specific health issues within the diverse US population.

Minor in Global Health Studies

The minor in global health studies is designed for students from a variety of backgrounds, including those interested in medicine and the health sciences. It combines coursework and international experiences, drawing on many different disciplines.

Elective courses may be drawn from anthropology, biological sciences, economics, history, international studies, political science, sociology, and social policy. Requirements may also be met by taking eligible courses in Northwestern's study abroad programs in public health. A complete list of eligible courses is available from program advisers and the program website.

Minor requirements (7 units)

- 301
- 2 core courses chosen from 302, 303, 304, 305, 308, 390
- 4 approved elective courses
- Global health studies minors must gain substantial public health experience abroad in one of Northwestern's public health programs in China, Cuba, Chile, France, Mexico, or South Africa or in another supervised international health experience preapproved by the program director.

Courses

GBL HLTH 301-0 Introduction to International Public Health Social, economic, ethical, and cultural influences on variation in human health and well-being in populations worldwide; the continuum between health and sickness and the related impact of distal, chronic, and acute forces.

GBL HLTH 302-0 Global Bioethics Ethical challenges to the safety, freedom, and dignity of human and animal life resulting from advances in biotechnologies and health research on a global scale. Readings drawn from various disciplines, perspectives, and regions.

GBL HLTH 303-0 Gender and Global Health How cultural constructions of gender, sex, and sexuality shape a woman's risk and experience of breast cancer, mental illness, intimate partner violence, substance abuse, HIV/AIDS, and other diseases as well as access to health resources.

GBL HLTH 308-0 Global Health in Human History Exploration of paleopathology, including records of pre- and protohistoric adaptations to human disease, health, and medicine. The biocultural perspective on patterns of disease links past perspectives and current realities. Prerequisite: 200-level anthropology, global health, or biology course or consent of instructor. Taught with ANTHRO 308; students may not receive credit for both courses.

GBL HLTH 310-1,2 Supervised Global Health Research Minors are encouraged to do supervised public health research on campus. Supervised research does not fulfill elective or core course requirements, however.

GBL HLTH 311-SA Health Care Systems in Europe and the United States Provides students with an understanding of the various ways in which health care systems are organized in European countries, the problems they face, and the reforms implemented or proposed at the national and EU levels. Restricted to students in Northwestern's Paris program.

GBL HLTH 312-SA Public Health in Europe: Issues and Policies Examines issues and debates on health policy in France and the EU, including primary health issues, health insurance, health inequalities, HIV/AIDS, SARS, elderly care, and genetically modified organisms. Lectures are supplemented by visits to relevant sites. Restricted to students in Northwestern's Paris program.

GBL HLTH 313-SA International Organizations and Health: A Research Seminar Students design team research projects, learn about research methodology, discuss their research progress, and present findings. Restricted to students in Northwestern's Paris program.

GBL HLTH 314-SA Health and Community Development in South Africa Health-related issues confronting South Africa, their social and economic impact, efforts to address them.Apartheid and posttransition policies. Demographics, prevention, and treatment of both infectious and chronic noncommunicable diseases. Restricted to students in Northwestern's South Africa program.

GBL HLTH 315-SA Public Health in South Africa Context of and responses to public health issues in South Africa, including HIV/AIDS, tuberculosis, malnutrition and poverty, psychosocial rehabilitation, and environmental and occupational health. Lectures are supplemented by visits to relevant sites. Restricted to students in Northwestern's South Africa program.

GBL HLTH 316-SA Development Perspectives on Health in South Africa through Community Engagement Reflection on service-learning experiences at community organizations in relation to theories of international development and global health. Focus on how health-related issues, including HIV/AIDS, malnutrition, poverty, the environment, occupational health, and gender, impact development. Restricted to students in Northwestern's South Africa program.

GBL HLTH 390-0 Special Topics in Global Health Advanced work in areas of developing interest and special significance. Can be repeated for credit with a different topic. Recent course titles have included Managing Global Health Challenges, Disability and Global Health, and International Perspectives on Mental Health.

GREEK

See Classics.

HEBREW

See Jewish Studies.

HINDI

See Asian Languages and Cultures.

HISTORY

www.history.northwestern.edu

The Department of History is a place where students can study virtually any region of the world, during almost any historical era, from a wide variety of perspectives. The faculty includes nationally distinguished scholars in United States, European, Latin American, African, and Asian history. Faculty resources enable the department to offer major fields of study in the history of the Americas, English/European history, African/Middle Eastern history, and Asian/Middle Eastern history. The department is particularly strong in social, cultural, and intellectual history.

Most history courses are open to any undergraduate. Few have specific prerequisites, although freshmen are generally advised to try 100- and 200-level courses before attempting 300-level courses. History majors have priority in registering for classes, but the majority of students enrolled in most history courses are majoring in other departments and schools. The history faculty welcomes this diversity of students.

Since all courses listed below cannot be given in any one year and the quarters in which they are offered are subject to change, see the online quarterly class schedule from the Office of the Registrar for actual offerings.

Major in History

The history major enables students to broaden their intellectual horizons as they study the experiences of people outside their time and place. Courses are designed to develop the ability to read insightfully, think critically, and write with precision and polish. Students enroll in a range of historical courses as well as develop an area of concentration. Majors are each assigned a faculty adviser with whom they are encouraged to consult frequently.

Students majoring in history select one of four concentrations and may arrange to emphasize special fields within its context:

- History of the Americas
- English/European history
- African/Middle Eastern history
- Asian/Middle Eastern history

The program for majors consists of 12 graded courses in history and 4 graded courses in related subjects, none of which may be substituted by advanced placement credits. These courses, chosen by the student in consultation with the adviser, are distributed as follows.

Department courses (12 units)

- 2 undergraduate seminars
  - 393, taken as soon as possible after declaring the history major
  - 395 (should be taken in junior or senior year and need not be within the student's concentration)
- 10 additional 200- or 300-level courses
- 6 courses must be in one of the four areas of concentration listed above; 1 of these may be 101, 102, or 103.
- 4 courses must be outside the area of concentration and distributed to provide both geographical and chronological variety.
- At least 2 of the 12 courses must be in fields other than modern European or US history (e.g., courses in European history before 1800 or in African, Asian, Middle Eastern, or Latin American history in any period).

Related courses (4 units)

- At least 2 must be at the 300 level.
- The other 2 may be 200- or 300-level courses.
- Courses must be chosen from at least two programs or departments in the social sciences and humanities.
- Courses should bear some coherent relationship to the student's major program.
- Students are encouraged to discuss their related courses with their advisers.

Minor in History

The minor in history encourages students majoring in other fields to study history and to organize their historical studies in a coherent way. The structure of the minor requires students to gain both depth and breadth in history. Students must select a concentration, which enables them to acquire significant knowledge of one area of the world, and take courses outside the concentration, which encourages an understanding of diverse cultural contexts.

Minor requirements (7 units)

- At least 3 must be at the 300 level.
- Only 1 may be an introductory colloquium (101-6, 102-6, 103-6).
- 4 must be in one of the following areas of concentration, and at least 2 of these must be at the 300 level:
  - Europe, including Britain
  - United States
  - Latin America
  - Asia
  - Middle Eastern
  - Africa
- 3 must be outside the area of concentration.

Honors in History

Junior majors with strong academic records and an interest in pursuing honors attend informational sessions during winter quarter. They submit a thesis proposal and a letter of recommendation from a Northwestern history professor by an early spring deadline. Those chosen enroll as seniors in a 3-quarter thesis seminar (398-1,2,3) and submit a completed thesis in May. All 3 quarters of 398 may count toward the major; see the department for details.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of History

Weinberg College students pursuing a major in history who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Introductory Colloquia

The following 3 courses are colloquia, each limited to 15 undergraduates, which introduce students to modes of historical analysis through the study of various topics in history. Specific subjects will be listed in the *Class Schedule*. Open to freshmen only.

HISTORY 101-6 Freshman Seminar: European History

HISTORY 102-6 Freshman Seminar: American History

HISTORY 103-6 Freshman Seminar: Non-Western History

Introductory Lecture Courses

HISTORY 200-0 New Introductory Courses in History Introductory lecture courses on topics not covered in regular offerings. Content varies. May be repeated for credit with different topic.

HISTORY 250-1,2 Global History 1. The early modern to modern transition. **2.** The modern world. Completing 250-1 is not a prerequisite for 250-2.

HISTORY 300-0 New Lectures in History Lecture courses on special topics not covered in regular offerings. Content varies. May be repeated for credit with different topic.

HISTORY 301-SA-1,2 New Lectures in History 1. Topics in the history of the eastern Mediterranean world. **2.** Topics in the history of the Czech Republic. Restricted to students in Northwestern's study abroad programs.

African History Courses

HISTORY 255-1,2,3 Background to African Civilization and Culture Historical approach to society, economy, polity, and culture in Africa. **1.** Agricultural origins to the 17th century. **2.** 16th through 19th centuries. **3.** 1875 to 1994.

HISTORY 356-1,2 History of South Africa 1. From the African iron age to the establishment of the multinational gold mining industry, emphasizing the rise of African states and the contest for land with white settlers. **2.** Emphasis on the 20th century, the rise of African nationalism, and the clash with the apartheid state.

HISTORY 357-0 East Africa Selected topics in East African history.

HISTORY 358-0 West Africa Selected topics in West African history: economy, society, and government.

Asian History Courses

HISTORY 281-0 Chinese Civilization Chinese history to the 16th century, emphasizing cultural and intellectual history.

HISTORY 284-1,2 Japanese History 1. Ancient and medieval Japan (200–1600), from the first evidence of civilization on the archipelago through the Warring States Period. **2.** Social, cultural, and political developments in the Tokugawa Period (1600–1868).

HISTORY 286-0 World War II in Asia Analysis of the vast intended and unintended effects of World War II on Asia. Nationalism, global history, decolonization, fascism, Communism, democracy, and the experiences of ordinary people.

HISTORY 381-1,2 History of Modern China 1. Late Imperial China, 1600–1911. **2.** 1911–present.

HISTORY 382-0 The Modern Japanese City Social and cultural history of urban Japan.

HISTORY 383-0 Japan's Modern Revolution History of Japan from 1830 to 1912, focusing on the overthrow of the Tokugawa shogunate and emergence as a modern imperialist power.

HISTORY 384-1,2 History of Modern Japan 1. Japan: the modern state, 1860–1943. **2.** War and postwar Japan, 1943–present.

HISTORY 385-1,2 History of Modern South Asia 1. The early modern period, ca. 1500–1800: The Mughal Empire; the early phase of European trade and conquest in the subcontinent. **2.** ca. 1750–present: The age of British colonial dominance; the politics of nation building and anticolonial resistance; independence, partition, and the postcolonial predicament.

England and the British Isles History Courses

HISTORY 360-0 Tudor and Stuart Britain Formation of the British state during the Tudor and Stuart dynasties, 1485–1714, with emphasis on changing patterns of religious belief and the transformation of the monarchy.

HISTORY 361-0 Sex and Scandal in Early Modern England Sexual behavior in England between 1500 and 1800, concentrating on scandalous narratives and public controversy.

HISTORY 362-1,2,3 Modern British History 1. Social, political, and institutional history, 1688–1815. **2.** The Victorians: liberalism, empire, and morality, 1780–1900. **3.** Empire to Cool Britannia, 1900–present.

HISTORY 364-0 Gender and Sexuality in Victorian Britain Key debates and issues: prostitution, the city and sexual crime, sexuality and empire, sex and the single woman, homosexuality on trial, and the "scientific" writings of Victorian sexologists.

European History Courses

HISTORY 201-1,2 European Civilization 1. Culture and structure of preindustrial society, high medieval through mid-18th century. **2.** Impact of industrial and political change and development of modern society to the present.

HISTORY 203-1,2,3 Jewish History 1. 750-1492: Political, economic, cultural, and intellectual life of Jewish communities under medieval Islam and Christianity. Judeo-Arabic culture and its critics; Jewish-Christian relations; the place of violence; the rise and influence of Jewish law and mysticism. **2.** 1492–1789: Mercantile era involving economic and cultural reshaping of Jewish community; legalized readmission of Jews to European cities; emancipation process bolstering Jewish integration into European society. **3.** 1789–1948: Plurality of models of Jewish integration, acculturation, and assimilation; formation of multiple identities; split of the traditional community; emerging patterns of sociocultural behavior; spread of political movements.

HISTORY 330-0 Medieval Sexuality Fluidity of sex and gender roles in an age before "sexual orientation"; impact of and resistance to Christian theology's negative assessment of sexuality; the cult of chastity.

HISTORY 331-0 Women in Medieval Society Examination of medieval women's lives in both secular and religious spheres through the different ideologies (religious, philosophical, scientific) that shaped them.

HISTORY 332-1,2 The Development of Medieval Europe 1. Early Middle Ages, 300–1000. **2.** High and Late Middle Ages, 1000–1450.

HISTORY 333-0 The Age of the Renaissance Decline and revival of European civilization, 1350–1530. Cultural, political, economic, and social developments.

HISTORY 334-0 The Age of the Reformation Europe in the 16th century, especially origins, evolution, and effects of changes in religion.

HISTORY 336-0 Spain 1500–1700: Rise and Fall of a European Empire Social, political, and economic history of the largest early-modern European empire, its multicultural genesis, rise to domination in Europe and the Americas, and struggle to integrate internally.

HISTORY 337-0 History of Modern Europe Survey of the political and social history of Europe between 1815 and 1945, with emphasis on the political integration and disintegration of the Continent and the causes and effects of social and economic change.

HISTORY 338-1,2 Europe in the 20th Century Growth of mass politics, fascism, the home fronts, rise of the welfare state, loss of empire, economic resurgence and integration. **1.** 1900–45. **2.** 1945–present.

HISTORY 340-0 Gender, War, and Revolution in the 20th Century Examination of changes in gender ideals and in the lives of women and men in Europe and America as a result of world wars, Russian revolution, fascism, and the Cold War.

HISTORY 341-0 Paris: World City, 1700 to the Present Survey of the social, cultural, political, economic, and spatial development of Paris from aristocratic enclave to a class-divided bourgeois city, from an imperial capital to a postcolonial metropolis.

HISTORY 342-1,2 History of Modern France 1. The Ancien Régime and the French revolution. **2.** 19th century to the present.

HISTORY 343-0 Modern Italy Italy from the Enlightenment to the present, concentrating on the *Risorgimento*, the world wars, Mussolini and fascism, the postwar economic miracle, and terrorism.

HISTORY 344-0 Weimar and Nazi Germany German social, economic, political, and cultural developments between 1918 and 1945.

HISTORY 345-1,2,3 History of Russia 1. Emergence of the Kievan and Muscovite states, 800–1700. **2.** Russia from Peter to the Revolution, 1700–1917. **3.** The Soviet Union and its successor states, 1917–present.

HISTORY 346-0 East Central Europe under Communist Rule and Beyond, 1945 to the Present The history of East-Central Europe from the World War II to the collapse of Soviet rule and beyond.

HISTORY 348-1,2 Jews in East Europe, 1250–1991 1. 1250–1917: East European Jews from the earliest medieval

settlement through modernized communities; interaction with Slavic cultures and societies in the Polish-Lithuanian Commonwealth and the Russian Empire. **2.** 1917–91: Political, social, religious, cultural, literary, and artistic aspects of the Jewish encounter with communism; integration of Soviet Jews into the transformation of the Soviet empire.

HISTORY 349-0 History of the Holocaust Origins and development of the massacre of European Jewry during World War II.

Latin American History Courses

HISTORY 365-0 Becoming Latin American, 1492–1830 Aspects of the development of Latin America's socioeconomic, political, cultural, and religious institutions and practices from the pre-Columbian and Iberian backgrounds through the colonial period.

HISTORY 366-0 Latin America in the Independence Era The 18th-century background to Latin American independence and its 19th-century aftermath. The process of achieving independence, changing social structures and economic patterns, and the problem of forming new nations.

HISTORY 367-0 History of Modern Brazil Historical roots of modern Brazilian society: its rush toward economic modernization; radical social and economic inequalities; racially and culturally hybrid national identities; quest for effective democracy and universal citizenship.

HISTORY 368-1,2 Revolution in 20th-Century Latin America **1.** Mexico and its revolutions. Mexican history, from the modernizing regime of Díaz, through the revolutionary upheaval and the consolidation of a new regime, to contemporary problems. **2.** Comparative study of the origins and aftermaths of major Marxist revolutions in Cuba and South and Central America.

HISTORY 369-0 Development and Inequality in Modern Latin America Examination of various models of economic development that have been implemented in 20th-century Latin America, exploring the cultural, social, political, and economic roots of such policies and their impact on the region's poorest and most marginalized populations.

Middle Eastern History Courses

HISTORY 270-0 Middle Eastern/Islamic Civilization Influence of Islam on the components of Middle Eastern societies (nomads, agrarian and urban populations) from the inception of the faith (7th century B.C.E.) to the modern period.

HISTORY 370-1,2,3 History of the Islamic Middle East **1.** 600–1200: the classical Islamic community; medieval Islamic civilization. **2.** 1200–1789: the great empires—Mamluks, Ottomans, and Safavids; cultural and economic decline. **3.** 1789–present: Jewish and Arab nationalism, oil diplomacy, Islam in the modern context.

HISTORY 372-0 History of Ancient Egypt (3100–c. 1000 B.C.E.) The Old Kingdom: centralized government, divine kingship. The Middle Kingdom: new monarchic principles in the aftermath of social disorder. The New Kingdom: imperialism in response to foreign aggression; religious revolution of Akhenaton.

HISTORY 373-1,2 The Ottomans 1. The Last Empire of Islam, 1300–1622. Emergence and rise to power; relations with other European and Asian powers; principal institutions; governmental and societal frameworks. **2.** From the Second Ottoman Empire to the Age of Nationalism, 1622–1918. Political and societal changes that shaped the modern Middle East and southeast Europe.

United States History Courses

HISTORY 210-1,2 History of the United States Interpretative survey from the 17th century to the present. **1.** Precolonial to the Civil War. **2.** Reconstruction to the present. Lectures, discussion sections.

HISTORY 212-1,2 Introduction to African American History **1.** Key concepts from 1700 to 1861, including African origins, the Atlantic slave trade, origins of slaving and racism in the United States, life under slavery in the North and the South, religion, family, culture, and resistance**. 2.** Key concepts from emancipation to the civil rights era. Focus on construction of class, gender, and community; the rise of Jim Crow; strategies of protest; and migration and urbanization. Taught with AF AM ST 212-1,2; students may not receive credit for both courses.

HISTORY 214-0 Asian American History Introduction to the history of Asians in the United States, with a focus on their impact on American society as well as their experiences within the United States. Taught with ASIAN AM 214; students may not receive credit for both courses.

HISTORY 216-0 Global Asians Survey of Asian diasporas in the United States and elsewhere in the 19th and 20th centuries, emphasizing causes of migration, process of settlement, relations with other ethnic groups, and construction of diasporic identities. Taught with ASIAN AM 216; students may not receive credit for both courses.

HISTORY 218-0 Latino History History of Latina/os in the United States and in the context of US–Latin American relations from the 18th century to the present. Taught with LATINO 218; students may not receive credit for both courses.

HISTORY 303-1,2 American Women's History Women and gender in American life, with attention to differences among women based on class, race, and ethnicity. **1.** To 1865. **2.** Since 1865.

HISTORY 304-0 Asian American Women's History Exploration of race, gender, and the contours of US history from the perspective of Asian American women's experiences. Considers migration, exclusion, labor, marriage, family, sexuality, and cross-racial alliances. Taught with ASIAN AM 304; students may not receive credit for both courses.

HISTORY 305-0 American Immigration Origins, social characteristics, cultural values, and assimilation of immigrants in the 19th and 20th centuries. Consequences of immigration in comparative and historical perspective.

HISTORY 308-0 The American West Examination of the history of the American West as both frontier and region, real and imagined, from the first contacts between natives and colonizers in the 15th century to the multicultural encounters of the 21st century.

HISTORY 310-1,2 Early American History 1. Conquest and colonization. **2.** The age of the American Revolution.

HISTORY 311-0 The New Nation: The United States, 1787–1848 The early years of the new republic from the Constitution to the war with Mexico. Political theory, slavery, social reform, religious revivalism, westward expansion, political parties, the growth of capitalism.

HISTORY 314-0 Civil War and Reconstruction "Middle period" of American history, emphasizing origins of the Civil War, its revolutionary nature, and its immediate and long-term consequences for the South and the nation.

HISTORY 315-1,2,3 The United States since 1900 America's domestic history and role in world affairs since 1900. **1**. Early 20th century. **2.** Mid-20th century. **3.** Late 20th century to the present.

HISTORY 316-0 The Sixties Examination of one of the most tumultuous eras in US history, its roots in the reshaping of American society after World War II, and its legacies for the present. Emphasis on social movements of the period, particularly the civil rights movement, and political and cultural change.

HISTORY 317-1,2 American Cultural History Changing values of the American people, how they have been transmitted, and how they have shaped American society, politics, and the economy. **1.** 19th century. **2.** 20th century to the present.

HISTORY 318-1,2 Legal and Constitutional History of the United States 1. Colonial period–1850. Development of legal institutions, constitutionalism, law and social change, law and economic development. **2.** 1850–present. Law in industrial society: administration, race relations, corporations, environmental protection, civil liberties. Taught with LEGAL ST 318-1,2; students may not receive credit for both 318-1 courses or for both 318-2 courses.

HISTORY 319-0 History of US Foreign Relations Survey of US relations with the rest of the world from the 18th century to the present, with particular attention to the 20th century.

HISTORY 320-0 History of Social Movements in the United States From the abolition movement of the early 19th century to the New Right of the present. Samples radical, reform, and reactionary movements, with their development, organization, and effect on American politics and culture.

HISTORY 321-0 The Vietnam Wars Analysis of Vietnam's wars for national independence, with emphasis on US involvement. Topics include international context, political rationales, military engagements, popular attitudes, cultural exchange, and lasting legacies.

HISTORY 322-1,2 Development of the Modern American City Characteristics of urban society in America from the period of settlement to the present. **1.** To 1870. **2.** 1870–present.

HISTORY 324-0 US Gay and Lesbian History Gender, sexuality, and the rise of modern lesbian and gay identities. Lecture and discussion. Taught with GNDR ST 324; students may not receive credit for both courses.

HISTORY 326-0 US Intellectual History Central questions in America's intellectual past from the 19th century forward.

History of Science and Technology Courses

HISTORY 275-1,2 History of Western Science and Medicine 1. Origins of science and medicine in early modern Europe: science, religion, and cosmology; anatomy and sexual difference; the Enlightenment and social science. **2.** Modern science and medicine in Europe and America: quantum physics and the A-bomb; Darwinism, genetics, and eugenics; DNA typing and "racial science."

HISTORY 325-0 History of American Technology American history through its material culture; industrialization and its discontents; consumer culture and household technology; mass communication and democracy; technological utopia and the computer revolution.

HISTORY 377-0 Medicine in American Society Development of medical theories, practices, and institutions in North America, from colonial times to the present, with emphasis on the 19th century.

HISTORY 378-0 History of Law and Science The changing relations between justice and science—including the forensic sciences of identification and intellectual property—in the United States and Europe over the past 300 years.

Courses Primarily for Majors in History

HISTORY 392-0 Topics in History Advanced work through reading, research, and discussion in an area of special significance. Graduate students permitted in some courses with consent of instructor.

HISTORY 393-0 Approaches to History Introductory seminar for history majors and others interested in understanding how history is thought about and written. Intensive exploration of a significant historical event, period, or topic.

HISTORY 395-0 Research Seminar Students research and complete a term paper on a topic of choice. Required of majors.

HISTORY 398-1,2,3 Thesis Seminar Advanced work through supervised reading, research, and discussion. Admission by written application, to be reviewed by department. Grade of K given in 398-1 and 398-2.

HISTORY 399-0 Independent Study Reading and conferences on special subjects for advanced undergraduates. Open only with consent of director of undergraduate studies and instructor.

History Courses in Other Departments

A history major may take no more than 2 courses listed below to satisfy the 12-course history requirement.
CLASSICS 211, 212, 321-1,2,3
ECON 315, 318, 323-1,2, 324
RELIGION 264, 265

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

HUMANITIES

www.humanities.northwestern.edu

The humanities are a broad and interdisciplinary collection of fields that differ from the physical, biological, and certain of the social sciences by concentrating on the study of human thought and culture. The humanities thus include the study of literature, philosophy, history, art, and music, as well as film, dance, theater, and television. Certain scholars in sociology, psychology, anthropology, and political science also pursue humanities research.

The Alice Kaplan Institute for the Humanities coordinates humanities courses, the Kaplan Humanities Scholars Program, and the humanities minor. Humanities courses are taught by institute professors, former fellows, and other Northwestern faculty members. The Kaplan Institute fosters conversation among humanities scholars at all levels in diverse fields across the University and beyond. It sponsors and cosponsors lectures, performances, seminars, and colloquia on assorted topics of theoretical and empirical interest to faculty and students.

Kaplan Humanities Scholars Program

Freshmen accepted into the competitive Kaplan Humanities Scholars Program pursue a yearlong investigation of "Humanities in the World." Two sets of custom-designed lecture courses and seminars taught by some of the University's best teachers explore long-standing worldwide debates about the role of the humanities. Participants read a wide array of texts, consult a diversity of sources, take field trips, and attend performances. For more information see www.kaplanscholars.northwestern.edu.

Minor in Humanities

The minor in the humanities exposes undergraduate students from a wide range of backgrounds to diverse examples of human thought and culture that make up the ever-changing array of topics and objects studied in the various humanities disciplines. Humanities courses also present the different interdisciplinary methods and theories used in humanities scholarship. The minor is rooted in the idea that the opportunity to study an assortment of humanities topics from a wide range of perspectives provides an excellent complement to the more closely focused coursework undertaken in any major, whether inside or outside the humanities.

Minor requirements (7 units)

- Up to 3 200-level humanities classes
- Balance from 300-level humanities classes, which may include 399 and/or a humanities internship through the Chicago Field Studies program (see page 68)

Courses in the Kaplan Humanities Scholars Program

Specific topics in these courses will vary as different professors participate.

HUM 101-6 Freshman Humanities Seminar
HUM 102-6 Freshman Humanities Seminar
HUM 210-0 Humanities in the World 1
HUM 211-0 Humanities in the World 2

Other Humanities Courses

HUM 201-0 Thinking Through and Across Traditions What is a cultural tradition? How is a tradition created, passed down, transmitted across cultures, and transformed in the process? Course content varies; it may concentrate on works that come from a particular cultural tradition (e.g., Western European, Japanese, Russian, African American) or cut across cultural boundaries.

HUM 205-0 The World of Homer An introduction to the history and material culture of Geometric and Archaic Greece. Society, economy, art, and archaeology of the Greek world and Homeric epic. Taught with CLASSICS 210; students may not receive credit for both courses.

HUM 220-0 Health, Biomedicine, Culture, and Society Broad introduction to controversies surrounding health and biomedicine by analyzing culture, politics, values, and social institutions. Taught with SOCIOL 220; students may not receive credit for both courses.

HUM 260-0 Humanities Explorations Multifaceted exploration of significant topics of wide humanistic interest, such as the nature of the self, encounters with the transcendent, and the nature of the good society, from different points of view and a variety of sources and methodologies—e.g., aspects of love, the feminine divine in cross-cultural perspective, imagining democracy, and the city as metaphor. May be repeated for credit with change of topic.

HUM 265-0 Introductory Topics in the Humanities Interdisciplinary explorations of the ways in which societies address ethical dilemmas that affect value judgments. Examinations of diverse concepts and histories, including, for example, science in its cultural and political worlds. May be repeated for credit with change of topic.

HUM 301-0 Topics in the Humanities Interdisciplinary issues and current research in the humanities—e.g., biology, citizens, and communities in the 19th and 20th centuries; culture, conflict and modernity in the 20th century; narration, exile, and survival; India in the Victorian imagination. May be repeated for credit with change of topic.

HUM 302-0 New Perspectives in the Humanities New issues in the humanities and current innovative research—e.g., poetry and diaspora; race, gender, and the politics of beauty; role and place of negritude in contemporary African thought. May be repeated for credit with change of topic.

HUM 395-0 Humanities Seminar Interdisciplinary course offered by a changing roster of humanities faculty. Topics have included cities as modern utopia/dystopia in Europe, Asia, and America; the afterlife of Marxism; the politics of reputation; being animal, being human.

HUM 397-0 Exhibiting Antiquity: The Culture and Politics of Display Examination of the construction of Mediterranean antiquity through modes of reception since 1750. Analysis of programs of collecting and display and the intersection of institutional and scholarly agendas. Taught with ART HIST 318 and CLASSICS 397; students may receive credit for only 1 of these courses.

HUM 399-0 Independent Study Individual projects with faculty guidance. Open to junior and senior minors. Prerequisite: consent of instructor.

INTEGRATED SCIENCE

www.isp.northwestern.edu

The Integrated Science Program is a highly selective curriculum of natural sciences and mathematics presented predominantly in small classes at an accelerated pace. Courses emphasize the common base and relationships between the traditional sciences, including the importance of mathematics and the development of first principles, leading to interdisciplinary topics at the forefront of science today. The goal is to provide students who are interested in careers in science and mathematics with a broad quantitative background that will give them superior preparation for further work in graduate or professional schools or permanent employment. The curriculum is composed of 24.7 units, up to 3 of which may be independent research, as well as a regular seminar series. Most students take advantage of the opportunity to pursue research in world-class laboratories at Northwestern and are able to publish peer-reviewed papers in professional journals. ISP may lead to a three-year bachelor of arts degree if, by the end of the third year, the student has completed 37.7 or more units and satisfied all other college requirements.

Students must be accepted to Northwestern to be eligible for admission to ISP, which requires a separate application to the program director. For more information on admission procedures, see Special Admission Programs on page 11. Also see the ISP website for the required AP and achievement tests.

The ISP curriculum consists of specially designed courses taught by faculty members of science and mathematics departments. Course descriptions are found in the appropriate departments in this catalog. Though listed in a three-year format, the program is often spread over four years, particularly if a student wishes to combine an ISP major with a second major in a traditional department such as biological sciences, chemistry, computer science, environmental sciences, earth and planetary sciences, materials science, mathematics, physics, psychology, or an engineering field. Specific second-major requirements for ISP students can be found on the program website and under individual departments in this catalog.

Major in Integrated Science

Major requirements (24.7 units)

- *First year*
  - 101-1,2 (.5 unit each)
  - CHEM 171/181, 172/182
  - MATH 281-1,2,3
  - PHYSICS 125-1,2,3
- *Second year*
  - BIOL SCI 240/220, 241/221
  - CHEM 212-1/232-1, 348
  - EARTH 350
  - MATH 381, 382
  - PHYSICS 339-1,2
- *Third year*
  - ASTRON 331
  - BIOL SCI 310, 311
  - PHYSICS 339-3
  - STAT 383
- INTG SCI 398 may be substituted for up to 3 of the following courses: ASTRON 331; BIOL SCI 310 or 311; MATH 382 or STAT 383; PHYSICS 339-3.

Honors in Integrated Science

Students eligible to pursue honors based on their overall performance in ISP courses will be so informed no later than fall quarter of senior year. Those who choose to pursue honors must then enroll with a faculty research adviser in at least 2 quarters of 398 or 399, either in ISP or an ISP-affiliated department. (Some of these credits may count toward the major; see the program director for details.) At the beginning of May eligible students submit a senior thesis describing their research activities for consideration by the ISP committee.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program director and see the program website and Honors in the Major on page 38.

Courses

INTG SCI 101-1,2 Computing Applications (.5 unit each) Introduction to the formulation and solution of scientific problems using advanced computational programming methods.

INTG SCI 398-0 Undergraduate Research Advanced independent study and research for superior students. Consent of ISP director required.

INTERNATIONAL STUDIES

www.intstudy.northwestern.edu

International studies is an undergraduate adjunct major, complementing and taken in conjunction with a disciplinary major. It is open to students in all schools.

The adjunct major provides students with an interdisciplinary understanding of the international system as it has developed and as it affects contemporary politics and society. Students are required to take a core set of courses in history, political science, sociopolitical development, and economics that are designed to introduce key elements and concepts related to the historical development of the global political and economic system. They then choose thematic and regional areas of focus, taking courses from a variety of disciplines such as history, political science, economics, anthropology, literature, art, linguistics, global health, music, and religion. Students complete the major with either an integrating project seminar related to the thematic focus or an honors thesis that includes a 3-quarter honors seminar.

Each student majoring in international studies has a different combination of courses. Because international studies majors must show a minimum of 8 courses not double-counted in any other major(s), students should see an international studies adviser when designing their programs.

Adjunct Major in International Studies

Adjunct major requirements (12 units)

- 5 core courses
  - 201-1,2
  - HISTORY 319-3 or POLI SCI 344
  - ECON 201
  - POLI SCI 240
- 3 courses in a thematic cluster
  - Chosen from one of these themes:
    - Issues in international security
    - Global commons
    - Culture and society
    - International political economy and development
  - From at least two different disciplines
  - Students with coherent interdisciplinary programs of study that do not fit into one of these four themes may petition to create a self-designed thematic cluster.
  - Lists of eligible courses may be found each quarter at the program office and on the website.
- 3 courses in a regional (area studies) cluster
  - 1 course must be historical.
  - 1 course must be in literature or the arts.
  - 1 course must be in belief and social systems.
  - The program website and advisers have lists of appropriate courses, and advisers will discuss substitutions if courses are not available for a particular region.
  - An exception to the three-content-area requirement is made for students who choose to use study abroad to fulfill the regional cluster. These students may either count 3 courses taken abroad for the regional cluster or ask for a regional cluster exception and take 3 additional international studies–related courses at Northwestern. Study abroad does not lessen the 12-course total requirement, however.
  - Language instruction does not count toward the regional cluster.
- Integrating project seminar or thesis seminar
  - Most international studies majors in their junior or senior year take an integrating seminar linked to their thematic cluster. The seminar provides a format to complete a research project that integrates a variety of disciplines to address an issue in international culture, society, economics, or politics.
  - Instead of an integrating seminar, students admitted to the international studies honors program participate in the 3-quarter thesis seminar and write an integrated honors thesis.
- Students must demonstrate proficiency in a language other than English at a level equivalent to two full years of instruction.
- All adjunct majors require completion of a stand-alone major as well. At most 4 courses may be double-counted toward both the international studies adjunct major and another major.

Minor in International Studies

Minor requirements (8 units)

- 5 core courses, as defined for the major
- 3 additional courses in either a regional or a thematic cluster

Honors in International Studies

Majors with strong academic records and an interest in pursuing honors should apply by early February of junior year or, if they plan on spending junior year abroad, in sophomore year. Participants are required to have enough comprehension of a foreign language to draw on its research resources. Students accepted into the honors program enroll in a 3-quarter seminar (398-1,2,3) in spring of junior year and fall and winter of senior year, during which they plan, research, and write their theses. The three seminar enrollments take the place of the integrating project seminar required of other international studies majors.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information see the department website, contact the director of honors, and see Honors in the Major on page 38.

Courses

INTL ST 201-1,2 Global History Introduction to political and social forms organizing human societies over the centuries. **1**. How to analyze variations in geopolitics, demographic cycles, long-distance commerce, and world imperial religions over time. **2.** Examination of how Western expansion through colonization gradually brought all societies into the orbit of a single world economy. The processes of global integration, disintegration, and present-day globalization.

INTL ST 390-0 Special Topics in International Studies Additional courses focus on international topics to augment offerings of departments. Different topics in different quarters, as announced.

INTL ST 395-0 Integrating Project Seminar Small research seminars allow international studies majors to conduct research in their chosen themes.

INTL ST 398-1,2,3 Thesis Seminar Students on campus must enroll in 398-1 in spring quarter of junior year; juniors studying abroad apply to the honors program in January of sophomore year. 398-2,3 are required for completion of the honors program.

INTL ST 399-0 Independent Research Advanced research is carried out under the supervision of a Northwestern professor. Independent study may be counted toward completion of either a regional or a thematic cluster. Consent of the director of the undergraduate's major is required following submission of a written proposal.

ITALIAN

See French and Italian.

JAPANESE

See Asian Languages and Cultures.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

JEWISH STUDIES

www.jewish-studies.northwestern.edu

The Jewish Studies Program focuses not only on Judaism in its narrow sense as a religious phenomenon but also in its broader sense as a culture and civilization. A good case can be made that the roots of Western culture lie in two places: Athens and Jerusalem. The traditional education of the humanist scholar recognized this by requiring not only the mastery of Greek and Latin but also of Hebrew. Thus, the study of Judaism in this program considers the many and varied dimensions of the phenomenon of Jewish civilization. A typical program of study includes, in addition to the religious dimension, the historical, sociological, linguistic, philosophic, and artistic dimensions. The Jewish Studies Program offers a major and two minors: Jewish studies and Hebrew studies.

Major in Jewish Studies

Prerequisite

- Complete or place out of HEBREW 121-1,2,3

Major requirements (12 units)

- 2 courses chosen from third-year Hebrew (any quarter of HEBREW 216), courses in the Department of Religious Studies on classical Jewish texts in Hebrew, or courses in Hebrew literature read in Hebrew. Students who complete two years of Yiddish language are exempt from this requirement and need only 10 courses for the major.
- RELIGION 230
- 1 course covering the biblical period
- 1 course covering the rabbinic period
- 2 courses covering the postrabbinic periods (post-800 C.E.), such as HISTORY 348-1,2, 349, 203-1,2
- 5 additional courses counting for major or minor credit in Jewish studies; may include third-year courses in Hebrew and Yiddish
- At least 6 courses must be at the 300 level.
- At least 1 must be from the history department.
- At least 1 must be in literature.

Minor in Jewish Studies

Minor requirements (7 units)

- 3 courses in Jewish history that provide a basis for advanced work
  - 1 course on ancient or biblical Judaism (such courses include RELIGION 220 or any course on the history of ancient Israel)
  - 1 approved course on the history or culture of the Jewish people in the Middle Ages
  - 1 approved course on some aspect of modern Jewish history, such as HISTORY 203-2, 348-2
- 2 courses on Jewish religion offered in the Department of Religious Studies or approved by the director of undergraduate studies; eligible courses include RELIGION 230, 320, 332, 333, and 339
- 2 additional approved courses chosen from the fields of Jewish literature and Jewish philosophy—e.g., courses covering thinkers such as Maimonides, Rosenzweig, and Levinas; or the sociology/anthropology of Jewish communities; or Hebrew and Yiddish writers in translation
- At least 5 courses may not be double-counted toward a major.

- Students who also satisfactorily complete two years of language study in Hebrew or Yiddish complete the minor requirements with 5 courses:
  - 3 in Jewish history
  - 1 in religion
  - 1 in Jewish literature and philosophy

Minor in Hebrew Studies

Prerequisite

- Complete or place out of HEBREW 121-1,2,3

Minor requirements (6 units)

- 2 courses conducted in Hebrew—for example, third-year Hebrew (HEBREW 216-1,2,3)
- 1 course on a classical Hebrew text read in Hebrew (eligible courses are typically on biblical, rabbinic, or mystical texts—for example, RELIGION 329 or 339)
- 1 course on modern Hebrew literature, using Hebrew literary texts from the Haskalah through the contemporary periods, either in the original language or in English
- 1 course on modern Israel, exclusive of Israeli literature, typically in history, political science, sociology, or anthropology; must be approved by the director of undergraduate studies
- 1 elective chosen from Hebrew literature or Jewish literature, in translation or in the original; in Israel studies; in the Department of Linguistics relevant to Semitic languages; covering classical Hebrew texts in translation or in the original; or conducted in Hebrew (e.g., HEBREW 216-1,2,3, 316-1,2,3)
- At least 2 of the 6 courses must be at the 300 level.

Honors in Jewish Studies

Majors with strong academic records and an interest in pursuing honors should submit a written proposal in spring quarter of junior year. Accepted students take 399 with their thesis adviser in fall and winter of senior year; 1 quarter may count toward the major. Alternatively, students may enroll in a 3-quarter-long seminar in a relevant department. Those interested in this option should consult with the relevant department, the anticipated thesis adviser, and the director of undergraduate studies.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information contact the director of undergraduate studies and see Honors in the Major on page 38.

Jewish Studies Courses

JWSH ST 242-0 Imagining Modern Jewish Culture in German and Yiddish History and character of Yiddish and the development of modern German culture in general and German-Jewish culture in particular. Appreciation of the variety of "Judaisms" imagined and reimagined during modern European history. Taught with GERMAN 242; students may not receive credit for both courses.

JWSH ST 266-0 Introduction to Yiddish Culture: Images of the Shtetl Analysis and discussion of the literary, visual, and filmic images of the communal life developed by Eastern European Jews and inseparably associated with them. Taught with GERMAN 266 and YIDDISH 266; students may receive credit for only 1 of these courses.

JWSH ST 278-1,2 Modern Hebrew Literature in Translation History of Hebrew literature. **1.** The European period. **2.** The Israeli period. Taught with COMP LIT 278; students may not receive credit for both courses.

JWSH ST 279-0 Modern Jewish Literature Modern European, American, and Israeli Jewish literature in historical context. Taught with COMP LIT 279; students may not receive credit for both courses.

JWSH ST 350-0 Representing the Holocaust in Literature and Film Analysis of artistic, ethical, and historical questions about representing the Holocaust in different genres.

JWSH ST 366-0 The Rise and Fall of Modern Yiddish Culture Analysis of major representatives of Yiddish literature, with particular attention to how their work relates to other modernist traditions. Taught with GERMAN 366 and YIDDISH 366; students may receive credit for only 1 of these courses.

JWSH ST 379-0 Storytelling in American Jewish Literature Modern Jewish writers from diverse national and linguistic backgrounds who have reshaped the oral tradition in Judaism to their individual talents.

JWSH ST 396-0 Topics in Modern Jewish Culture Analysis of major texts and figures in 20th- and 21st-century Jewish literature, with attention to their cultural context and import.

Hebrew Courses

HEBREW 111-1,2,3 Hebrew I Understanding, speaking, reading, and writing of mainly conversational Hebrew. Hebrew used as language of instruction. Drill in language laboratory.

HEBREW 121-1,2,3 Hebrew II From language to literature: review of grammar; reading and discussing Hebrew literary works (prose and poetry) and newspaper articles. Compositions and oral presentations. Prerequisite: 111-3 or equivalent.

HEBREW 216-1,2,3 Hebrew III: Topics in Hebrew Literature Reading Hebrew literature, some biblical but mostly modern prose. Compositions and oral presentations. Prerequisite: 121-3 or equivalent.

HEBREW 316-1,2,3 Hebrew IV: Advanced Topics in Hebrew Literature Reading 20th-century Hebrew literature. Presentations, discussion, and essays in Hebrew. Prerequisite: 216-3 or consent of instructor.

HEBREW 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Hebrew. Prerequisite: consent of instructor.

Yiddish Courses

YIDDISH 101-1,2,3 Beginning Yiddish The beginning Yiddish sequence offers students a systematic introduction to Yiddish language and culture emphasizing the four modalities: speaking, listening comprehension, reading, and writing. No prerequisite in Yiddish.

YIDDISH 102-1,2,3 Intermediate Yiddish Continuation of the introductory 111 sequence emphasizing all four language modalities. Prerequisite: YIDDISH 101-3 or equivalent.

YIDDISH 266-0 Introduction to Yiddish Culture: Images of the Shtetl See JWSH ST 266.

YIDDISH 366-0 The Rise and Fall of Modern Yiddish Culture See JWSH ST 366.

Relevant Courses in Other Departments

Additional Jewish studies courses are offered by many departments and programs. The following is a sampling; a complete list is available on the department website.

- COMP LIT 278, 279
- ENGLISH 105, 205 (relevant sections of each)
- GNDR ST 382 (relevant sections)
- GERMAN 234
- HISTORY 203, 348, 349, 391 (relevant sections), 392 (relevant sections)
- POLI SCI 395 (relevant sections)
- RELIGION 220, 230, 320, 329 (relevant sections), 330, 332, 333, 339, 351
- SPANISH 397 (relevant sections)

KOREAN

See Asian Languages and Cultures.

LATIN

See Classics.

LATINA AND LATINO STUDIES

www.latinostudies.northwestern.edu

Latina and Latino studies focuses on the experiences of US Latinas and Latinos and encompasses a wide diversity of communities, cultures, and backgrounds as well as relationships to diasporic homelands.

Explicitly concerned with exposing inequality and injustice, the field examines the relationships among social structure, cultural production, and power. It produces scholarship that challenges normative analyses of the place of Latinas and Latinos in US society. Scholars use inter- and multidisciplinary approaches instead of more conventional paradigms.

The curriculum explores productive tensions between US Latinas and Latinos, as well as commonalities and differences in social movements, transnationalism, electoral politics, race and comparative processes of racialization, immigration, queer theory, and gender and sexuality.

Majors and minors meet with the program director for advising, including review and approval of course selections and review of progress toward timely completion of the major or minor.

Major in Latina and Latino Studies

The major consists of 16 courses plus a related immersion experience. All must be selected in consultation with the program director.

Program courses (12 units)

- 1 introductory course from 201-1,2,3 (if students take all 3, only 1 will count toward the major)
- 1 senior-year seminar: 395 (399 and an approved senior thesis may be substituted)
- 6 core courses
  - At least 1 from each of the three broad disciplinary categories (social sciences, history, and humanities)
  - At least 4 at the 300 level
- 4 comparative courses in US race and ethnicity
  - Courses are chosen from African American studies, Asian American studies, or other courses with substantial content about other US-based ethnic or racial groups.
  - At least 2 courses must be at the 300 level.

Related courses (4 units)

- At least 2 must be at the 300 level.
- 1 must have a focus on analyzing gender or sexuality.
- Courses are typically drawn from Latin American and Caribbean studies, English, anthropology, history, sociology, economics, gender and sexuality studies, performance studies, theater, and American studies.

Immersion experience

- All majors must have an immersion experience with Latina/o communities in the United States or a transnational counterpart.
- Examples of immersion experiences include
  - Study abroad in Mexico or Latin America
  - Chicago Field Studies
  - Senior thesis in Latina and Latino studies
  - Independently proposed research or internship
  - SESP 299-1,2 Civic Engagement Capstone Research Project if it relates to Latina/o communities
  - 2 performance-based courses in theater, dance, communication, sound design, or performance with a US Latina/o focus; examples are THEATRE 349-3 and DANCE 335 (if relevant topics)
- Courses for the immersion experience may double-count toward elective and required courses for the major with permission of the program director.

Minor in Latina and Latino Studies

Minor requirements (6 units)

- 1 introductory course from 201-1,2,3 (if students take all 3, only 1 will count toward the minor)

- 3 core courses at the 300 level, 1 from each of the three broad disciplinary categories (social sciences, history, and humanities)
- 2 comparative courses in US race and ethnicity from African American studies, Asian American studies, or other courses with substantial content about other US-based ethnic or racial groups
- Courses must be selected in consultation with the program director from an approved list.

Honors in Latina and Latino Studies

Majors with strong academic records and an interest in pursuing honors should apply by the end of junior year. The application includes a project proposal and approval from a faculty thesis adviser, who may be from another department. Accepted students complete a senior thesis or project through 2 quarters of independent study (399). Taken in fall and spring of senior year, both quarters of 399 may count toward the major requirements.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information see the program website and Honors in the Major on page 38.

Courses

LATINO 201-1 Introduction to Latina and Latino Studies Introduction to past experiences shaping US Latina/o communities and to material and epistemologies for interpreting them; focus on parallels of colonization, assimilation, cultural resistance, and cultural innovation. Uses history as its primary, although not exclusive, disciplinary approach.

LATINO 201-2 Introduction to Latina and Latino Social and Cultural Analysis Survey course examining political and social conditions of US Latinas/os. Uses qualitative and quantitative social science methodologies to consider parallels and distinctions among a heterogeneous population identified in the US as "Latino."

LATINO 201-3 Introduction to Latina and Latino Cultural Studies Uses literary theories and cultural studies approaches in the study of US Latinas/os. Draws on text and other forms of representation to examine parallels and divergent social and cultural experiences.

LATINO 218-0 Latino History History of Latina/os in the United States and in the context of US–Latin American relations from the 18th century to the present. Taught with HISTORY 218; students may not receive credit for both courses.

LATINO 222-0 Latino Youth in US Cities Cultural, social, and political contexts that shape the lives of Latino/a youth in US cities, as well as Latino/a youths' ideas of self-identity and civic engagement.

LATINO 277-0 Introduction to Latino Literature Survey of major writers and movements from Spanish colonial era to the present, covering a range of genres and ethnicities. Taught with ENGLISH 277 and SPANISH 277; students may receive credit for only 1 of these courses.

LATINO 342-0 Latino Social Movements Histories and ideologies of various US Latino social movements. Draws upon historical, ethnographic, autobiographical, and documentary accounts.

LATINO 391-0 Topics in Latina and Latino History Content varies; may be repeated for credit with different topic. Recent topics include history of Latinas/os in Chicago; origins and histories of US Latinos.

LATINO 392-0 Topics in Latino Social and Political Issues Content varies; may be repeated for credit with different topic. Recent topics include el barrio; history of Latino/a activism.

LATINO 393-0 Topics in Latina and Latino Text and Representation Content varies; may be repeated for credit with different topic. Recent topics include Latinas/os in Hollywood; Latina/o representation in the media.

LATINO 395-0 Capstone Seminar in Latina and Latino Studies Advanced course synthesizing the state of current research. Questions the boundaries of Latina/o studies. Contextualizes research and topics in relation to other ethnic studies, gender/queer studies, and diaspora studies. Primarily for majors and graduate students. Prerequisite: consent of the program director.

LATINO 399-0 Independent Study in Latina and Latino Studies Reading, research, and/or tutorials for students pursuing projects outside the context of regularly offered courses. Prerequisite: consent of instructor.

LATIN AMERICAN AND CARIBBEAN STUDIES

www.wcas.northwestern.edu/lacs

The Program in Latin American and Caribbean Studies allows students to pursue a coherent interdisciplinary course of study on this region of the world, including courses offering a variety of perspectives: social, historical, linguistic, political, and cultural. The program requires a set of core courses and also offers a series of elective courses in several different departments. Students also are encouraged to study in a Latin American or Caribbean country through the programs offered by the Study Abroad Office.

Minor in Latin American and Caribbean Studies

All students in the program are expected to have an effective reading knowledge of Spanish, Portuguese, or another language spoken in the region. Students who would like more information about the minor should contact the program director.

Minor requirements (8 units)

- 4 core courses from the following four areas, normally chosen from this list, although substitutions may be approved by the program director:

- ANTHRO 390 or 490 (when relevant to Latin America, the Caribbean, and/or US Latinos)
- HISTORY 300, 365, 367, 368, 369, or 392 (when relevant to Latin America or the Caribbean)
- POLI SCI 353 or 356
- PORT 396 (when relevant to Latin America, the Caribbean, and/or US Latinos)
- SPANISH 230, 231, 260, 261, 361, 395, or 397 (when relevant to Latin America, the Caribbean, and/or US Latinos)

• 4 additional courses on Latin America and the Caribbean
- Courses must be chosen from the list on the program website or approved by the program director. Many departments and programs, especially anthropology, history, Latina and Latino studies, political science, and Spanish and Portuguese, regularly offer courses that can count toward this requirement.
- 1 elective course focusing on Latinos in the United States is strongly recommended.

• At least 5 courses for the minor must not be double-counted toward a major.

Course

LATIN AM 391-0 Topics in Latin American and Caribbean Studies An interdisciplinary introduction to significant topics in Latin American and Caribbean studies. Content varies from year to year; may be repeated for credit with a different topic.

LEGAL STUDIES

www.legalstudies.northwestern.edu

The Legal Studies Program challenges students to use various academic perspectives and methodologies to study legal issues and to use the conceptual framework of the law to illuminate empirical and theoretical concerns in the social sciences and humanities. It is not a "prelaw" program. This program conceives of law broadly to include the study of legal institutions, legal actors, and legal processes. The law has become an important institution in American society and throughout the world; as such, it warrants study in its own right and provides an excellent lens through which students may learn about and critically examine a variety of themes central to other academic disciplines.

Adjunct Major in Legal Studies

Students are required to have completed or be in the process of completing at least 2 legal studies electives before admission to the program. These 2 courses will later count toward the adjunct major. Students apply for the adjunct major and admission to the Advanced Research Seminar (398-1,2) in spring of sophomore year.

Adjunct major requirements (11 units)

• 2 core courses: 398-1,2, typically taken during junior year

• 9 approved electives taught in legal studies or drawn from other departments, including 1 course from each of the following five categories:
- *Theory and philosophy*
- *Global and comparative studies*
- *Institutions, organizations, economics*
- *Law and inequality*
- *Argument and communication*

• A list of approved courses is available on the program website.

• 206 and POLI SCI 230 are strongly recommended.

• At most 2 Chicago Field Studies credits may be counted.

• All adjunct majors require completion of a stand-alone major as well. At most 2 of the 9 electives may be double-counted toward another major.

Minor in Legal Studies

Minor requirements (8 units)

• The courses must be from legal studies or approved courses from other departments.

• At least 1 course must be chosen from each of the five categories listed for the major.

• At least 4 must be at the 300 level.

• At most 2 Chicago Field Studies credits may be counted.

Honors in Legal Studies

All legal studies majors complete the advanced research seminar (398-1,2) and prepare a thesis as part of the course requirements. Those whose theses and grades meet program criteria are recommended to the college for graduation with honors; students do not need to formally apply for consideration. For more information consult the program director and see Honors in the Major on page 38.

Courses

LEGAL ST 206-0 Law and Society Introduction to the role of law in American society. Relationship of law, inequality, and social change. Changes in legal institutions: the courts, the legal profession, and legal services for the poor. Taught with SOCIOL 206; students may not receive credit for both courses.

LEGAL ST 308-0 Sociology of Law Sociological analysis of legal institutions such as courts, the police, and lawyers. Law, inequality, and social change. Taught with SOCIOL 318; students may not receive credit for both courses.

LEGAL ST 318-1,2 Legal and Constitutional History of the United States 1. Colonial period–1850. Development of legal institutions, constitutionalism, law and social change, law and economic development. **2.** 1850–present. Law in industrial society: administration, race relations, corporations, environmental protection, civil liberties. Taught with

HISTORY 318-1,2; students may not receive credit for both 318-1 courses or for both 318-2 courses.

LEGAL ST 332-0 Constitutional Law I Introduction to interpretation of the US Constitution by the Supreme Court. Judicial review, federalism, separation of powers, economic and religious liberty, and personal privacy. Taught with POLI SCI 332; students may not receive credit for both courses. Prerequisite: POLI SCI 220 or 230.

LEGAL ST 333-0 Constitutional Law II: Civil and Political Rights Consideration of US Supreme Court decisions dealing with civil and political rights, including equality, freedom of expression, and criminal procedures. Taught with POLI SCI 333; students may not receive credit for both courses. Prerequisite: POLI SCI 220 or 230.

LEGAL ST 340-0 Gender and the Law Examination of the changing role of law in American gender relations. Legal definitions of gender in the household, the marketplace, and the state.

LEGAL ST 376-0 Topics in Legal Studies Culture wars and the Constitution, wrongful convictions, law and social movements, trial advocacy, and other topics. May be repeated for credit with consent of instructor or program director.

LEGAL ST 398-1,2 Advanced Research Seminar Exposure to theoretical and empirical approaches to the study of law and legal institutions in society; preparation and presentation of original thesis. Consecutive enrollment required in both courses in the sequence. Prerequisite: Acceptance to program as adjunct major.

LEGAL ST 399-0 Independent Study Readings and conferences on special subjects for students pursuing a specific area of interest in legal studies.

LINGUISTICS

www.linguistics.northwestern.edu

Linguistics is the scientific study of language, its structure and function as a means of communication, its acquisition, and the mental and physiological processes involved in its use. Knowledge of the structure, origins, and functions of language can provide deep insight into human nature and behavior. The major in linguistics prepares students for professional studies in law, medicine, technology, education, and business, as well as for graduate work in linguistics, cognitive science, and related disciplines.

Three introductory courses examining the sound structure of human language, the structure of words and sentences, and the structure of linguistic meaning make up the core of the major and provide the foundation for more advanced work. More specialized courses in linguistics introduce students to the activities of working researchers in various subfields.

Linguistics majors are encouraged to participate in faculty research and to develop independent research. Students often enhance their linguistics major through interdisciplinary studies in cognitive science, communication sciences and disorders, psychology, philosophy, international studies, mathematics, or computer science. Students with a strong record in their major courses and an interest in pursuing linguistics at the graduate level are encouraged to enroll in 400-level courses.

Major in Linguistics

Department courses (12 units)

- 3 introductory courses: 250, 260, 270
- 9 courses beyond the 200 level
  - Should include 350, 360, and 370. A methods course such as 330, 331, 332, 333, or 334 may be substituted for 1 of these courses.
  - Only 1 of the 9 may be 398 or 399.
  - Certain exceptions or substitutions, such as COG SCI 210, may be granted with the consent of the director of undergraduate studies.

Related courses (4 units)

- Selected in consultation with the linguistics director of undergraduate studies.

Minor in Linguistics

The minor in linguistics broadens the academic background of students majoring in related fields such as cognitive science, communication sciences and disorders, psychology, philosophy, foreign languages, mathematics, and computer science by offering training in the theory and methods of linguistic analysis.

Minor requirements (8 units)

- 250, 260, 270
- 5 courses beyond the 200 level, including 2 chosen from 350, 360, or 370 (a methods course such as 330, 331, 332, 333, or 334 may be substituted for 1 of these courses)

Four-Year BA/MA Program

Students with a strong record in their major courses and an interest in graduate study are eligible to apply for the four-year BA/MA program in linguistics. Applications should be made no later than spring quarter of junior year. To be considered for this program, students must demonstrate that they will be able to complete by the end of senior year all Weinberg College requirements for the BA degree plus the department's requirements for the MA degree. See Accelerated Master's Programs on page 39.

Honors in Linguistics

In the summer before senior year, eligible students majoring in linguistics are invited to participate in the honors program. Criteria include completion of prerequisite and core coursework and sufficiently high grades in the major and overall. Students then undertake the research and writing of a thesis in 2 additional linguistics courses beyond those required for the major. These courses may be selected from 398, 399, and 400-level courses.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information see the director of undergraduate studies and Honors in the Major on page 38.

Courses

All 200-level linguistics courses have an experimental requirement. Students may fulfill this requirement by participating in any combination of two one-hour experiments or video showings. The experiments will be part of ongoing departmental research and illustrate features of language structure and use relevant to topics covered in the core linguistics curriculum. Similarly, the videos will be on topics covered in the core curriculum.

COG SCI 210-0 Language and the Brain See Cognitive Science.

LING 220-0 Language and Society Introduction to the study of language in its social context. Language variation by gender, race/ethnicity, social class, and region. Language norms and attitudes. Multilingualism and public policy.

LING 221-0 Language and Prejudice Linguistic manifestations of prejudice from various sources: region, gender, race, ethnicity, social class, sexual orientation, and country of origin. How language affects perception: ethnic slurs, gender-biased language, taboo words, political correctness.

LING 222-0 Language, Politics, and Identity Role of language in constructing, preserving, and manipulating political and national identities. Topics include language discrimination, linguistic nationalism, language and religion, alphabet issues, dialect issues. Regional content varies.

LING 243-0 Language Evolution Introduction to linguistics from an evolutionary perspective. The biological basis of communicative systems; the evolution of the human language capacity; sounds, syntactic structures, and meanings in the world's languages.

LING 250-0 Sound Patterns in Human Language Introduction to phonetics and phonology. Description and classification of speech sounds in terms of articulation, acoustics, and perception. Similarities and differences of sound patterns across languages. Introduction to speech technology.

LING 260-0 Formal Analysis of Words and Sentences Formal structure of words (morphology) and sentences (syntax) in natural language. Biological basis of human language.

LING 270-0 Meaning How information is encoded in words and sentences and how speakers and listeners use language to communicate.

LING 300-0 Topics in Linguistics Topics in linguistic theory. Content varies. May be repeated for credit with different topic.

ENGLISH 302-0 History of the English Language See English.

LING 311-0 Child Language Introduction to first-language acquisition. How infants and children learn the grammar (structure of sounds, words, and sentences) of their native language. Innate and environmental factors in linguistic development. Emphasis on experimental and corpus-based methods of inquiry.

LING 315-0 Experimental Approaches to Word Form Processing Experimental techniques and theoretical models for analyzing perception and production of spoken and written word forms. Access to the mental lexicon in perception and production. Prerequisite: 250 or consent of instructor.

LING 316-0 Experimental Syntax Experimental methodologies and theories of sentence comprehension. Studies of syntactic structures in sentence comprehension. Prerequisite: 260 or consent of instructor.

LING 317-0 Experimental Pragmatics Experimental methodologies for analyzing the role of context in utterance production and comprehension. Prerequisite: 270 or consent of instructor.

LING 320-0 Sociolinguistics Linguistic diversity in multidialectal and multilingual societies. Correlations between linguistic variables and social categories. Language planning and policy; diglossia.

LING 321-0 Bilingualism Cognitive, linguistic, neuroscientific, and computational aspects of the acquisition, representation, and processing of two or more languages in an individual's mind/brain. Prerequisite: 250, 260, or 270.

LING 324-0 Linguistics and English Composition Recent trends in the study of the uses and forms of writing and the processes of written composition. The learning and teaching of written language.

LING 327-0 Language and Sexuality The use of language to construct, negotiate, and conceal sexual identity, focusing on the language of and about gay men and lesbians. Topics include heteronormativity, identity labels, gender versus sexuality, and cross-cultural sexual diversity. Prerequisite: a course in linguistics or consent of instructor.

LING 330-0 Research Methods in Linguistics Methods of linguistic data collection, management, and analysis with an emphasis on the use of computational, experimental, and statistical methods.

LING 332-0 Linguistic Field Methods Collection of primary linguistic data from an unfamiliar language. Lexicon and grammar development focusing on phonology, morphology, and syntax. Prerequisite: 250, 260, or 270.

LING 334-0 Introduction to Computational Linguistics Hands-on introduction to computational methods in empirical linguistic analysis and natural language processing.

LING 336-0 Words, Networks, and the Internet Word networks and language on the Internet. Python tools for exploring spam, search engines, and social media. Prerequisite: 330, 334, 361, or equivalent background.

LING 340-0 Historical Linguistics Introduction to the study of how and why language changes. Topics include the comparative method, the regularity of sound change, syntactic change, distant genetic relationships, and language evolution.
LING 341-0 Language Typology A comparison of varying and universal features of the world's languages. Prerequisite: 250, 260, or 270.
LING 342-0 Structure of Various Languages Phonological, morphological, or syntactic structure of a particular language. May be repeated for credit with change in language.
LING 350-0 Fundamentals of Laboratory Phonology Articulatory and acoustic phonetics. Syllable structure, phonotactics, prosody, and intonation. Fundamentals of experimental design and data analysis. Prerequisite: 250 or consent of instructor.
LING 360-0 Fundamentals of Syntax Fundamental principles of theoretical syntax. Phrase structure, argument structure, movement operations. Emphasis on argumentation, hypothesis formation and testing, and analytic methods. Prerequisite: 260 or consent of instructor.
LING 361-0 Morphology Issues in theoretical morphology. The internal structure of words. Linguistic and psycholinguistic findings about the representation and processing of word structures. Prerequisite: 250, 260, or 270.
LING 370-0 Fundamentals of Meaning Theoretical approaches to the study of linguistic meaning. Topics include word meaning, argument and event structure, sentence meaning, truth conditions, and inference types (e.g., entailment, implicature, presupposition). Prerequisite: 270 or consent of instructor.
LING 371-0 Reference Linguistic and philosophical approaches to the study of reference, focusing on the role of context in utterance production and interpretation. Topics include definiteness, genericity, deixis, and anaphora. Prerequisite: a course in linguistics or philosophy of language, or consent of instructor.
LING 372-0 Pragmatics Introduction to extrasemantic meaning, focusing on the role of context in utterance production and interpretation. Topics include the semantics-pragmatics boundary, implicature, presupposition, speech acts, reference, and information structure. Prerequisite: 250, 260, or 270.
LING 373-0 Implicature An interdisciplinary approach to the study of extrasemantic meaning, drawing on primary readings from linguistics, philosophy, and psychology. Topics include conversational and conventional implicature, explicature, impliciture, and the semantics-pragmatics boundary. Prerequisite: 370, 372, or consent of instructor.
LING 380-0 Spoken English for Nonnative Speakers Conversational English addressing all oral language skills; primarily for international graduate students who are nonnative speakers of English. Content varies.
LING 381-0 Written English for Nonnative Speakers Written argumentation skills and all aspects of academic writing; primarily for international graduate students who are nonnative speakers of English.
LING 398-0 Undergraduate Seminar in Linguistics By invitation of the department. For students of superior ability, with choice of topic left to the group.
LING 399-0 Independent Study

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

MATERIALS SCIENCE

www.matsci.northwestern.edu/wcas-matsci.html

Materials science is the study of processing-structure-property relationships in materials of importance to society, such as metals, ceramics, polymers, semiconductors, biomaterials, nanomaterials, and their combinations (composites). Materials scientists pay special attention to "microstructure"—i.e., how materials are constructed on the microscopic, submicroscopic, and even the nanometer levels, and how this affects their properties. Given the wide range of uses for materials, their properties of interest are similarly broad, from mechanical (e.g., strength) to electrical (e.g., semiconduction) to biological (e.g., biocompatibility).

By offering the opportunity to study materials science within the context of the liberal arts and sciences, the Material Science Program in Weinberg College is distinct from the program in the Department of Materials Science and Engineering in the Robert R. McCormick School of Engineering and Applied Science. The Weinberg program has strong connections with Weinberg's physical and biological sciences departments in addition to its links with McCormick's various engineering disciplines.

Major in Materials Science

Students majoring in materials science in Weinberg College choose from two tracks: general materials or soft materials. (Students interested in solid-state materials should see the materials physics concentration in the Department of Physics and Astronomy; they may double-major in materials science.)

Requirements include foundation courses in mathematics and science and advanced electives. Course descriptions for materials science courses are listed in the McCormick School chapter of this catalog.

Program courses (13 units)

Laboratory components of general and organic chemistry courses require separate registration and bear separate credit; see the chemistry section for details.

- 5 core courses: MAT SCI 201 or 301, 315, 316-1,2, 351-1

- 5 courses in the chosen track
  - *General materials track*
    - CHEM 210-1 or 212-1
    - CHEM 342-1 or MAT SCI 314
    - MAT SCI 331; 2 courses chosen from 332, 351-2, 361
  - *Soft materials track*
    - CHEM 210-1,2 or 212-1,2
    - CHEM 342-1 or MAT SCI 314
    - MAT SCI 331; 370 or 372
- 3 advanced electives
  - At least 1 in materials science chosen from 332, 333, 336, 337, 340, 341, 351-2, 355, 360, 361, 370, 371, 376, 380, 381, 390, 391, 395, 398
  - At least 1 in another department chosen from the following:
    - CHEM 210-3 or 212-3, 307, 333, 342-2, 342-3, 360
    - EARTH 300
    - MATH 250; 351 or 381
    - PHYSICS 332, 333-1, 333-2, 337, 339-3, 357, 358

Foundations in mathematics and science *(Units depend on chemistry and mathematics sequences taken.)*

- MATH 220 and 224 *or* 212, 213, and 214; 230, 234, and 240 *or* 281-1,2,3 *or* 285-1,2,3 *or* 290-1,2,3 *or* 291-1,2,3
- CHEM 101, 102, 103 *or* 171, 172
- PHYSICS 135-1,2,3 or 125-1,2,3
- Students in the soft materials track who are interested in biomaterials and/or medicine are encouraged to take additional courses in biology.

Minor in Materials Science

Program courses (6 units)

- 201 or 301; 315; 316-1,2
- 2 other 300-level materials science courses (excluding 394, 396-1,2, 399)

Foundations in mathematics and science *(units depend on chemistry and mathematics sequences taken)*

- MATH 220 and 224 *or* MATH 212, 213, and 214; MATH 230 and 234 or equivalent (e.g., 290-2,3 or 291-2,3)
- CHEM 101, 102, 103 *or* 171, 172
- 1 course in thermodynamics: MAT SCI 314 or CHEM 342-1 or PHYSICS 332

Materials Science Double Major for Physics and Astronomy Students

Students in physics and astronomy completing the materials physics concentration and wishing to double-major in materials science are required to take an additional advanced studies course for each course duplicated between the two programs (e.g., MAT SCI 316-1,2, 332, 355, 360, 361, 380). The replacement courses should be in disciplines other than physics.

Materials Science Second Major for ISP Students

The Integrated Science Program is a highly selective BA program within Weinberg College. Students majoring in ISP who wish to complete a second major in materials science must take

- MAT SCI 201 or 301
- 315
- 316-1,2
- 2 300-level MAT SCI electives

Honors in Materials Science

Seniors who have done outstanding work in the classroom and research laboratory may be eligible for graduation with honors in materials science. To be considered, a student must meet minimum GPA requirements and complete 2 units of research (from CHEM 398, 399; MAT SCI 396-1,2, 394, 399; PHYSICS 398, 399) and a written research report. These 2 units are neither required for nor counted toward the major. Students who intend to submit a senior research report should send an e-mail including the name of the research adviser to the director of undergraduate studies by fall of senior year.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program director and see Honors in the Major on page 38.

MATHEMATICAL METHODS IN THE SOCIAL SCIENCES

www.mmss.northwestern.edu

A central feature of modern social, behavioral, managerial, and policy sciences is the use of mathematics, statistics, and computers, both as languages and as methods of abstraction and analysis. Most undergraduate programs in the social sciences do not incorporate mathematical approaches in an organized and consistent manner, however. The Mathematical Methods in the Social Sciences Program (MMSS) was created to give undergraduate students an opportunity to combine the study of social sciences with training in formal analytical methods.

MMSS students pursue a double course of study: a common mathematics/quantitative methods sequence and the social science major of their choice. (In some cases, students have chosen their joint major from outside the social sciences.) The program is for students with high mathematical aptitude and strong interest in social problems and issues, including policy and research implications. It provides excellent preparation for graduate study in social or managerial sciences as well as for careers requiring quantitative skills and a solid background in the social sciences.

In the first two years of the program, students enroll in a coordinated sequence of 12 1-quarter courses (2 courses a quarter) covering mathematical methods and their applications in the social sciences. These courses are open only to MMSS students and are taught at an appropriately

advanced level. In senior year, all MMSS students participate in a senior seminar in which they write a thesis. There are no other required MMSS courses, but students must fulfill the requirements of their joint major.

Admission to the MMSS program is very selective and is limited to entering freshmen and to Northwestern sophomores with superior academic records and a demonstrated strong aptitude in mathematics.

A full-year course in calculus is a prerequisite for admission. High school students fulfilling this prerequisite are encouraged to enter the program as freshmen, applying to both Northwestern and the program.

To be considered for admission as sophomores, students lacking calculus should complete at least 2 quarters of calculus (MATH 220 and 224) in freshman year. Those with sufficient background in calculus are advised to register for a 200-level calculus/linear algebra sequence such as MATH 230, 234, 240, 290-1,2,3, 291-1,2,3, or ES APPM 252-1,2 in freshman year. Students with less mathematics preparation who are admitted to the program after freshman year may be required to take all or part of the first-year MMSS math sequence.

Northwestern applicants interested in the program should see Special Admission Programs on page 11. Current students who wish to be considered for the program should complete an online application at www.mmss.northwestern.edu.

Adjunct Major in MMSS

Adjunct major requirements (14 units)

- 6 first-year courses: 211-1,2,3; MATH 285-1,2,3
- 6 second-year courses: 311-1,2; MATH 300, 385, 386-1,2
- 2 senior-year courses: 398-1 and 398-2 or 398-3
- All adjunct majors require completion of a stand-alone major as well. MMSS students must complete a major in a social science or other approved area. See the program website for information on adjustments to requirements in other majors for students in MMSS.

Major in Mathematics for MMSS Students

MMSS students seeking a sophisticated understanding of mathematics and formal analysis of models are encouraged to pursue a major or minor in mathematics as well as their joint major in MMSS and another social science. To receive a mathematics major, MMSS students must complete

- The required MMSS courses (which include MATH 285-1,2,3, 300, 385, and 386-1,2). Students who receive permission to skip 300 must substitute another 300-level mathematics course.
- MATH 320-1,2,3 or 321-1,2,3
- 3 courses chosen from MATH 310-2,3, 311-2,3, 325, 330-1,2,3, 331-1,2,3, 334, 344-1,2, 360-1,2, 366-1, or 368; students may not count corresponding quarters of both 310 and 311 or both 330 and 331 toward this requirement

Minor in Mathematics for MMSS Students

To receive a minor in mathematics, MMSS students must successfully complete MATH 320-1,2,3 or 321-1,2,3, as well as the other required MMSS courses (including MATH 285-1,2,3, 300, 385, and 386-1,2). MMSS students who receive permission to skip MATH 300 must substitute another 300-level mathematics course.

Honors in Mathematical Methods in the Social Sciences

All MMSS students write a senior thesis in MMSS, in another major, or in both. Those who enroll in 2 units of MMSS 398, write an MMSS thesis of sufficiently high quality, and earn sufficiently high grades may be recommended to the college for graduation with honors in MMSS. Typically, more than half of all MMSS students graduate with program honors. For more information consult the program director and see Honors in the Major on page 38.

Courses

MMSS 211-1,2,3 Quantitative Social Science for MMSS: First Year 1. Intermediate microeconomics. **2.** Game theory. **3**. Formal models in political science.

MATH 285-1,2,3 Accelerated Mathematics for MMSS: First Year See Mathematics.

MATH 300-0 Foundations of Higher Mathematics See Mathematics.

MMSS 311-1,2 Quantitative Social Science for MMSS: Second Year 1. Advanced microeconomic theory. **2.** Advanced formal models in political science.

MATH 385-0 Probability Theory for MMSS See Mathematics.

MATH 386-1,2 Econometrics for MMSS See Mathematics.

MMSS 398-1,2,3 Senior Thesis Seminar

MATHEMATICS

www.math.northwestern.edu

Mathematics, often celebrated as the "Queen of the Sciences," has long been an indispensable tool in the physical sciences, engineering, and commerce. Today it is also used in sophisticated ways in the social sciences and humanities. Students majoring in mathematics have the opportunity to learn about its diverse applications, as well as to acquire an understanding of both the foundations and the frontiers of the discipline.

The department offers a major and a minor in mathematics. The mathematics major is flexible, accommodating students interested in the foundations of the modern mathematical sciences; those primarily interested in the application of mathematics to the biological, social, and behavioral sciences; and those interested in management or engineering.

Students with sufficiently strong preparation who are interested in a rigorous approach to the subject are encouraged to enter the Mathematical Experience for Northwestern Undergraduates Program (MENU). The department also encourages appropriately prepared students to enroll in its graduate courses.

A course in computer science is often a valuable adjunct to a mathematics major. Students interested in probability and statistics or in becoming actuaries should take 310-1,2,3 or 311-1,2,3 and 1 or more courses in statistics (e.g., STAT 320-2,3, 350, 351, 352, 355). They should try to include some courses from real analysis (320 or 321), computer science, and areas where probability and statistics are used.

Those interested in economics should take 320-1,2,3 or 321-1,2,3 and 310-1,2,3 or 311-1,2,3 and as well as ECON 380-1,2 and/or 381-1,2. Double majors in mathematics and economics should consult the director of undergraduate studies in economics about possible adjustments to their economics requirements.

All majors are encouraged to discuss their programs of study with the director of undergraduate studies as well as their classroom professors.

Major in Mathematics

Major requirements *(units depend on basic courses taken)*

- Basic *courses:* 220, 224 (or 212, 213, 214), 230, 234, 240 (or 281-1,2,3 or 285-1,2,3 or 290-1,2,3 or 291-1,2,3), or equivalent
- 9 additional courses offered by the department at the 300 level or above
  - Must include at least 1 of the complete sequences 310-1,2,3, 320-1,2,3, 321-1,2,3, 330-1,2,3, or 331-1,2,3.
  - 334 is required of all majors who have not passed at least 1 quarter of 311, 320, 321, 330, or 331 with a grade of C- or above.
  - With the prior approval of the director of undergraduate studies, as many as 3 of these 9 courses may be at the 300 level or above in other departments that focus on serious applications of mathematics or have substantial mathematical content. This option is especially recommended to those interested in the applications of mathematics to other areas of study. No such course, however, may be simultaneously counted toward the requirements of another major, minor, or school.

Minor in Mathematics

Minor requirements *(units depend on basic courses taken)*

- Basic courses: 220, 224 (or 212, 213, 214), 230, 234, 240 (or 281-1,2,3 or 285-1,2,3 or 290-1,2,3 or 291-1,2,3), or equivalent
- 6 additional courses offered by the department at the 300 level or above
  - Must include at least 1 2-quarter sequence chosen from 310-1,2, 320-1,2, 321-1,2, 330-1,2, or 331-1,2. Students may ask the director of undergraduate studies for permission to substitute where appropriate 310-2,3, 320-2,3, 321-2,3, 330-2,3, or 331-2,3 or other regularly offered 2-quarter mathematics sequences that provide a focused, in-depth introduction to a subfield of mathematics.
  - With the prior approval of the director of undergraduate studies, as many as 2 of these 6 courses may be at the 300 level or above in other departments that focus on serious applications of mathematics or have substantial mathematical content. This option is especially recommended to those interested in the applications of mathematics to other areas of study. No such course, however, may be simultaneously counted toward the requirements of another major, minor, or school.

MENU Program

Mathematical Experience for Northwestern Undergraduates (MENU) is a flexible program of courses designed to provide qualified undergraduates with a thorough foundation in mathematics suitable for advanced study in mathematics and its applications across a wide range of disciplines.

MENU offers students an opportunity to expand their mathematical knowledge while retaining flexibility about their majors. The program is especially suited for students considering a major in mathematics, the natural sciences, or economics, although MENU attracts participants with a variety of interests and majors. The program director is available to advise all MENU students regardless of major.

During the first year MENU participants typically enroll in one of two yearlong sequences: MATH 290-1,2,3 or 291-1,2,3. Each provides a strong background in linear algebra and multivariable calculus. In contrast to standard mathematics courses, MATH 290 and 291 develop linear algebra before multivariable calculus and use linear algebra as an important tool in the study of multivariable calculus. MATH 291 emphasizes theory and proofs and is appropriate for students who are particularly skilled in and passionate about mathematics. Students may transfer between 290 and 291 with permission from the MENU director.

After the first year MENU participants may choose among four upper-level MENU sequences: MATH 311-1,2,3, 321-1,2,3, 331-1,2,3, or 360-1,2; or they may enroll in other advanced courses in the mathematics department.

Admission to MENU is by invitation. Students who earn an Advanced Placement score of at least 4 on the Calculus BC examination or at least 5 on the Calculus AB examination should automatically receive an invitation to participate. Others who satisfy any of the following criteria qualify for MENU (although they do not receive an

automatic invitation) and may obtain permission to enroll from the director:

- International students who have completed single-variable calculus
- Students who have completed a college-level sequence in single-variable calculus with high grades
- Students earning a score of 7 on the International Baccalaureate Higher-Level Mathematics Examination (although they do not receive an automatic invitation)

Students who excelled in 220 and 224 may consult the MENU director about continuing their study of mathematics in MENU. Further information about MENU is available at www.math.northwestern.edu/undergraduate/menu.

Mathematics Second Major for ISP Students

The Integrated Science Program is a highly selective BA program in Weinberg College (see Integrated Science Program). Students majoring in ISP may complete a second major in mathematics by fulfilling the following requirements:

- They may not substitute ISP 398 for any mathematics course in the ISP curriculum.
- They must also complete 1 of the full-year sequences 320-1,2,3, 321-1,2,3, 330-1,2,3 or 331-1,2,3 in lieu of all major requirements listed above.
- It is recommended but not required that ISP students planning graduate work in mathematics take both a real analysis (320/321) and an algebra (330/331) sequence.

Mathematics Second Major or Minor for MMSS Students

Students who have completed all the requirements for the MMSS major may complete an additional major or a minor in mathematics. Please see Mathematical Methods in the Social Sciences for information.

Honors in Mathematics

Majors with strong academic records in mathematics and an interest in pursuing honors should speak with the director of undergraduate studies before the end of junior year. To graduate with department honors, students should complete both 320-1,2,3 (or 321-1,2,3) and 330-1,2,3 (or 331-1,2,3). In exceptional cases, students who have not completed these courses may be considered for honors. Students must also complete with distinction 2 quarters of independent study (399) or 2 quarters of a graduate course, as well as an acceptable project that culminates in an honors thesis. The courses may be counted toward the major requirements.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the department website and the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of Mathematics

Weinberg students majoring in mathematics who wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete the relevant requirements outlined in the SESP chapter of this catalog. They should contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Course Recommendations for Entering Students

Students enrolled in the McCormick School, ISP, or MMSS should consult their programs to determine the appropriate beginning mathematics course.

Students who have not taken any calculus normally enroll in 220. Those with particularly weak mathematics backgrounds should consult the director of calculus about the possibility of starting in 212. Students intending to major in a behavioral science other than economics and those from Medill may take 202 and 211 rather than 220/224/230, especially if they are concerned about their math skills. Those who wish only to fulfill the Area II distribution requirement and plan no further study of mathematics may also take 104, 110, or 111.

Students who have taken calculus in secondary school should determine their beginning math course as follows:

- Those who have studied linear algebra or multivariable calculus should consult the director of undergraduate studies.
- Those invited to MENU should take 290 or 291; they may consult the MENU director about which is appropriate.
- Those who have taken a year of calculus with grades of A- or better should consult the MENU director about admission to MENU.
- Those who have taken a year of calculus with grades of B or B+ should enroll in 230.
- Those who have taken a semester of calculus with grades of B or better should enroll in 224.
- Those whose calculus grades were below B should consult the director of calculus.

Substantial portions of the material from 230, 234, 240, 250 are also covered in the sequences 281-1,2,3, 285-1,2,3, 290-1,2,3, 291-1,2,3, and ESAM 252-1,2,3. Those uncertain about the exact equivalencies should consult with the director of undergraduate studies. Students should not attempt to mix and match courses on their own, since they will not be allowed credit for programs that result in excessive duplication of subject matter.

Courses

Prerequisites for mathematics courses may be waived by the director of undergraduate studies but may not be taken for credit after completion of courses for which they were prerequisites. No 100-level course may be taken for credit

after a 200- or higher-level course has been completed. See the course descriptions for other restrictions.

MATH 104-0 Introduction to Game Theory Introduction to the mathematical theory of strategic competition; optimal strategies and equilibria; the Prisoner's Dilemma; bargaining and negotiation; strategic voting; applications to economics and political science. For nonscience students seeking a gentle introduction to the subject without the technical details or prerequisites of a more advanced course. Familiarity with high-school mathematics is assumed.

MATH 110-0 Introduction to Mathematics I Exploration of the beauty and mystery of mathematics through a study of the patterns and properties of the natural numbers 1, 2, 3, … . Topics include counting, probability, prime numbers, Euclidean algorithm, and unique factorization. Recommended for students with little mathematical background.

MATH 111-0 Introduction to Mathematics II Similar in spirit to 110, with topics chosen from number theory, topology, probability, geometry, cryptology, and algebra. Recommended for students with little mathematical background. 110 is not a prerequisite.

MATH 202-0 Finite Mathematics Primarily for the behavioral sciences. Topics chosen from elementary linear algebra and its applications, finite probability, and elementary statistics.

MATH 211-0 Short Course in Calculus Elements of differential and integral calculus. Examples drawn from the behavioral and social sciences. Students may not receive credit for both 211 and 220. Not suitable for those planning to major in mathematics, the natural sciences, or economics. Does not prepare for 230. 202 is not a prerequisite.

MATH 212-0 Single-Variable Calculus I Review of trigonometric, exponential, logarithmic, and inverse functions and transformation of graphs. Limits, continuity, derivative of a function, product, quotient and chain rule, mean value theorems, Newton's method, linear approximation and differentials, optimization problems. Students may not receive credit for both 212 and 211 or 220. For students with little or no previous exposure to calculus. Prerequisite: consent of department.

MATH 213-0: Single-Variable Calculus II Logarithmic differentiation, implicit differentiation, inverse trigonometric functions, related rates. L'Hôpital's Rule, curve sketching. Fundamental theorem of calculus. Techniques of integration, including integration by substitution and by parts, partial fractions, trigonometric substitutions, numerical integration, areas, and volumes. Students may not receive credit for both 213 and 211 or 224. Prerequisite: 212 or consent of department.

MATH 214-0: Single-Variable Calculus III Review of trigonometric substitutions and partial fractions. Improper integrals. Applications of integration: computation of arc length and surface area, work, and probability. Sequences and series: the integral and comparison tests, alternating series, power series, ratio test. Taylor's formula and Taylor series. Series solutions of differential equations. Students may not receive credit for both 214 and 224. Prerequisite: 213 or consent of department.

MATH 220-0 Differential Calculus of One-Variable Functions Limits, differentiation, linear approximation, optimization, curve sketching, related rates, Newton's method, antiderivatives. Students may not receive credit for both 220 and 211 or 212.

MATH 224-0 Integral Calculus of One-Variable Functions Integrals, techniques of integration, volumes, arc length, work, differential equations, sequences and series, Taylor polynomials. Students may not receive credit for both 224 and 213 or 214. Prerequisite: 220.

MATH 230-0 Differential Calculus of Multivariable Functions Vector algebra, vector functions, partial derivatives, optimization, Lagrange multipliers. Students may not receive credit for both 230 and 281-1, 285-2, 290-2, or 291-2. Prerequisite: 214 or 224.

MATH 234-0 Multiple Integration and Vector Calculus Cylindrical and spherical coordinates, double and triple integrals, line and surface integrals. Change of variables in multiple integrals; gradient, divergence, and curl. Theorems of Green, Gauss, and Stokes. Students may not receive credit for both 234 and 281-1, 285-3, 290-3, or 291-3. Prerequisite: 230.

MATH 240-0 Linear Algebra Basic concepts of linear algebra. Solutions of systems of linear equations; vectors and matrices; subspaces, linear independence, and bases; determinants; eigenvalues and eigenvectors; other topics and applications as time permits. Students may not receive credit for both 240 and 281-3, 285-1, 290-1, or 291-1. Prerequisite: 230.

MATH 250-0 Elementary Differential Equations Applications of calculus and linear algebra to the solution of ordinary differential equations. Students may not receive credit for both 250 and 281-2. Prerequisites: 230; 240 or concurrent registration in 240; or equivalent.

MATH 281-1,2,3 Accelerated Mathematics for ISP: First Year **1.** Multivariable differential calculus, multiple integration and vector calculus. **2.** Vector integral calculus, differential equations, infinite series. **3.** Linear algebra, differential equations. Open only to students in ISP.

MATH 285-1,2,3 Accelerated Mathematics for MMSS: First Year 1. Linear algebra. **2.** Continuation of linear algebra; multivariable differential calculus. **3.** Multivariable integral calculus. Prerequisite: first-year standing in MMSS.

MATH 290-1,2,3 MENU: Linear Algebra and Multivariable Calculus 1. Linear algebra in Euclidean space. **2.** Continuation of linear algebra. Multivariable differential calculus. **3.** Multivariable integral calculus. Vector analysis. Students may not receive credit for both 240 and 290-1; 230 and 290-2; or 234 and 290-3. Prerequisites: one year of calculus (usually in high school) and consent of the department.

MATH 291-1,2,3 MENU: Intensive Linear Algebra and Multivariable Calculus 1. Foundations. Linear algebra in vector spaces. **2.** Continuation of linear algebra. Multivariable differential calculus. **3.** Multivariable integral calculus. Vector analysis. Emphasis on theory and proof. Prepares students for 300-level mathematics courses such as 321 and 331 as sophomores. Students may not receive credit for both 240 and 291-1; 230 and 291-2; or 234 and 291-3. Prerequisites: one year of calculus (usually in high school) and consent of the department.

MATH 300-0 Foundations of Higher Mathematics Introduction to fundamental mathematical ideas—such as sets, functions, equivalence relations, and cardinal numbers—and basic techniques of writing proofs. Students may not receive credit for 300 without prior departmental consent after taking 320-1, 321-1, 330-1, or 331-1. Prerequisite: 240.

MATH 306-0 Combinatorics and Discrete Mathematics Discrete mathematics, inductive reasoning, counting problems, binomial coefficients and Pascal's triangle, Fibonacci numbers, combinatorial probability, divisibility and primes, partitions, and generating functions. Prerequisite: 240 or instructor's consent.

MATH 308-0 Graph Theory Introduction to graph theory: graphs, trees, matchings, planar graphs, colorings. Additional topics as time permits. Prerequisites: 291-1, 300, 306, or equivalent.

MATH 310-1,2,3 Probability and Stochastic Processes **1.** Discrete probability spaces, random variables, expected value, combinatorial problems. Special distributions, independence, and conditional probability. Weak law and central limit theorem. **2.** Convolution, central limit theorem, Markov processes in discrete time, recurrence, and transience. **3.** Markov processes in continuous time, stationary process, second-order process, stochastic differential equations. Students may not receive credit for both 310-1 and any of 385, EECS 302, IEMS 202, or STAT 320-1, 383. Prerequisites: 234, 240.

MATH 311-1,2,3 MENU: Probability and Stochastic Processes 1. Events, discrete and continuous random variables, distributions, generating functions, law of large numbers, central limit theorem. **2.** Markov chains, convergence of random variables, random processes, renewals, queues. **3**. Stationary processes, martingales, diffusion processes. This sequence covers more topics at a faster pace and in greater depth than does 310, and students may not receive credit for both 311-1 and 310-1, 311-2 and 310-2, or 311-3 and 310-3. Students may also not receive credit for 311-1 and 385, EECS 302, or STAT 320-1, 383. Prerequisite: 290-1,2,3 or 291-1,2,3 or consent of the department; 320-1 or 321-1 recommended.

MATH 314-0 Probability and Statistics for Econometrics Introduction to probability theory and statistical methods, including properties of probability distributions, sampling distributions, estimation, confidence intervals, and hypothesis testing. Students may not receive credit for both 314 and 310-1, 311-1, 385, EECS 302, IEMS 202, or STAT 320-1, 383. Prerequisite: 234, 240, or equivalent.

MATH 320-1,2,3 Real Analysis Rigorous analysis in Euclidean space, beginning with one and proceeding to several variables. Properties of the real numbers, limits and continuity, differentiation and integration, sequences and series, the inverse and implicit function theorems. Applications to Fourier series. Primarily for undergraduates; open to graduate students only with departmental consent. Students may not receive credit for both 320-1 and 321-1 or both 320-2 and 321-2. Prerequisite: 234, 240, 300; or 291-1,2,3; or instructor's consent.

MATH 321-1,2,3 MENU: Real Analysis 1,2. Rigorous analysis on Euclidean and metric spaces. Real number system; metric space topology; sequences, series; continuity; differentiation; integration; sequences and series of functions; inverse and implicit function theorems. **3.** Lebesgue measure and integration. Sequence covers more topics, more abstractly, at a faster pace, and in greater depth than 320-1,2 and emphasizes analyzing and creating proofs. Students may not receive credit for both 320-1 and 321-1 or both 320-2 and 321-2. Prerequisite: average grade of A- or above in 291, A- or above in 334, A in 300, B or above in 331, or consent of the department.

MATH 325-0 Complex Analysis Complex numbers, analytic functions, contour integrals, Cauchy's theorem, Laurent series, residue theorem, conformal mapping, analytic continuation. Students may not receive credit for both 325 and ESAM 311-3. Prerequisites: 234 and 240 or equivalent.

MATH 327-0 Mechanics for Mathematicians Fundamental mathematical ideas arising in classical mechanics. Newtonian mechanics. Lagrangian formalism and calculus of variations; motion with constraints; symmetries and conservation laws. Hamiltonian mechanics; Liouville's theorem. No prior knowledge of physics is assumed. Students may not receive credit for 327 after taking PHYSICS 330-1. Prerequisite: a thorough knowledge of linear algebra and vector calculus, as covered, for example, in 234 and 240 or equivalent, plus at least 1 300-level math course.

MATH 330-1,2,3 Abstract Algebra 1. Groups and their structure; elementary ring theory; polynomial rings. **2.** Continuation of ring theory. **3.** Field theory and Galois theory. Students may not receive credit for corresponding quarters of both 330 and 331. Prerequisite: 240 or consent of instructor.

MATH 331-1,2,3 MENU: Abstract Algebra 1. Groups and their structure, including the Sylow theorems. **2.** Ring theory; polynomial rings. Module theory, including applications to canonical form theorems of linear algebra. **3.** Field theory; Galois theory. 331 differs from 330 in that it covers more topics in more depth and aims at intensive development of students' ability to analyze and create mathematical proofs. Students may not receive credit for

corresponding quarters of both 330 and 331. Prerequisite: 291-3; 240 and 300; or consent of department.

MATH 334-0 Linear Algebra: Second Course Abstract theory of vector spaces and linear transformations. Complex vector spaces, unitary and Hermitian matrices. Jordan canonical form. Selected applications as time permits. Students who took 330-1 (formerly 337-1) prior to 2004–05 may not take 334 for credit toward the major without departmental consent. Prerequisites: 240 or equivalent; 300 or equivalent.

MATH 336-1,2 Introduction to the Theory of Numbers 1. Divisibility and primes, congruences, quadratic reciprocity, Diophantine problems. **2.** Additional topics in analytic and algebraic number theory. Prerequisite: for 336-1: 230; for 336-2: 336-1.

MATH 340-0 Geometry Axiomatics for Euclidean geometry. Non-Euclidean geometry. Projective geometry. Introduction of coordinate system from the axioms. Quadrics. Erlangen program. Introduction to plane algebraic curves. Prerequisite: 230 and 300 or equivalent.

MATH 342-0 Introduction to Differential Geometry Curves and surfaces in three-dimensional space. Prerequisites: 234 and 240 or equivalent.

MATH 344-1,2 Introduction to Topology 1. Basic concepts: topologies, connectedness, compactness, separation axioms. Geometric concepts, including simplicial complexes and manifolds. **2**. Fundamental groups. Language of categories. Covering spaces. Prerequisite for 344-1: 320-1 or equivalent; for 344-2: 344-1 and 330-1 or equivalent.

MATH 351-0 Fourier Analysis and Boundary Value Problems Expansion in orthogonal functions with emphasis on Fourier series. Applications to solution of partial differential equations arising in physics and engineering. Students may not receive credit for both 351 and 381 or both 351 and ESAM 311-2. Prerequisite: 250.

MATH 353-0 Qualitative Differential Equations Qualitative theory of ordinary differential equations. Linear systems, phase portraits, periodic solutions, stability theory, Lyapunov functions, chaotic differential equations. Prerequisites: 240 and 250 or equivalent.

MATH 354-1,2 Chaotic Dynamical Systems 1. Chaotic phenomena in deterministic discrete dynamical systems, primarily through iteration of functions of one variable. **2.** Iteration of functions of two and more variables, including the study of the horseshoe map, attractors, and the Henon map. Complex analytic dynamics, including the study of the Julia set and Mandelbrot set. Prerequisite: 240.

MATH 360-1,2 MENU: Applied Analysis 1. Linear ordinary differential equations and their applications. **2.** Systems of linear ordinary differential equations, qualitative analysis of ordinary differential equations, linear partial differential equations, Laplace transform, Fourier series, orthogonal functions, and applications. Prerequisite: 290-1,2,3 or 291-1,2,3.

MATH 364-0 Game Theory Selected topics in game theory: noncooperative games, matrix games, optimal strategies, cooperative games. Students may not receive credit for both 364 and ECON 380-1. Prerequisite: 240.

MATH 366-1 Mathematical Models in Finance Cash flow computations. Basic financial concepts (stocks, bonds, options, arbitrage, hedging) and put-call parity. Binomial tree models. Risk-neutral valuation. Random walk and Brownian motion as a tool of modeling fluctuations. Options pricing. Application of the central limit theorem. The Black-Scholes formula and partial differential equation. Numerical approximations. Prerequisites: 240 plus any 1 of 310-1, 311-1, 385, IEMS 202, or ECON 381-1. Some acquaintance with basic differential equations is desirable but not required.

MATH 368-0 Introduction to Optimization Methods and concepts of linear and nonlinear optimization theory, going beyond the treatment of optimization in calculus. Topics not usually covered in real analysis, including Kuhn-Tucker Theory, convexity conditions, and linear programming. Fulfills a prerequisite for the Kellogg managerial analytics certificate. Prerequisites: 285-3, 290-3, or 291-3; or both 240 and 300.

MATH 370-0 Mathematical Logic Mathematical formulation and rigorous discussion of logical systems, particularly the propositional calculus and the functional calculi of first and second order. Well-formed formulae, formal languages, proofs, tautologies, effective procedures, deduction theorems, axiom schemata. Prerequisite: consent of instructor.

MATH 381-0 Fourier Analysis and Boundary Value Problems for ISP Fourier analysis and boundary value problems. Students may not receive credit for both 351 and 381. Ordinarily taken only by students in ISP; permission required otherwise. Prerequisites: 281-1,2,3; PHYSICS 125-1,2,3.

MATH 382-0 Complex Analysis and Group Theory for ISP Complex analysis, elements of group theory. Students may not receive credit for both 325 and 382. Ordinarily taken only by students in ISP; permission required otherwise. Prerequisites: 281-1,2,3; PHYSICS 125-1,2,3.

MATH 385-0 Probability and Statistics for MMSS Probability theory and its social science applications. Students may not receive credit for both 385 and any of 310-1, 311-1, 314, or STAT 383. Prerequisite: second-year standing in MMSS.

MATH 386-1,2 Econometrics for MMSS Econometric methods. Prerequisite: second-year standing in MMSS.

MATH 395-0 Undergraduate Seminar Topics of modern mathematics and relationships among different branches of mathematics. Open only to superior students by consent of department. May be taken for only 1 unit of credit at a time but may be repeated for credit with change of topic.

MATH 399-0 Independent Study Open on approval of department to undergraduates who are qualified to do independent work under the direction of a faculty adviser.

Students must file a plan of study with the department before enrollment in 399.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

MIDDLE EAST AND NORTH AFRICAN STUDIES

www.mena.northwestern.edu

Study of the Middle East and North Africa is vital, given the region's centrality in history and politics and a liberal education's focus on the diversity of the human experience. The Middle East and North African Studies Program incorporates the latest critical approaches to social, cultural, political, and economic forces in the region, which stretches roughly from Morocco to Iran and Central Asia, from the Mediterranean into Saharan Africa and the Sudan. The program trains students in languages, histories, literatures, and sociocultural specificities while encouraging consideration of the region's global integration. It advances fresh perspectives on Middle East studies by inquiring how the cultural, political, and economic conditions of globalization influence the region internally and externally.

Drawn from anthropology, art history, history, literature, media studies, political science, religion, and radio/television/film, among other areas, the faculty represent a variety of perspectives, with a focus on the 19th, 20th, and 21st centuries. It reflects Northwestern's strengths in diaspora studies, Islam in trans-Saharan Africa, media studies, cultural production, and North African studies. The program embraces comparative approaches, both cross-regional and cross-disciplinary. Course topics include the Middle East and North Africa in international politics, mass media, migration, digital cultures, arts and literature, law, and religious movements.

The major and the minor prepare students for careers in a variety of fields, including law, government, human rights, international development, and cultural organizations.

Major requirements (17 units)

- 6 courses in Arabic, Hebrew, Persian, or Turkish beyond the first year. Native-speaker proficiency, determined by testing, fulfills the language requirement but does not count for course credit. Native speakers may complete this 6-course requirement with courses in a second MENA language and/or approved disciplinary courses.
- 2 quarters of 301
- 9 additional courses, each chosen from the approved program list for the quarter or in consultation with the director
  - Distributed among three disciplinary categories
    - 3 in history
    - 3 in social sciences (including anthropology, economics, linguistics, political science, psychology, and sociology)
    - 3 in humanities (including art history, art theory and practice, comparative literary studies, English, humanities, philosophy, and religious studies)
  - At least 7 of the 9 must relate to the Middle East and North Africa.
  - At least 2 of the 9 must be research courses in MENA studies, including seminars and independent study, leading to a substantial paper; consult the program website or office for eligible courses.
  - With consent of the director, additional quarters of 301 may count in the disciplinary category of the respective instructor.
- At most 2 courses may be double-counted toward another major.
- The major also requires a study abroad experience in the Middle East or North Africa, preferably during the academic year; consult the program director for advice and approval. Students may petition for a waiver or modification of this requirement in exceptional cases.

Minor requirements (8 units)

- Each course must be chosen from the approved MENA studies list for the quarter or in consultation with the director and must relate to the Middle East or North Africa.
- Foreign language study is not required for the minor, and no more than 2 courses may be Arabic, Hebrew, Persian, or Turkish language courses.
- At least 2 courses should be selected in each of the three disciplinary categories: history, social sciences, and humanities.
- Students who satisfactorily complete two years of language study in Arabic, Hebrew, Persian, or Turkish may complete the minor with only 6 disciplinary courses.
- Native-speaker proficiency does not count for course credit; native speakers may count 2 nonnative MENA language courses among the 8 courses.

Honors in Middle East and North African Studies

Majors with strong academic records and an interest in pursuing honors should secure a faculty adviser and submit an honors application, including a brief research proposal, to the program office by the first week of spring quarter of junior year. (Those studying abroad have another two weeks.) Accepted students complete a thesis, normally through 3 quarters of senior-year independent study (399), which can count for credit in the relevant disciplinary category.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program website,

visit the program office, and see Honors in the Major on page 38.

Courses Taught in English

MENA 275-0 Arabic Literature in Translation Introduction to Arabic literary background, surveying literary genres from the pre-Islamic period to the present. Taught with COMP LIT 275; students may not receive credit for both courses.

MENA 290-3,4,5,6 Introductory Topics in Middle East and North African Studies Content and prererequisites vary. Course number indicates distribution requirement area in which a course counts. May be repeated for credit with change of topic.

MENA 301-1,2,3 Seminar in Middle East and North African Studies Interdisciplinary approaches to the study of the Middle East and North Africa. Content varies with annual theme. May be repeated for credit with a change in topic. Courses need not be taken in sequence.

MENA 390-3,4,5,6 Advanced Topics in Middle East and North African Studies Content and prerequisites vary. Course number indicates distribution requirement area in which a course counts. May be repeated for credit with change of topic.

MENA 399-0 Independent Study Reading and conferences on special subjects for advanced undergraduates. Prerequisite: consent of director of undergraduate studies and instructor.

Arabic Courses

ARABIC 111-1,2,3 Arabic I Three-course introduction to modern standard Arabic primarily, along with some exposure to and familiarization with the main regional spoken varieties. Speaking, reading, and listening comprehension and basic writing skills developed.

ARABIC 114-0 Conversation and Culture in the Arab World: Spoken Egyptian Arabic In-depth introduction to culture and everyday language of Egypt; contrastive analysis of formal written modern standard Arabic and spoken Egyptian Arabic. Prerequisite: 111-2 or equivalent.

ARABIC 121-1,2,3 Arabic II Further development of grammar knowledge, reading, writing, speaking, and listening skills. Completion of at least this level is recommended for students seeking functional proficiency for study abroad. Prerequisite: 111-3 or equivalent.

ARABIC 211-1,2,3 Arabic III Continued skills development through reading and discussion of Arabic writings from both textbooks and media resources. Prerequisite: 121-3 or equivalent.

ARABIC 311-1,2,3 Arabic IV Continuation of instruction in Arabic using textbooks and supplemental materials from literary sources (prose and poetry) and broadcast and print media. Emphasis on developing more advanced writing skills. Prerequisite: 211-3 or equivalent.

ARABIC 316-1 Reading Arabic Poetry (in Arabic) Introduction to classical and modern Arabic poetry in both traditional meter and free verse, including selections from the Umayyad, Abbasid, and modern periods. Prerequisite: 311-3 or equivalent.

ARABIC 316-2 Reading Classical Arabic Texts (in Arabic) Samples of *adab* and classical branches of learning are used to introduce students to classical Arabic literature and continue to strengthen their skills. Prerequisite: 311-3 or equivalent.

ARABIC 316-3 Reading Modern Arabic Prose (in Arabic) Samples of modern Arabic short stories and novels are used to introduce students to modern Arabic literature and continue to strengthen their skills. Prerequisite: 311-3 or equivalent.

ARABIC 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Arabic. Prerequisite: consent of instructor.

Hebrew Courses

See Jewish studies.

Persian Courses

PERSIAN 111-1,2,3 Persian I Sequential 3-course introduction to basic literacy and oral proficiency.

PERSIAN 121-1,2,3 Persian II Intermediate Persian Prerequisite: 111-3 or equivalent.

PERSIAN 399-0 Independent Study For students who have advanced with distinction beyond the regular course offerings in Persian. Prerequisite: consent of instructor.

Turkish Courses

Turkish courses are offered in alternate years.

TURKISH 111-1,2,3 Turkish I Sequential 3-course introduction to basic literacy and oral proficiency.

TURKISH 121-1,2,3 Turkish II Intermediate Turkish Prerequisite: 111-3 or equivalent.

MOLECULAR BIOSCIENCES

The Department of Molecular Biosciences does not offer an undergraduate degree. See Biological Sciences for a description of that major.

NEUROBIOLOGY

The Department of Neurobiology does not offer an undergraduate degree. See Biological Sciences for a description of that major.

PERSIAN

See Middle East and North African Studies.

PHILOSOPHY

www.philosophy.northwestern.edu

The Department of Philosophy is committed to exposing students to a broad range of philosophical traditions and issues. With strengths in Anglo-American and continental

philosophy, the department provides courses in all systematic areas of philosophy as well as a strong array of courses in ancient, medieval, and modern philosophy. The research interests of members of the department show a similar breadth. This pluralism enables students to see philosophy's application to all areas of life and to appreciate the diversity of approaches possible in philosophy.

Major in Philosophy

Because the study of philosophy involves the critical discussion of the most fundamental questions asked by human beings, it helps develop breadth of understanding and clarity of thought. This character of philosophical inquiry makes choosing philosophy as a second major attractive to many students. Moreover, with appropriate supporting courses, a philosophy major can be a sound preparation for many careers, whether or not they involve further study.

The core of the program is a firm grounding in the history of philosophy. Against this background, students may tailor a program that meets their particular interests.

Major requirements (13 units)

- 2 history of philosophy courses: 210-1,3 (should be completed as early as possible, since the material is a prerequisite to more advanced work)
- 1 logic course: 150 or 250 (should be completed as early as possible, since the material is a prerequisite to more advanced work)
- 1 course in moral or political philosophy: 260 or 261
- 9 additional courses
  - None may be freshman seminars, 270, 373, or 398.
  - At least 6 must be at the 300 level (not including 398).
  - Up to 3 quarters of 273-1,2,3, offered in the Brady Program in Ethics and Civil Life (page 90), may be counted, but then students may not petition to count another course offered outside the department.
  - 1 of the 9 electives may be from outside the department if it has substantial philosophical content. Course approval must be obtained from the director of undergraduate studies by submitting a petition that includes the course syllabus.

Minor in Philosophy

The minor in philosophy requires students to be well-grounded in the history of philosophy, especially ancient and early modern, covering the major texts of ethical and political theory as well as the major texts of epistemology and metaphysics. The emphasis on argument and logical structure in philosophy requires familiarity with contemporary logic, at least up to the level of the first-order predicate calculus. Beyond this foundational requirement, students take 4 courses tailored to their individual interests and, typically, to complement work being done in their major. To provide the greatest latitude, only 3 of the 4 remaining courses need be at the 300 level.

Minor requirements (8 units)

- 4 core courses: 150 or 250, 210-1, 210-3, and 260 or 261
- 4 additional courses
  - At least 3 must be at the 300 level.
  - None may be freshman seminars, 270, 373, or 398.
  - 1 from 273-1,2,3, offered in the Brady Program in Ethics and Civil Life (page 90), may be counted.

Honors in Philosophy

Majors with strong academic records and an interest in pursuing honors should have project proposals approved by a faculty supervisor and the director of undergraduate studies or the philosophy department honors convenor before the end of winter quarter of junior year. They then take 398-1 in spring quarter of junior year and 398-2 in fall quarter of senior year; neither counts toward major requirements. (Students may petition to begin this thesis sequence in fall quarter of senior year.) Near the end of the second quarter of 398, students submit completed theses, which are evaluated by the undergraduate committee in terms of level of research and philosophical reflection.

Students whose papers and grades meet department criteria are recommended to the college for graduation with honors. For more information see the department website and Honors in the Major on page 38.

Courses Primarily for Freshmen and Sophomores

Students with an informed interest in philosophy, especially those intending to choose philosophy as a major, should begin with 210-1 and 210-3 in their first year.

PHIL 110-0 Introduction to Philosophy Fundamental problems and methods of philosophy.

PHIL 150-0 Elementary Logic I Introduction to the formal study of logical implication. Paraphrase of English sentences into logical schemata. Truth-functional logic. Quantifiers, predicates, and relations. Implication and its general properties. Establishing implication. First quarter of 150/250/350 sequence.

PHIL 151-0 Scientific Reasoning Introduction to probabilistic calculus and its role in science. Topics may include Bayes's theorem, the Dutch Book theorem, hypothesis and confirmation, problems of induction, subjective and objective interpretations of probability.

PHIL 210-1,2,3 The History of Philosophy 1. Ancient philosophy. **2.** Medieval. **3.** Early modern.

PHIL 216-0 Introduction to Pragmatism Introduction to classical and contemporary literature in pragmatist philosophy: Peirce, James, Mead, Dewey, and 20th-century neopragmatist authors (Quine, Rorty, Putnam, et al.).

PHIL 219-0 Introduction to Existentialism Principal sources of existential philosophy: Kierkegaard, Jaspers, Marcel, Nietzsche, Sartre, Heidegger, Merleau-Ponty, and others.

PHIL 220-0 Introduction to Critical Theory Crisis, criticism, and critique in philosophical, political, and cultural contexts. Focus on the philosophical aspects of critical theory

with reference to social conditions and art, literary, and/or political forms. Taught with COMP LIT 207; students may not receive credit for both courses.

PHIL 225-0 Minds and Machines Introductory course addressing philosophical issues arising from the study of intelligence, including the possibility of machine intelligence and its relevance to the study of human intelligence.

PHIL 230-0 Gender, Politics, and Philosophy Role of gender difference in the main political-philosophical traditions: social contract, liberalism, republicanism, socialism-Marxism, critical theory. The classics of feminist political philosophy (Wollstonecraft, Mill, Taylor, Engels), followed by contemporary debates. Taught with GNDR ST 233; students may not receive credit for both courses.

PHIL 240-0 Freedom and Responsibility Introduction to philosophy through an examination of major theories of freedom and responsibility, with attention to how these may be affected by the scientific worldview.

PHIL 241-0 Philosophy of Cyberspace Exploration of important philosophical issues concerning virtual worlds, including their nature, the nature of virtual economies, online identity, and notions of privacy, property, and online justice.

PHIL 248-0 Paradoxes A tour of puzzles, paradoxes, and their neighbors. Possible topics include Zeno's paradox, the sorites paradox, the liar paradox, and paradoxes of confirmation.

PHIL 250-0 Elementary Logic II Formal systems of deductive inference and their metalogical properties. Formal semantics. Natural deduction. Completeness and compactness; decidable fragments of first-order logic. Lowenheim-Skolem theorems. Second quarter of 150/250/350 sequence. Prerequisite: 150.

PHIL 254-0 Introduction to Philosophy of the Natural Sciences Philosophical and methodological issues in the natural sciences, such as the discovery and testing of hypotheses, explanation, theory selection, the nature of scientific laws, causality, space and time, determinism.

PHIL 255-0 Theory of Knowledge Basic philosophical questions about human knowledge, focusing on skepticism and competing theories of knowledge.

PHIL 259-0 Introduction to Metaphysics Introductory discussion of some debates in contemporary metaphysics. Possible topics include objectivity, time, universals, causations, possible worlds, and material constitution.

PHIL 260-0 Introduction to Moral Philosophy Overview of some of the main ideas and most influential writings of moral philosophy.

PHIL 261-0 Introduction to Political Philosophy Overview of some of the main ideas and most influential writings of political philosophy.

PHIL 262-0 Ethical Problems and Public Issues Analysis of such controversial issues as the death penalty, abortion, euthanasia, sexual morality, economic justice and welfare, pornography and censorship, discrimination and preferential treatment, the environment, and world hunger.

PHIL 266-0 Philosophy of Religion Survey of the central issues in the philosophic analysis of religious experience: the existence of God, creation, miracles, the claims of faith versus the claims of reason, sin, free will, and immortality.

PHIL 267-0 Philosophy, Race, and Racism Introduction to philosophical discussions of race, race identity, and racism. Readings may be drawn from classical as well as contemporary sources.

PHIL 268-0 Ethics and the Environment Topics include our relationship to the environment, the obligation to future generations, pollution and population control, food and energy production and distribution, species diversity, and the preservation of wilderness.

PHIL 269-0 Bioethics Ethical analysis of a variety of issues such as the human genome project, genetic therapy, cloning and stem cell transplantation, human and animal research, reproductive technologies, and the allocation of resources.

PHIL 270-0 Climate Change and Sustainability: Political and Ethical Dimensions Interdisciplinary analysis of political and ethical issues concerning climate change; discussion of scientific evidence for anthropogenic global warming; discussion of the politics and ethics of resource use, conservation practices, and sustainability. Taught with ISEN 230; students may not receive credit for both courses.

PHIL 280-0 Introduction to the Philosophy of Art An introduction to major themes and theories in the philosophy of art, including questions concerning the nature of taste, beauty, art, and artistic creativity.

Courses Primarily for Juniors and Seniors

PHIL 310-0 Studies in Ancient Philosophy Works of one or more important philosophers or movements before 500 C.E. May be repeated for credit with change of topic.

PHIL 311-0 Studies in Medieval Philosophy Works of one or more important philosophers or philosophical movements between 500 and 1500 C.E. May be repeated for credit with change of topic.

PHIL 312-0 Studies in Modern Philosophy Works of one or more important philosophers or philosophical movements between 1500 and 1800. May be repeated for credit with change of topic.

PHIL 313-1,2 Kant's Critique of Pure Reason 1. Detailed analysis of Kant's claims to justify human knowledge in *The Critique of Pure Reason*. **2.** Detailed analysis of Kant's criticism of traditional metaphysics.

PHIL 314-0 Studies in German Philosophy Study of one or more key themes, figures, or historical developments in German philosophy from the 18th century to the present. May be repeated for credit with change of topic.

PHIL 315-0 Studies in French Philosophy One or more figures of 20th-century or contemporary French philosophy. May be repeated for credit with change of topic.

PHIL 316-0 Studies in American Philosophy Examination of one or more classical texts or contemporary works in American philosophy. Representative authors are Peirce, James, Dewey, Mead, and Quine. May be repeated for credit with change of topic.

PHIL 317-0 Studies in 19th- and 20th-Century Philosophy Study of one or more key philosophical themes, figures, or developments of the 19th century, 20th century, or both. May be repeated for credit with change of topic.

PHIL 318-0 Studies in Contemporary Philosophy Selected philosophical works of the latter part of the 20th century or the 21st century. May be repeated for credit with change of topic.

PHIL 319-0 Existentialism and Its Sources Intensive study of one or a small number of major contributions to the existentialist tradition.

PHIL 325-0 Philosophy of Mind Selected topics in the philosophy of mind: mind-body problem, problem of other minds, self-knowledge, personal identity, philosophical psychology. May be repeated for credit with change of topic.

PHIL 326-0 Philosophy of Medicine Introduces premed students to ethical problems they are likely to encounter. For example: Is it ever ethical to withhold information from a patient? Should physicians help terminally ill patients commit suicide? Should health care for the elderly be more limited than for children?

PHIL 327-0 Philosophy of Psychology Problems such as the nature of psychological explanation, experimentation and the testing of psychological claims, the standing of psychology as a science, reductionism, the unconscious, and conceptualizing the psyche and its processes.

PHIL 328-0 Classics of Analytic Philosophy Examination of classic texts that shaped the analytic movement of 20th-century Anglo-American philosophy. Readings from Frege, Russell, Wittgenstein, Carnap, Quine, and others.

PHIL 330-0 Practical Reasoning and Choice Theory of decision making, what it is to decide, possible constraints on decisions, how to understand preference reversals, paradoxes of decision making, and actions taken against one's better judgment. Prerequisite: 150.

PHIL 350-0 Advanced Logic Metalogical limitations of logical theories. Formal arithmetic. Recursive functions. Arithmetization of syntax. Incompleteness and undecidability. Truth-predicates in first- and second-order logic. The provability predicate. Third quarter of 150/250/350 sequence. Prerequisite: 250.

PHIL 351-0 Advanced Topics in Philosophical Logic Methods of modern formal logic applied to traditional philosophical questions, e.g., modal logic, deontic logic, epistemic logic, many-valued logic, tense logic. Prerequisite: 250.

PHIL 352-0 Philosophy of Mathematics Nature of mathematical entities and mathematical truth. Platonism, intuitionism, fictionalism, nominalism, the synthetic a priori, self-referential paradoxes, incompleteness and undecidability, consistency, alternative axiomatizations and uniqueness, the relation between mathematics and logic, and mathematical revolutions.

PHIL 353-0 Philosophy of Language The nature and uses of language as presenting philosophical problems, e.g., theory of reference, the modes of meaning, definition, metaphor, problems of syntax, and semantics. May be repeated for credit with change of topic.

PHIL 355-0 Scientific Method in the Social Sciences Analysis of the philosophical foundations of social inquiry with reference to selected problems, thinkers, and schools, both classical and modern.

PHIL 357-0 Topics in Metaphysics and Epistemology Examination of current debates in metaphysics and epistemology, broadly understood. Possible topics include skepticism, mental representation, time, the epistemology of testimony, linguistic norms, personal identity, causation, and modality. May be repeated for credit with change of topic.

PHIL 358-0 Epistemology Central problems in the theory of knowledge, emphasizing contemporary developments. A priori knowledge, perception memory, induction, and theories of meaning and truth.

PHIL 359-0 Studies in Metaphysics The most general features of reality and their relation to thought and language. Topics may include existence, time, identity, properties, truth, causality, and freedom.

PHIL 360-0 Topics in Moral Philosophy Philosophical analysis of recent or contemporary issues, theories, or figures in moral philosophy. May be repeated for credit with change of topic.

PHIL 361-0 Topics in Social and Political Philosophy Philosophical analysis of a recent or contemporary issue, individual philosopher, or school of thought in social and political philosophy. May be repeated for credit with change of topic.

PHIL 362-0 Studies in the History of Ethical and Political Theory Examination of one or more major figures or movements in the history of moral or political philosophy. May be repeated for credit with change of topic.

PHIL 363-0 Kant's Moral Theory Exploration of the moral and ethical thought of Immanuel Kant through careful study of *Groundwork of the Metaphysics of Morals* along with readings from the *Critique of Practical Reason*, *Metaphysics of Morals*, and *Religion within the Bounds of Mere Reason*.

PHIL 367-0 Studies in African American Philosophy Study of the work of one or more important African American philosophers or philosophical movements of the 19th or 20th centuries. May be repeated for credit with change of topic.

PHIL 369-0 Philosophy and Gender Survey of approaches to sex and gender throughout the history of philosophy.

PHIL 370-0 Philosophy and Literature Issues involving the relationship between philosophy and literature.

PHIL 380-0 Topics in the Philosophy of Art Topics to be discussed might include the nature and purpose of art,

art and perception, the nature of creativity, and the social responsibility of the artist.

PHIL 390-0 Special Topics in Philosophy May be repeated for credit with change of topic.

PHIL 398-1,2 Senior Tutorial Undergraduate honors thesis. Grade of K given in 398-1. Prerequisite: consent of instructor.

PHIL 399-0 Independent Study Open to properly qualified students with consent of instructor.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

PHYSICS AND ASTRONOMY

www.physics.northwestern.edu

The physics and astronomy major provides an excellent intellectual foundation for nearly any career. The emphasis on quantitative thinking and mathematical analysis that characterizes physics and astronomy can be applied to business and other nonscience areas. While there is no formal major in astronomy, students may select the astronomy concentration within the physics major.

Majors in physics and astronomy usually take PHYSICS 135-1,2,3 in freshman year. Exceptionally qualified students may take PHYSICS 125-1,2,3 with consent of the Department of Physics and Astronomy and the Integrated Science Program director. Depending on their high school preparation, majors normally study mathematics in their freshman and sophomore years, starting with MATH 220, 224, and 230 and continuing with 234, 240, 250, and 351. (See the prerequisites for PHYSICS 135-1,2,3; students taking PHYSICS 125-1,2,3 must be enrolled in either MATH 290-1,2,3 or 281-1,2,3.)

Students in Weinberg College may complete their science distribution requirement by taking any of the following courses: PHYSICS 103, 105, 130-1,2, 135-1,2; ASTRON 101, 102, 103, 111, 120, 130. PHYSICS 103, 105, and the 6 astronomy courses allow students who have taken only high school mathematics to explore important ideas in the physical sciences.

Students intending to study physics and/or astronomy in graduate school should consider taking some or all of the following: 2 or 3 units of PHYSICS 398 or 399 undertaken with the supervision of a faculty member and consisting of a research project in the student's area of concentration; MATH 325 and 334; selected introductory graduate courses such as PHYSICS 412-1,2,3. They should plan to meet with the director of undergraduate studies before sophomore year ends.

Major in Physics

The physics major is designed to help students acquire a broad and varied background in physics and related fields. The three basic steps toward completing the physics major are fulfilling prerequisites in introductory physics and calculus; taking a core sequence of courses in classical physics, modern physics, and mathematics; and completing a course concentration.

Prerequisites

- MATH 220 and 224 or 212, 213, and 214; 230
- PHYSICS 125-1,2,3 or 135-1,2,3

Major requirements

- 9 core courses
  - MATH 234, 240, and 250 *or* 250 and 290-1,2,3 *or* 281-1,2,3; 351
  - PHYSICS 330-1, 332, 333-1, 339-1
  - 1 lab course from ASTRON 321; PHYSICS 357, 358, 359, 360 (may not also be counted toward the concentration)
- 6–8 courses in the chosen concentration
  Laboratory components of general chemistry courses require separate registration and bear separate credit; see the chemistry section for details.
  - *Advanced physics (6 units)*
    - PHYSICS 330-2, 333-2, 339-2
    - 1 lab course from ASTRON 321; PHYSICS 357, 358, 359, 360 (may not also be counted toward the concentration electives)
    - 2 other 300-level physics or astronomy courses other than PHYSICS 335, 398, 399 and ASTRON 398, 399
  - *Astronomy (6 units)*
    - PHYSICS 330-2, 333-2, 339-2
    - ASTRON 220
    - 2 other 300-level astronomy classes other than 398, 399
  - *Biomedical physics (8 units)*
    - CHEM 101 and 102 *or* 171 and 172
    - BME 301, 302, 305
    - 2 courses selected from BME 303, 323, 327, EECS 360
    - 1 lab course from ASTRON 321; PHYSICS 357, 358, 359, 360
  - *Computational physics (7 units)*
    - ES APPM 311-1 or 346
    - MATH 310-1
    - PHYSICS 352
    - 1 lab course from ASTRON 321; PHYSICS 357, 358, 359, 360 (may not also be counted toward the concentration electives)
    - 3 electives chosen from the following:
      1 300-level physics or astronomy course other than 335, 398, 399
      ES APPM 311-2,3, 322
      EECS 310, 336
      MATH 310-2,3, 354-1,2, 374
      STAT 330-1,2

- *Materials physics (8 units)*
  - CHEM 101 and 102 *or* 171 and 172
  - PHYSICS 337, 339-2
  - MAT SCI 316-1,2 plus 2 courses chosen from 332, 355, 360, 361, 380
- *Nanoscale physics (6 units)*
  - PHYSICS 333-2, 337, 339-2, 358
  - 2 electives chosen from the following:
    BME 305, 317, 343, 366
    EECS 389
    MAT SCI 355, 360, 370, 376, 381
    MECH ENG 319, 381, 382, 385
    At most 1 from ASTRON 321; PHYSICS 357, 359, 360

Minor in Physics

The minor in physics gives students a basic understanding of the most essential concepts in the field. It carries the same prerequisites as the physics major, a somewhat lighter core, and 2 physics electives.

Prerequisites

- MATH 220 and 224 *or* 212, 213, and 214; 230
- PHYSICS 125-1,2,3 or 135-1,2,3

Minor requirements (8 units)

- MATH 234, 240, and 250; or 250 and 290-1,2,3; or 281-1,2,3
- PHYSICS 330-1; 333-1; 335 or 339-1
- 2 other 300-level physics or astronomy courses other than 398 or 399

Physics Second Major for ISP Students

The Integrated Science Program is a highly selective BA program in Weinberg College that includes PHYSICS 125-1,2,3 and 339-1,2,3 and ASTRON 331 as part of its curriculum. Application to this program is made directly to ISP. It is possible to complete a double major in physics and ISP by completing the following 6 additional upper-level courses:

- PHYSICS 330-1,2 or PHYSICS 333-1,2
- 3 courses chosen from 300-level physics or astronomy courses other than PHYSICS 335, 398, 399, ASTRON 399, and those required by ISP (PHYSICS 339-1,2,3 and ASTRON 331)
- 1 lab course from ASTRON 321; PHYSICS 357, 358, 359, 360
- Students pursuing an ISP/physics double major may not substitute ISP 398 for any physics or math course in the ISP curriculum. They do not have to choose a physics course concentration.

Honors in Physics and Astronomy

Majors with strong records in their physics, astronomy, and mathematic courses and an interest in pursuing honors should notify the director of undergraduate studies in October of senior year. Eligible students must enroll for 2 units of 398 by the time of graduation. They participate in research culminating in a written report.

Students whose research reports and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of Physics

Weinberg College students pursuing a major in physics who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Advanced Placement

Freshmen who have taken a calculus-level physics course in high school may waive parts of the introductory physics sequence in the following ways:

- A score of 5 on the College Board Advanced Placement Physics C1 examination (Mechanics) and/or the C2 exam (Electricity and Magnetism) will give the student full credit for 135-1 and/or 135-2, respectively.
- A score of 5 on the College Board Advanced Placement Physics B exam (algebra-based physics) will give the student full credit for 130-1 and 130-2.
- A passing score on the departmental placement examinations, given during New Student Week, will allow a student to place out of any or all parts of the 130-1,2,3 or 135-1,2,3 sequences. (No college credit is given for placing out of the courses.)
- Students who have taken college-level physics on the campus of an accredited college while in high school may apply to have the credit transferred to Northwestern. A transcript from the college is needed. "College-level" classes taken at a high school are not eligible for transfer credit.

Physics Courses

PHYSICS 103-0 Ideas of Physics Topics in modern physics. Content varies—for example, relativity, the physics of music, and the progress of physics through history. Requires only high school mathematics and is designed for nonscience majors.

PHYSICS 105-0 Music, Sound, Timbre Introduction to the interface of art, technology, and science. MIDI; musical analysis and composition; physical acoustics and psychoacoustics; construction and acoustics of instruments; signal generation, recording, and analysis.

PHYSICS 125-1,2,3 General Physics for ISP General physics course relying extensively on calculus. Similar to 135-1,2,3 but more advanced and intended for ISP students. A

concurrent advanced calculus course, MATH 281-1,2,3, is offered by the mathematics department. Prerequisite: first-year standing in ISP or consent of the department.

PHYSICS 130-1,2,3 College Physics Algebra-based physics primarily for premedical students who do not need to take calculus-based physics. Topics covered are similar to those of 135-1,2,3. Students with credit for a quarter of 135 may not later receive credit for the comparable quarter of 130. Prerequisites: algebra and trigonometry.

PHYSICS 135-1,2,3 General Physics Classical physics for science and engineering majors and premedical students. **1.** Mechanics. Prerequisites: MATH 220, 224; concurrent registration in MATH 230. **2.** Electricity and magnetism. Prerequisite: 135-1. **3.** Introduction to modern physics; wave phenomena. Prerequisite: 135-2. Students with credit for a quarter of 135 may not later receive credit for the comparable quarter of 130.

PHYSICS 330-1,2 Classical Mechanics 1. Newtonian mechanics, oscillations, the Lagrangian and Hamiltonian formalisms, central-force motion. **2.** Motion in a non-inertial reference frame, kinematics of rigid modes, systems with many degrees of freedom. Prerequisites: 135-1 or equivalent; MATH 234, 240, 250, or equivalent.

PHYSICS 332-0 Statistical Mechanics Ideal gas, Boltzmann distribution, transport phenomena, fluctuation theory, Bose-Einstein and Fermi-Dirac statistics. Prerequisites: 330-1, MATH 234, 240, 250, or equivalent.

PHYSICS 333-1,2 Advanced Electricity and Magnetism 1. Electrostatics and magnetostatics, multipole expansion, solutions of Laplace's equation, images, analytic functions. **2.** Maxwell's equations, electromagnetic equations, electromagnetic wave propagation and radiation, microwave cavities, diffraction. Prerequisites: 135-1,2,3; MATH 234, 240, 250, or equivalent.

PHYSICS 335-0 Modern Physics for Nonmajors Survey of modern physics for nonmajors with a technical background. Relativity and quantum physics; nuclear, atomic, and molecular structure. Prerequisites: 135-1,2,3 or equivalent. Does not fulfill 300-level requirement for majors.

PHYSICS 337-0 Introduction to Solid-State Physics Electrons in periodic lattices; phonons; electrical, optical, and magnetic properties of metals and semiconductors; superconductivity. Prerequisites: 339-1,2.

PHYSICS 339-1,2 Quantum Mechanics Introduction to quantum theory. Applications to atomic and molecular systems. The harmonic oscillator, the one-electron atom, the hydrogen molecule, barrier penetration. Prerequisites: second-year standing in ISP or 330-1, 333-1, MATH 351.

PHYSICS 339-3 Particle and Nuclear Physics Nuclei and their constituents; nuclear models; alpha and beta decay; nuclear fission and fusion; the strong, electromagnetic, and weak interactions; and the fundamental particles and particle schemes. Prerequisites: 339-1,2.

PHYSICS 352-0 Introduction to Computational Physics Application of computing to physics: Monte Carlo simulation, numerical integration of equations of motion, discrete element methods in electromagnetism. Prerequisites: 135-1,2,3 or equivalent; MATH 250 or equivalent (concurrent registration is sufficient); EECS 110 or equivalent prior programming experience.

PHYSICS 357-0 Optics Laboratory Optics/laser lab focusing on optical instruments widely used in medical/biological studies, including optical microscopy, fluorescence spectroscopy, tumor detection in optical scattering, and optical fibers in endoscopes. Prerequisite: consent of instructor.

PHYSICS 358-0 Nanolithography Advanced lab involving fabrication of metallic nanometer-scale structures by electron-beam lithography. Characterization of these structures by atomic force microscopy. Prerequisite: 135-1,2,3 or equivalent.

PHYSICS 359-0 Electronics Introduction to modern electronics, construction of elementary analog and digital circuits. Prerequisites: 333-1,2 or consent of instructor.

PHYSICS 360-0 General Physics Laboratory Classic experiments in atomic, nuclear, and solid-state physics using modern electronics and microcomputers. Independent work. Prerequisites: 333-1,2 or consent of instructor.

PHYSICS 361-0 Classical Optics and Special Relativity Advanced topics following from electrodynamics, including advanced classical optics, Fraunhofer and Fresnel diffraction, radiation from accelerated charges, wave guides and/or antennae, and special relativity, including dynamics. Prerequisites: 333-1,2.

PHYSICS 371-0 Nonlinear Dynamics and Chaos Advanced topics following from classical mechanics. The focus will be on nonlinear dynamics and chaos theory, though coupled oscillations and continuous systems will also be covered. Prerequisites: 330-1,2.

PHYSICS 398-0 Independent Thesis Research Individual study under the direction of a faculty member. Open only to advanced students pursuing departmental honors.

PHYSICS 399-0 Independent Study Opportunity to study an advanced subject of interest under the individual direction of a faculty member. Open to all advanced students; consent of instructor required.

Astronomy Courses

All 100-level astronomy courses are specifically designed for students without technical backgrounds and require a mathematics background of only high school algebra.

ASTRON 101-0 Modern Cosmology Modern views on the structure of the universe, its past, present, and future. For nonscience majors who seek to follow 120 with a more detailed course.

ASTRON 102-0 Milky Way Galaxy Structure of the galaxy, star formation, interstellar clouds and dust, star clusters, neutron stars and black holes, the galactic center. For nonscience majors who seek to follow 120 with a more detailed course.

ASTRON 103-0 Solar System The planets and their moons, the sun, comets, asteroids. For nonscience majors who seek to follow 120 with a more detailed course.

ASTRON 111-0 Introduction to Astrobiology The modern scientific perspective on the question of life elsewhere in the universe. The prospects for life on Mars. The discovery of extrasolar planets and the search for extrasolar biospheres.

ASTRON 120-0 Highlights of Astronomy Acquaints students with modern ideas about the solar system, stars, galaxies, and the universe. Emphasizes fundamental principles and underlying concepts.

ASTRON 130-0 Imaging in Astronomy Introduction to the wide range of telescopes used to gather astronomical data and the techniques used to reduce the data. Of relevance to any field that uses extensive data or image analysis.

ASTRON 220-0 Introduction to Astrophysics Use of introductory physics (mechanics, electromagnetism, thermodynamics, and modern physics) to cover astrophysical topics starting with the solar system and ending with the large-scale structure of the universe and cosmology. Prerequisites: PHYSICS 135-1,2,3 or equivalent.

ASTRON 321-0 Observational Astrophysics Geometric optics applied to design of optical and x-ray telescopes; diffraction and the Airy disk; radio and optical interferometry and aperture synthesis; adaptive optics; recent developments in detector technology; quantum and thermal noise in astronomy. Independent research projects using the CCD camera and 18-inch refractor in Dearborn Observatory. Offered alternate years. Prerequisite: 220.

ASTRON 325-0 Stellar Astrophysics Physics of stellar interiors, stellar atmospheres, and star formation. Specific topics include simple stellar models, nuclear energy generation, overview of evolutionary phases, white dwarfs, neutron stars, interstellar gas and dust grains, gravitational collapse. Prerequisite: 220.

ASTRON 329-0 Extragalactic Astrophysics and Cosmology Big bang cosmology, thermal history of the universe, primordial nucleosynthesis, microwave background, dark matter, large-scale structure, galaxy formation, spiral and elliptical galaxies, groups and clusters of galaxies. Prerequisite: 220.

ASTRON 331-0 Astrophysics Stellar structure and evolution: nucleosynthesis, supernova phenomena, white dwarfs, neutron stars, and black holes. Prerequisite: PHYSICS 339-3. Limited to students enrolled in ISP or with consent of the physics department.

ASTRON 399-0 Independent Study Opportunity to study an advanced subject under the individual direction of a faculty member. Open to all advanced students. Consent of instructor required.

POLITICAL SCIENCE

www.polisci.northwestern.edu

Political science is the study of politics and power from domestic, international, and comparative perspectives. It entails understanding political ideas, ideologies, institutions, policies, processes, and behavior, as well as groups, classes, government, diplomacy, law, strategy, and war. A background in political science is valuable for citizenship and political action, as well as for future careers in government, law, business, media, or public service.

Northwestern's Department of Political Science offers classes in the four major subfields of the discipline—American politics, comparative politics, international politics, and political theory. Political science faculty are closely associated with other departments in Weinberg College, the law school, and the Kellogg School of Management, as well as several interdisciplinary programs, including the Buffett Center for International and Comparative Studies, the Institute for Policy Research, the Program of African Studies, the Gender and Sexuality Studies Program, the Chicago Field Studies Program, the Environmental Policy and Culture Program, and the Center for Civic Engagement.

Major in Political Science

The major in political science provides an opportunity for students to learn about politics in a variety of realms and settings. Students generally begin the major with 200-level courses, which provide a general introduction to subfields of political science as well as background for 300-level courses. Majors should choose 200-level courses from at least two subfields: American politics, comparative politics, international politics, and political theory.

When students declare a major in political science, they meet with an adviser in the department to discuss their programs of study. They may choose courses focusing on American politics, comparative politics, international politics, law and politics, political theory, or research methodology or courses across a variety of areas. Students planning to major in political science are advised to complete the 200-level gateway courses and at least 1 300-level course in political science by the end of sophomore year. Majors should complete their methodology requirement by the end of junior year and before taking the 395 research seminar. Students should plan to take 395 in junior year or early in senior year. Those who plan to pursue honors must take 395 in junior year.

Department courses (11 units)

- 3 gateway courses chosen from 201, 220, 221, 230, 240, 250. Since the gateway courses expose students to a variety of subfields, students may take no more than 2 from the American politics courses 220, 221, and 230 to fulfill this requirement.

- 1 methodology course in political science chosen from 310, 311, 312, 315
- 395
- 6 additional 300-level courses in political science; CFS 293, 394, 396, or 397 may substitute for at most 1 of these courses
- At most 2 political science courses taken abroad may be counted.

Related courses (5 units)

- At least 3 must be at the 300 level.
- No more than 1 may be at the 100 level.
- At most 3 taken abroad may be counted.
- Courses may be chosen from African American studies, American studies, anthropology, Asian American studies, Chicago Field Studies, economics, environmental policy and culture, gender and sexuality studies, global health, history, international studies, Latin American and Caribbean studies, legal studies, philosophy, psychology, and sociology.

Minor in Political Science

The minor in political science offers students the opportunity to acquire a foundation in the discipline as well as significant exposure to advanced courses.

Students may want to choose courses that complement and deepen their major area of study. For example, an economics major may want to focus on political economy courses. A history major might study contemporary politics in an area on which he or she is focusing. A philosophy major may study political theory. Alternatively, students can choose to broaden their knowledge of political science in areas unrelated to their majors. Students should consult with a member of the departmental undergraduate advising team to develop an individual program of study.

Minor requirements (6 units)

- At least 2 200-level courses chosen from 201, 220, 221, 230, 240, 250
- 4 additional political science courses, including at least 3 at the 300 level

Honors in Political Science

Majors (including students studying abroad) with strong academic records and an interest in pursuing honors should submit an application to the honors program by early March of junior year. Interested students should complete at least 7 of the 11 courses required for the major, including the methodology and research seminar requirements, before senior year. Accepted students enroll in the 2-quarter seminar 398-1,2, which provides guidance in writing a senior thesis; these courses do not count toward the major. Students interested in pursuing honors in more than one major are encouraged to pursue interdisciplinary honors.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information see the honors program link on the departmental website and Honors in the Major on page 38.

Certificate of Achievement in a Foreign Language

Mastery of a foreign language has become increasingly important to understanding politics at home and abroad. To encourage students to become proficient in a foreign language, the Department of Political Science offers a certificate of achievement in a foreign language that may be earned either through coursework in political science conducted in a foreign language (2 or more courses, usually completed during study abroad) or through the substantial use of foreign language materials in a thesis or other independent study–type (399) work. Faculty advisers can discuss options with students. The certificate must be approved by the director of undergraduate studies.

The Teaching of Political Science

Weinberg College students pursuing a major in political science who also wish to be certified for secondary teaching of political science with history must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

American Politics Courses

These courses examine the institutions of the US government and their linkages with the public.

POLI SCI 220-0 American Government and Politics The structure and process of American politics from competing perspectives. Analysis of representation, voting, interest groups, parties, leadership, and policy-making institutions. The gateway course for the American politics subfield.

POLI SCI 221-0 Urban Politics Structure of local and regional political power and its relation to the social and economic structure of community.

POLI SCI 320-0 The Presidency Development and operations of the American presidency. Political and constitutional evolution of the office, the modern executive establishment, and the politics of presidential leadership. Prerequisite: 220 or equivalent.

POLI SCI 321-0 Community Political Processes Selected problems of mobilizing and exercising political power in local and regional jurisdictional units. Relationship between political structure and community needs and demands.

POLI SCI 323-0 Public Opinion and Voting Behavior Who votes and for whom. Social, psychological, economic, and political factors influencing election choices. Sources of

opinions. Focus on American presidential elections with some comparative and nonpresidential material. Prerequisite: 220 or equivalent.

POLI SCI 324-0 Political Parties and Elections Role of political parties in a democratic society. Topics include nomination, national conventions, political funding, campaigns, party organization, and national, state, and local parties.

POLI SCI 325-0 Congress and the Legislative Process Organization of legislatures to make public policy; legislative-executive relations; impact of interest groups and other forms of citizen activity on legislative decision making. Emphasis on the US Congress. Prerequisite: 220 or equivalent.

POLI SCI 326-0 Race and Public Policy Analysis of how diversity shapes policy in the United States and how policies contribute to racial and ethnic diversity. Immigration reform, school choice, residential segregation, and criminal justice.

POLI SCI 327-0 African American Politics Survey of black politics in the United States, including blacks' relations with government, whites, political parties, public policy, and electoral politics.

POLI SCI 328-0 Public Policy The role of government in regulating economic and social behavior; theories of public policy making; sources and effects of public policy.

POLI SCI 329-0 US Environmental Politics Political problems associated with human impact on natural environment; pollution, natural resources, public lands, land use, energy, and population.

Comparative Politics Courses

This field analyzes political behavior and institutions in foreign countries and areas of the world. Some courses concentrate on understanding the politics of specific national systems, while others focus on certain types of political phenomena and make cross-national comparisons.

POLI SCI 250-0 Introduction to Comparative Politics Emphasis may be on industrialized and/or developing states. Major issues include regime-society relations, political change and conflict, and policy making.

POLI SCI 259-0 Contemporary African Politics A survey of Africa's diverse political systems, focusing on the development of democratic political systems since the 1990s. How the rule of law has become the norm in several important countries. Causes of political instability and violence in other countries; African and international responses to these problems.

POLI SCI 350-0 Social Movements Theory and case studies examining the processes shaping collective challenges to authority. Topics include causes of rebellion, mechanics of mobilization, repression and violence, strategies, and determinants of movement outcomes.

POLI SCI 351-0 Politics of the Middle East Survey of politics and political history of the Middle East and North Africa. Topics include colonialism, nationalism, state building, authoritarianism, democratization, political economy, Israeli-Palestinian conflict, Iraq war, and Iranian revolution.

POLI SCI 352-0 Comparative Democratic Institutions Elections, executive-legislative rules, policy formation, case studies of long-standing democracies, divided and coalition government, cabinet formation, ministerial turnover. Class is interactive and involves group work. Prerequisite: 250 or consent of instructor; MATH 220 or equivalent strongly recommended

POLI SCI 353-0 Politics of Latin America Patterns of socioeconomic development and regime forms in Latin America. Interaction of internal and international economic and political structures and processes.

POLI SCI 354-0 Politics of Southeast Asia Political economy of selected Southeast Asian countries, 1945 to present. Important themes include colonial influence, oligarchy, democratization, and human rights. Background in comparative politics or political economy is recommended.

POLI SCI 355-0 Politics of China The rise of the Communist Party; contemporary issues facing China, including economic reform, financial policies, and political reform.

POLI SCI 356-0 United States and Latin America Interactions between US foreign policy and Latin American politics. The evolving importance of Latin America in US geostrategic objectives since the beginning of the 20th century. How the projection of US power and influence shapes the domestic politics of selected countries.

POLI SCI 357-0 Politics of Postcolonial States European colonialism and its political consequences in Latin America, Asia, and Africa. Effects of colonial legacies on long-run development receive special attention.

POLI SCI 359-0 Politics of Africa Political structures and relation of cultural factors to political stability and change; development of modern political systems.

POLI SCI 361-0 Democratic Transitions Theories of the emergence and breakdown of democracy with a focus on cases from Europe, Latin America, Africa, and Asia.

POLI SCI 362-0 Politics of Western Europe Impact of historical development on contemporary institutions, political and political-economic institutions, interest groups and parties, policy making, and social and economic policy.

POLI SCI 363-SA Political Economy of the European Union The political production, structure, and regulation of economic activity in the EU. Restricted to students in Northwestern's Paris program.

POLI SCI 364-SA France and the European Union Introduction to French politics in the framework of European integration. Covers French efforts to promote integration and France's role in the international system and adaptation to the EU. Restricted to students in Northwestern's Paris program.

POLI SCI 365-SA Decision Making in the European Union Analysis, by lecture and simulation, of the EU's

complicated institutional structure for political decision making. Restricted to students in Northwestern's Paris program.

POLI SCI 366-SA Dynamics of Law Making in the European Union Examination of the dynamics of law making in the EU and conflict/balance between domestic and regional law. Restricted to students in Northwestern's Paris program.

POLI SCI 367-0 Politics and Nature in a Comparative Perspective The connectedness of people with natural systems. The relationships between processes of urbanization and globalization and struggles over protecting natural systems. Nature and cultural survival. The special role of national parks, biosphere reserves, and other protected areas in struggles over global biodiversity.

POLI SCI 368-0 Political Economy of Less-Developed Countries Major analytical perspectives of modern political economy seen through concrete problems of development and underdevelopment in the least developed countries.

POLI SCI 369-0 Politics of Post-Soviet Russia Analysis of Russia's political and economic revolutions after the collapse of the Soviet Union. Examines key concepts in comparative politics, such as revolution, regime change, market formation, nationalism, and state building.

POLI SCI 375-0 Comparative Politics of Business-Government Relations Relations between business and government in a variety of economic, social, and political contexts. Patterns of influence in both business and government. Theories of business influence in politics, such as pluralism, corporatism, collective action, and instrumental and structural Marxism.

International Politics Courses

This field includes the study of major actors and arenas in the world scene, global processes through which cooperation and conflict are managed in the international system, and ways in which change occurs and resources become allocated in the global system.

POLI SCI 240-0 Introduction to International Relations Introduction to the major theories, concepts, and problems of contemporary international relations. Security, political economy, and cooperation.

POLI SCI 340-0 International Relations Theory Conceptual approaches to international relations, including "national interest," sovereignty, international norms and law, and rationality. Prerequisite: 240 or consent of instructor.

POLI SCI 341-0 International Political Economy Introduction to the politics of international economic relations. Roots and evolution of the international political economy. Fundamental controversies about international trade, finance, and development. Prerequisite: 240 or consent of instructor.

POLI SCI 342-0 International Organizations Examination of institutions that arise from and govern the interactions of states, including formal organizations such as the WTO, UN, ICJ, and ICC, and informal norms such as international intervention, international criminal law, and sovereignty. Prerequisite: 240 or consent of instructor.

POLI SCI 343-0 International Law Introduction to politics of international law. Influence of politics on formation and interpretation of international law; influence of international law on international politics. Prerequisite: 240 or equivalent.

POLI SCI 344-0 US Foreign Policy How US foreign policy is formulated, executed, legitimated, and contested. Topics include 9/11 and its aftermath, covert action, interventionism, trade, US respect for international norms, and US engagement with the Middle East.

POLI SCI 345-0 National Security Basic issues in national security, focusing primarily on the United States. Topics include the nature of "national interest," major actors in national security policy making and military strategy, and the influence and role of the defense establishment.

POLI SCI 346-0 Politics of European Unification Development of and prospects for the European Union in geopolitical and historical context.

POLI SCI 347-0 Ethics in International Relations Role of ethical considerations in international relations: where and when ethical questions are raised and by whom; causes and predictability of tensions between the ethics and self-interests of nations and political figures.

POLI SCI 348-0 Globalization Analysis of changes in the world economy and their implications for politics, economics, and society. Politics of multinational production, finance, and trade in the context of governance problems in a globalizing world. Prerequisite: 240 or equivalent.

POLI SCI 349-0 International Environmental Politics International cooperation and conflict resolution of global and transnational environmental problems such as climate change. Role of political, economic, and normative considerations in the formation of politically feasible solutions to international environmental problems.

POLI SCI 370-0 The Fate of the State in a Globalizing World Role states play in world politics and implications for world politics. Origins of the state system and contemporary challenges, such as failed states, terrorism, transnational social movements, human rights norms, and humanitarian intervention.

POLI SCI 372-0 The Middle East in International Politics International history and politics of the Arab states, Israel, Iran, and Turkey. Colonialism and nationalism, political Islam and secularism, the Iranian Revolution, the Gulf War of 1991, the US-led occupation of Iraq, relations between Turkey and the European Union. Recommended but not required: 240.

POLI SCI 376-0 Internal Wars and the State Focus on post–Cold War increase in civil wars, including causes and consequences of internal wars, and theories of conflict. Examines cases of civil wars around the world such as Yugoslavia, Congo, and Iraq.

POLI SCI 377-0 Drugs and Politics Analysis of the links between illegal drugs and politics, from the politics of local communities to international public policy. Regional focus on North, Central, and South America.

POLI SCI 378-0 America and the World Analysis of key debates and developments in the history and politics of American foreign relations. Domestic politics and foreign policy, political culture, interventionism, legal globalization, international institutions.

Law and Politics Courses

These courses study the role of the judiciary at the national, local, and emerging levels of government. They also investigate issues in jurisprudence and the administration of justice.

POLI SCI 230-0 Introduction to Law in the Political Arena Roles of law in society and politics. How disputes are resolved, organization of the bar, why people litigate, the consequences of litigation. Compares common law, civil code, and other legal traditions.

POLI SCI 330-0 Politics of Local Justice Local justice systems, with emphasis on crime and police, trial courts, criminal litigation, sentencing and corrections, and political involvement in these issues.

POLI SCI 331-0 Politics of the Supreme Court Operation of appellate courts, with emphasis on the United States Supreme Court. Decision making by appellate courts and the development of public policy. Prerequisite: 220 or 230.

POLI SCI 332-0 Constitutional Law I Introduction to interpretation of the US Constitution by the Supreme Court. Judicial review, federalism, separation of powers, economic and religious liberty, and personal privacy. Taught with LEGAL ST 332; students may not receive credit for both courses. Prerequisite: 220 or 230.

POLI SCI 333-0 Constitutional Law II: Civil and Political Rights Consideration of US Supreme Court decisions dealing with civil and political rights, including equality, freedom of expression, and criminal procedures. Taught with LEGAL ST 333; students may not receive credit for both courses. Prerequisite: 220 or 230.

POLI SCI 339-0 Special Topics in Law and Politics Specialized courses focused on specific aspects of law in the United States and elsewhere.

Political Theory Courses

These courses examine the ideas that inform the thinking of today's citizens, representatives, and political scientists. They are organized by historical periods and conceptual similarity.

POLI SCI 201-0 Introduction to Political Theory Examination of texts in political theory. Topics vary but often include justice, the Greek polis, the modern state, individualism, representative democracy.

POLI SCI 301-0 Classical Political Theory Political thought of Greece and Rome in historical context and with attention to contemporary theoretical interest.

POL SCI 302-0 Early Modern Political Thought Political philosophers from the 16th, 17th, and 18th centuries. Topics include sources of power and their impact on justice, equality, and law. No prerequisites, but some knowledge of political theory is desirable.

POLI SCI 303-0 Modernity and Its Discontents Examination of late 19th- and early 20th-century social and political thought in the works of writers such as Marx, Weber, Mill, Kafka, Darwin, Nietzsche, Freud, and de Beauvoir. No prerequisites, but some knowledge of political theory is desirable.

POLI SCI 305-0 Moral Dilemmas and Political Theory Study of moral dilemmas and moral theory from the perspective of political theory. Specific attention to the politics of gender in dilemmas of citizenship, nationality, and abortion in ancient and modern theater, philosophy, and film. No prerequisites, but some knowledge of political theory is desirable.

POLI SCI 306-0 American Political Thought Advanced introduction to the development of political thought in the United States from the revolutionaries to the 20th-century pragmatists.

POLI SCI 307-0 Deportation Law and Politics Analysis of deportation law and politics from colonial America through today. Requires two visits to Chicago immigration courts.

POLI SCI 308-SA Critical Theory and the Study of Politics Critical theory examines and contests hegemonic thinking about politics and envisages alternate worlds of political possibility. This study abroad course is restricted to students in Northwestern's Paris program in critical theory, literature, and media.

POLI SCI 309-0 Advanced Topics in Political Theory Sustained reflection on one problem (e.g., freedom, republicanism, sexuality) or author (e.g., Plato, Machiavelli, Tocqueville, Arendt). Topics vary. May be repeated for credit with different topics. Prerequisite: 201 or equivalent.

Research Methodology Courses

Courses in this field prepare students to conduct original research on the causes and consequences of political phenomena. The methodological techniques are often transferable to research problems in government and business.

POLI SCI 310-0 Methods of Political Inference Methods for inferences based on data in political research. Research design and quantitative and qualitative methods of inference. Focuses on descriptive, statistical, and causal inference and the application of different methods to substantive problems.

POLI SCI 311-0 Logics of Political Inquiry Political science as "science." Identity sources, construction, functions, and

validation of social science theory and explanation from varied perspectives.

POLI SCI 312-0 Statistical Research Methods Intermediate coverage of statistical methods appropriate for data in political science research, such as multiple regression, logit and probit, estimation and inference with nonindependent or nonidentically distributed sampling, basic time series and panel data methods, and causal inference in statistical models.

POLI SCI 315-0 Introduction to Positive Political Theory Introduction to the rational choice approach to politics focusing on individuals making goal-oriented, purposeful decisions that are aggregated by the institutions through which the individuals interact. Prerequisite: high school algebra.

Seminars, Independent Study, and Special Opportunities

POLI SCI 390-0 Special Topics in Political Science Designed for investigation of topics of interest to students and faculty that are not covered by other course offerings. May be repeated for credit with consent of department. No prerequisites.

CFS 293-0, 394-1,2, 396-0, 397-0 Chicago Field Studies See Chicago Field Studies on page 68. Students may receive at most 1 political science credit for relevant coursework, as well as credit toward the related courses requirement for the major.

POLI SCI 395-0 Political Research Seminar Required of all political science majors; ordinarily taken during junior year or in fall quarter of senior year. With consent of the department, students may receive full credit for more than 1 395 seminar provided that 399 and 395 courses together do not exceed a total of 4 course credits.

POLI SCI 398-1,2 Senior Thesis Seminar Two consecutive quarters (fall and winter) during which students work on their senior theses. Prerequisite: 395 and admission to the honors program.

POLI SCI 399-0 Independent Study Study and research projects carried out under faculty supervision. A written proposal, signed by the professor with whom the student will study, should be submitted to the director of undergraduate studies. Consent of department required.

PORTUGUESE

See Spanish and Portuguese.

PSYCHOLOGY

www.wcas.northwestern.edu/psych

The study of psychology covers a wide range of topics in the natural and social sciences. It provides students an opportunity to increase their understanding of themselves and other people as developing individuals, biological organisms, and participants in society. Because of the strong research orientation of the department, it also provides an understanding of how research is done and an opportunity to participate directly in research.

A major in psychology may lead in various directions after graduation. Graduate study may prepare a student for a career as an academic, clinical, industrial, or other kind of psychologist. With course offerings spanning the areas of cognitive science, psychobiology, psychopathology, and social psychology, psychology is also a useful major for students planning careers in education, medicine, law, or management. Whether or not students continue their education beyond the bachelor's degree, they will find that the psychology major provides knowledge about human behavior and about methods of research and data analysis that is valuable in business, the helping professions, and other occupations.

At the graduate level, the department recognizes several specialties with programs leading to the PhD. Though opportunities for study and research are available to undergraduates in all of these areas, there is only one undergraduate psychology major. Its requirements are designed to give every student a mastery of the basic methods and a balanced exposure to different aspects of psychology. Beyond that, students are encouraged to follow their interests in regular courses and in independent study. Extensive laboratory facilities and research experiences are available.

Major in Psychology

Department courses (11 units)

- 3 core courses: 110, 201 (or approved substitute), and 205
- 8 additional courses
  - At least 2 must be personality, clinical, or social psychology courses chosen from 204, 215, 303, 306, 326, 357, 371, 375, 376, 377, 381, 384, 385, 386, 387.
  - At least 2 must be cognitive psychology or neuroscience courses chosen from 212, 228, 312-1,2, 321, 324, 333, 334, 335, 346, 355, 358, 361, 362, 363, 365, 367, 368; COG SCI 210, 211.
  - At least 1 must be an upper-level research course chosen from 321, 326, 333, 334, 335, 351, 355, 357, 358, 359, 362, 363, 367, 368, 371, 375, 377, 381, 386, 387, 392, 397-2, 398.
  - At least 2 must be at the 200 level; COG SCI 210 and 211 may count toward this requirement.
  - At least 3 must be at the 300 level.
  - A course may count toward more than one of these categories, but the total number of courses must be at least 8.
- Freshman seminars do not count toward the major.
- Only 1 quarter total of 397-1 and 399 may count toward the requirements.
- Only 1 quarter of 397-2 may count toward the major.
- See page 38 for further restrictions on enrollments in 398 and 399; these also apply to 397.

Related courses (5 units)
- 2 200-level mathematics courses
- 3 additional units of credit chosen from the following:
  - Any 200-level mathematics course
  - COG SCI 207
  - EECS 110, 111, 130
  - Any course outside of psychology and cognitive science counting toward the WCAS Area I natural sciences requirement
  - AP credits in biology, chemistry, environmental science, and physics
  - With department consent, PSYCH 351 may also count toward this requirement.

Minor in Psychology

The minor in psychology reflects the view that the undergraduate study of psychology should combine a methodological core with breadth of content. The minor therefore contains the basic course (110), the 2 central methods courses (201 and 205), and at least 1 course from each of the two main content areas defined for the major.

Minor requirements (7 units)
- 3 core courses: 110, 201 (or approved substitute), and 205
- 4 additional courses
  - At least 1 personality, clinical, or social psychology course from 204, 215, 303, 326, 381, 387
  - At least 1 cognitive psychology or neuroscience course from 212, 228, 312-1, 324, 346, 361, 362, 365; COG SCI 210, 211
  - At least 1 200-level psychology department course or COG SCI 210 or 211
  - At least 2 300-level psychology department courses; may not count both 399 and 397-1
  - A course may count toward more than one of these categories, but the total number of courses must be at least 4.
- Freshman seminars do not count toward the minor.

Honors in Psychology

Majors with strong academic records and an interest in pursuing honors should submit an application in spring of junior year. Course grades and research experience are both considered in selecting participants. Students typically enroll in 398 in fall, winter, and spring of senior year and carry out a yearlong research project; 398 may count toward requirements for the major. The senior thesis is a report on the research project.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information see the department website and Honors in the Major on page 38.

Courses

PSYCH 110-0 Introduction to Psychology A survey course reviewing primary psychological research and theories of human behavior. Laboratory experience exposes students to psychology as a research science.

PSYCH 201-0 Statistical Methods in Psychology Measurement; descriptive statistics; probability and sampling; T-test, ANOVA, correlation, and regression. Prerequisite: 110; some college mathematics recommended.

PSYCH 204-0 Social Psychology Psychological processes underlying social behavior; topics include social cognition, attraction, aggression, prejudice, and behavior in groups. Prerequisite: 110.

PSYCH 205-0 Research Methods in Psychology Methods of psychological research; experimental design; reliability and validity; review and application of statistics; execution and reporting of psychological research. Prerequisite: 201.

COG SCI 207-0 Introduction to Cognitive Modeling See Cognitive Science.

COG SCI 210-0 Language and the Brain See Cognitive Science.

COG SCI 211-0 Learning, Representation, and Reasoning See Cognitive Science.

PSYCH 212-0 Introduction to Neuroscience Brain processes related to memory, perception, and motivation. Dissection, histology, and surgery for brain stimulation. A prior course in biology is strongly recommended.

PSYCH 215-0 Psychology of Personality Nature of personality and its development. Modern theoretical interpretations. Biological and social bases of individual differences. Prerequisite: 110.

PSYCH 218-0 Developmental Psychology Development of cognitive, social, and other psychological functions. Prerequisite: 110.

PSYCH 228-0 Cognitive Psychology Introduction to research into mental processes such as memory, reasoning, problem solving, and decision making. Prerequisite: 110.

PSYCH 303-0 Psychopathology Understanding the nature of psychological, emotional, and behavioral disorders. Emphasis on current evidence regarding causes and characteristics of these disorders. Prerequisite: 110.

PSYCH 306-0 Introduction to Clinical Psychology Definition and history of clinical psychology, personality theory in clinical psychology, diagnosis and classification of disorders, assessment, psychotherapy, and ethical issues. Prerequisite: 303.

PSYCH 312-1,2 Physiological Psychology 1. Neurophysiology, neuroanatomy, and electrophysiological substrates of behavior. Prerequisites: 110; 1 biological sciences course. **2.** Neuroanatomical, electrophysiological, and biochemical substrates of psychological processes. Prerequisite: 312-1 or equivalent; 205 recommended.

PSYCH 314-0 Special Topics in Psychology Topic to be announced. Prerequisites vary. May be repeated for credit with different topic.

PSYCH 321-0 Neuroscience and Behavior Laboratory Classical exercises in the physiological psychology laboratory, including brain-wave recording and electrophysiology. Prerequisites: 205, 312-2.

PSYCH 323-0 Deception: Processes and Detection Multiple perspectives on truth and deception. Exposure to clinical and psychophysiological work on lying, malingering, and styles of deceit. Theories and methods in lie detection. Prerequisite: 110.

PSYCH 324-0 Perception Human perception, particularly vision but also hearing, taste, smell, and touch. Biological foundations, development, and disorders of perception. The senses in everyday life. Prerequisite: 110.

PSYCH 326-0 Social and Personality Development Research methods, theories, and facts relating to the development and modification of attitudes and behavior. Prerequisites: 205; 204, 215, or 218.

PSYCH 332-0 Native Americans and Environmental Decision Making Focus on Native Americans, culture and cultural processes, and environmental decision making. Emphasis on contemporary Native American cultures and relevant research. Prerequisite: 110.

PSYCH 333-0 Psychology of Thinking Research methods and recent experimental findings for types of human thinking. Students conduct original research. Prerequisites: 205, 228.

PSYCH 334-0 Language and Thought Exposure to original research and theoretical perspectives on language and its relation to thought and behavior. Critical analysis of theories and methods. Topics may vary. Prerequisites: 205; 228 or COG SCI 211.

PSYCH 335-0 Decision Making Human decision making from both descriptive and prescriptive perspectives. Theories and models of decision making applied to a variety of contexts. Prerequisites: 205, 228.

PSYCH 337-0 Human Sexuality Sexual development and differentiation, deviations, dysfunctions, and controversies in sexology. Prerequisite: 110.

PSYCH 339-0 Psychology of Gender Examination of sex differences and similarities. Evaluation of explanations for differences. Review of how gender affects achievement, relationships, and mental health. Prerequisite: 110.

PSYCH 340-0 Psychology and Law Examines the application of psychology to law, including topics such as the insanity defense, criminal profiling, eyewitness testimony, and interrogation. Prerequisite: 110.

PSYCH 344-0 Cultural Psychology Introduction to concepts and empirical methods used to study how culture shapes mind, brain, and behavior over multiple time scales, including over generations and the lifespan and across situational contexts. Prerequisite: 110; at least 1 additional psychology course recommended.

PSYCH 346-0 Psychology of Instructional Design and Technology Introduction to theory and practice in the development of technologies for formal and informal learning. Examines design approaches for developing and implementing effective instructional/training materials for individuals and organizations. Prerequisite: 110; 205 recommended. Taught with LOC 346; students may not receive credit for both courses.

PSYCH 351-0 Advanced Statistics and Experimental Design Advanced topics in research design and analysis of data. Focus on both theory and applications. Prerequisites: 205; 2 200-level mathematics courses.

PSYCH 355-0 Social, Cultural, and Affective Neuroscience Examines use of neuroscience techniques (e.g., neuroimaging) in research on affective and social processes and their interactions with cognitive processes; empirical findings, foundational topics, and current debates. Prerequisites: 205; one course in cognition and/or neuroscience, e.g., 212, 228, 312-1, 324, 364, 361, BIOL SCI 306, 326, COG SCI 210, CSD 303.

PSYCH 357-0 Advanced Seminar in Personality, Clinical, or Social Psychology Discussion and critical analysis of research methods and findings in an area of personality, clinical, and/or social psychology. Topics vary. May be repeated for credit with different topic. Prerequisite: 205; additional prerequisites may apply.

PSYCH 358-0 Advanced Seminar in Cognition or Neuroscience Discussion and critical analysis of research methods and findings in an area of cognitive psychology and/or neuroscience. Topics vary. May be repeated for credit with different topic. Prerequisite: 205; additional prerequisites may apply.

PSYCH 359-0 Advanced Seminar in Psychology Discussion and critical analysis of research methods and findings in psychology. Interdisciplinary focus, often spanning natural and social science aspects of psychology. Topics vary. May be repeated for credit with different topic. Prerequisite: 205; additional prerequisites may apply.

PSYCH 361-0 Brain Damage and the Mind Survey of human cognition as studied via investigations of brain damage and brain-imaging techniques. Prerequisite: 110, 212, or COG SCI 210.

PSYCH 362-0 Cognitive Development Development of cognition and perception, including development of memory, concepts, language, and expertise. May focus on one or more age groups. Prerequisites: 205; 218 or 228.

PSYCH 363-0 Images of Cognition Study of brain processes underlying cognition. Analysis of brain structure and function. Introduction to imaging techniques including fMRI, PET, and ERP. Prerequisites: 205; a course in cognition and/or neuroscience (e.g., 212, 228, 312-1, 361; COG SCI 210) or consent of instructor.

PSYCH 365-0 Brain and Cognition Investigates the neural bases of human cognition (e.g. perception, spatial, attention, memory, executive function, language and reading) with an emphasis on neuroimaging approaches to examining development and learning. Prior exposure to neuroscience or cognitive science is helpful but not required.

Taught with CSD 303; students may not receive credit for both courses.

PSYCH 367-0 Consciousness Examines how psychologists, neuroscientists, computer scientists, and physicists have tackled fundamental questions about consciousness using empirical and theoretical methods. Prerequisites: 205 and a course in cognition and/or neuroscience, or instructor permission based on a strong background in neurobiology and/or physics.

PSYCH 368-Human Memory Scientific study of human memory, including memory systems of the brain, amnesia, remembering, forgetting, encoding, consolidation, memory suppression, and memory distortion. Emphasizes original research reports in cognitive neuroscience. Prerequisites: 205; 1 or more of the following: 324, 361, 363, 364, 365.

PSYCH 371-0 Personality Research Research in personality, with emphasis on experimental approaches and methods. Basic concepts of test reliability and validity. Students conduct original research. Prerequisites: 205, 215.

PSYCH 375-0 Psychological Tests and Measures Explores the science of psychological assessment, including its history, test construction and evaluation, and common measures of personality, psychopathology, and ability. Students create and evaluate their own psychological measures. Prerequisites: 205; 204, 215, or 303.

PSYCH 376-0 Cognitive Behavior Therapy Scientific foundations of cognitive behavior therapy for a wide range of disorders. Focus on the rationale for different treatments and evidence of efficacy and process. Comparisons with other scientifically validated treatments. Prerequisite: 303.

PSYCH 377-0 Child Psychopathology Major forms of psychopathology present during childhood, including disorders exclusive to childhood and those that may appear during any developmental period. Developmental models of the etiology and course of major psychopathologies. Prerequisites: 205; 218 or 303.

PSYCH 381-0 Children and the Law Examines from a developmental perspective research on children's involvement in the legal system as decision makers, witnesses, victims, and perpetrators. Prerequisites: 205, 218.

PSYCH 384-0 Close Relationships Social-psychological analysis of close relationships, with an emphasis on romantic relationships. Interpersonal processes associated with relationship formation, development, and dissolution. Prerequisite: 204.

PSYCH 385-0 Psychology of Attitudes Survey of social psychological research on attitudes; focus on the formation of attitudes, the relationship between attitudes and behavior, and attitude change. Prerequisite: 204.

PSYCH 386-0 Stereotyping and Prejudice Analysis of the causes and consequences of stereotyping and prejudice, as well as methods used to study these issues. Students conduct original research. Prerequisites: 204, 205.

PSYCH 387-0 Consumer Psychology and Marketing Research Application of psychological theories, findings, and methodologies to marketing research questions and problems. Students conduct a marketing research project for an actual client. Prerequisite: 205.

PSYCH 397-1,2 Advanced Supervised Research Design, implementation, and reporting of a psychology research project. Prerequisites: 205 and consent of instructor; 397-2 Must be taken concurrently with the same professor as 397-1. Weinberg College limits on 398 and 399 enrollments (page 38) also apply to 397.

PSYCH 398-1,2,3 Senior Thesis Seminar (1–4 units) Senior honors research. Students must apply for admission in spring quarter of junior year.

PSYCH 399-0 Independent Study Consent of instructor required.

RELIGIOUS STUDIES

www.religion.northwestern.edu

The Department of Religious Studies offers undergraduates the opportunity to study religions as historical and cultural phenomena. This includes the scholarly exploration of religious traditions, histories, cultures, beliefs, practices, sacred texts, sacred stories, and material productions from around the world in their institutional as well as noninstitutional ("on the ground") forms. The department's approach is fundamentally multidisciplinary, drawing from a variety of fields and critical perspectives: anthropology, history, philosophy, ethics, sociology, and literary and cultural studies, among others.

The wide variety of undergraduate courses range from large introductory classes to advanced seminars, and there are also independent studies and a senior thesis program for qualified students. The courses cover aspects of Buddhism, Hinduism, Taoism, Christianity, Islam, Judaism, Native American religions, new religious movements, and religion and culture in America.

The department offers a major and two minors.

The major and minor in religious studies provide a coherent and balanced set of departmental courses with work on general theories of religion and on the historical development of religions and their social manifestations. In consultation with the department adviser, students may organize highly individual major programs of study that include courses from this department and other departments in the University. To ensure coherence and balance within the individual programs, students submit their proposed programs for approval to the department's director of undergraduate studies.

In the interdisciplinary minor in Catholic studies, students take courses from both religious studies and other departments and choose an area of focus within Catholic studies.

Major in Religious Studies

Major requirements (12 units)

- 170 or 171
- 395
- 10 additional religion courses
  - At least 9 must be above the 100 level.
  - At least 5 must be at the 300 or 400 level.
  - At least 2 must be from South Asian and East Asian religions.
  - At least 2 must be from Judaism, Christianity, Islam, and European and American religions.

Students may substitute up to 2 courses on religion from outside the department. These must be chosen from ANTHRO 350, HISTORY 270, 371, or 374, PHIL 266, or SOCIOL 314 or approved in advance by the department's director of undergraduate studies.

Minor in Religious Studies

Minor requirements: religious studies (6 units)

- 170 or 171
- 5 other departmental courses above the 100 level
  - At least 3 must be at the 300 or 400 level.
  - At least 1 must be from South Asian and East Asian religions.
  - At least 1 must be from Judaism, Christianity, Islam, and European and American religions.

Minor in Catholic Studies

Roman Catholic ways of thinking, living, and organizing the world have been fundamental to cultures since the fifth century of the Common Era, and the story of modernity in all its variations cannot be told without Catholicism. The Catholic studies program offers the opportunity to look at civilizations and cultures through the lens of the interdisciplinary study of Catholicism, using the critical tools of contemporary academic research and conversation.

The minor requires at least 6 courses. These include a core course introducing contextual, interdisciplinary approaches to the subject and the interaction between Catholic ideas and institutions and the broader world. Five elective courses allow students to explore a particular topic more deeply. Students seek appropriate courses, including topics courses, from across the University, including art history, English, history, political science, and sociology. A list of approved courses can be found on the religious studies department website.

Minor requirements: Catholic studies (6 units)

- At least 1 of the following: 381, 382, 383
- 5 additional courses
  - Must be chosen with the program director from 381, 382, 383, 384, 385, 386, and other relevant courses in religious studies and other departments.
  - Courses normally will be organized around a focus—for example, historical (medieval Catholicism); regional (Catholicism in Latin America); comparative (Catholicism and Islam); disciplinary (Catholicism in literature); thematic (political Catholicism, Catholic bioethics).

Honors in Religious Studies

Majors with strong academic records and an interest in pursuing honors should notify the undergraduate honors coordinator in writing by the end of spring quarter of junior year. Superior students become eligible for departmental honors by writing a senior thesis in addition to completing the 12 courses required for the major. The thesis is usually accomplished by enrolling in 2 quarters of 396 during fall and winter quarters of senior year.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the undergraduate honors coordinator and see Honors in the Major on page 38.

General Introductory Courses

RELIGION 170-0 Religion in Human Experience Religion as it has appeared in the past and as humans continue to express it in their personal and social lives.

RELIGION 171-0 Varieties of Religious Tradition Introduction to a variety of the world's major religious traditions.

RELIGION 173-0 Religion, Medicine, and Suffering in the West Examination of religious healing ceremonies and Christian perspectives on pain and suffering in light of the meaning of physical pain in the everyday lives of men and women.

American Religion Courses

RELIGION 260-0 Introduction to Native American Religions Diversity and common elements of Native American religious traditions; comparative study of sacred story, ritual, spiritual philosophy, and practice.

RELIGION 261-0 American Religion, Ecology, and Culture The historical rise of environmentalism in American culture and its impact on religious thought and practice.

RELIGION 264-0 American Religious History from 1865 to the Great Depression Topics include urban religion, African American churches, Christians and foreign policy, immigrant religion, the spiritual crisis of the 1920s, and Pentecostalism.

RELIGION 265-0 American Religious History from World War II to the Present Religion and the making of contemporary America, including Cold War religion, the "Black Gods" of the Great Migration, the rise of the Christian Right, and modern American Catholicism and Judaism.

RELIGION 360-0 African American Religions Exploration of the historical diversity of African American religious experiences and identities.

RELIGION 363-0 Topics in Women and Religion in America Topics, figures, events, and dynamics in the history of American women and religion.
RELIGION 369-0 Topics in American Religion Content varies. May be repeated for credit with change of topic.

Bible Courses

RELIGION 220-0 Introduction to the Hebrew Bible Major genres of Old Testament literature. Basic theological views and the social-political history of ancient Israel.
RELIGION 221-0 Introduction to the New Testament Beginning, development, and content of the New Testament; its Jewish and Hellenistic environment.
RELIGION 320-0 The Art of Biblical Narrative Ways in which the religious imagination of ancient Israel expresses itself through literary artistry.
RELIGION 321-0 Prophecy in Ancient Israel Historical evolution of Israelite prophecy; ancient Near Eastern parallels; major themes of prophetic thought.
RELIGION 329-0 Topics in the Bible Content varies. May be repeated for credit with change of topic.

Buddhism and East Asian Religions Courses

RELIGION 210-0 Introduction to Buddhism The Buddha's life and teachings, traditions that developed from these teachings, and systems of meditation, rituals, and ethics.
RELIGION 310-1 Buddhist Scripture Origins, development, and content of Buddhist sacred literature. Prerequisite: 170 or 210.
RELIGION 311-1 Theravada Buddhism and Culture Theravada Buddhism in interaction with its culture.
RELIGION 312-0 Zen Buddhism Historical development of Zen Buddhist theory and practice.
RELIGION 313-0 Tibetan Religion and Culture Propagation of religions in Tibet in their larger historical, cultural, and political contexts.
RELIGION 314-0 Buddhism in the Contemporary World Buddhism's reinterpretation of its thought and practice in response to postcolonial modernizations.
RELIGION 315-0 Contemporary Buddhist Philosophy Creative interaction of selected Buddhist thinkers with the Western philosophical tradition.
RELIGION 318-0 Topics in East Asian Religions Content varies. May be repeated for credit with change of topic.
RELIGION 319-0 Topics in Buddhism Content varies. May be repeated for credit with change of topic.

Christianity Courses

RELIGION 240-0 Introduction to Christianity Doctrine, worship, and institutions in the various branches of Christianity.
RELIGION 270-0 Introduction to Theology Theology as an academic discipline with a long history of asking—in dialogue with thinkers past and present—fundamental questions about religious experience, texts, practices, and ideas.
RELIGION 271-0 Theology of Love The concept of love from theological, historical, philosophical, and biblical perspectives. True love of self, others, and God.
RELIGION 272-0 Luther's Reformation and Transformation of the West Examination of Luther's work in the context of his life and times. Introduces basic dimensions of Western thought, showing how theology relates to broader cultural, political, social, and aesthetic issues. Taught with GERMAN 272; students may not receive credit for both courses.
RELIGION 340-1,2,3 Foundations of Christian Thought Survey of the development of Christian thought. **1.** Early or traditional Christianity. **2.** Christian thought from the Reformation to the 18th century. **3.** Christian thought from the 19th through the 21st centuries.
RELIGION 341-0 Medieval Christianity Christian thought, institutions, and figures of medieval Christianity, c. 500–1500.
RELIGION 342-0 Christian Mystical Theology Writings of mystics—e.g., Meister Eckhart, Cloud of Unknowing, Julian of Norwich, Teresa of Avila—in their cultural context.
RELIGION 343-0 Feminist Theology Content varies—e.g., feminist ethics, feminist theology, and women's spirituality. May be repeated for credit with change of topic.
RELIGION 344-0 Christian Ethics Four contemporary moral issues viewed from a variety of Christian approaches. Prerequisite: 170, 221, 240, or 260.
RELIGION 345-0 The Idea of Sainthood in Christianity Historical and contemporary conceptions of sanctity, especially in Roman Catholicism and Eastern Orthodoxy.
RELIGION 346-0 Church Architecture Survey of historical and recent churches: spatial dynamics, centering focus, aesthetic impact, and symbolic resonance.
RELIGION 349-0 Topics in Christianity Content varies. May be repeated for credit with change of topic.
RELIGION 381-0 Global Catholicism in the Contemporary World Historical and contemporary global Catholicism. Topics include the church and political modernity; local saints; controversies over worship styles; Catholics and political revolutions; the Vatican; the pontificate of John Paul II.
RELIGION 382-0 Catholicism in the Making of the Modern World 16th–17th-century Catholic influences on missions, colonial ventures, science, and the development of non-European history; the effects of these efforts upon Catholicism's understanding of itself and early "global culture."
RELIGION 383-0 Catholic Social Ethics Ecclesiastical, academic, and popular Catholic social ethics from 1891 to the present—for example, the living wage and Catholic Worker movements, peace initiatives, liberation ethics, andimmigration, environment, sexuality, and gender issues.
RELIGION 384-0 Soundings in the Catholic Tradition Topics in Catholic religious thought or religious movements. May be taken multiple times with different content.

RELIGION 385-0 Topics in US Catholicism Historical and contemporary subjects in the study of Catholic culture in the United States. May be taken multiple times with different content.
RELIGION 386-0 Topics in Latin American Catholicism Historical and contemporary subjects in the study of Catholic culture in Latin America. May be taken multiple times with different content.

Hinduism Courses

RELIGION 200-0 Introduction to Hinduism Unity and diversity of Hindu mythology, beliefs, and practices from ancient times to the present.
RELIGION 301-0 Goddess Traditions in South Asia Role and function of goddesses and feminine divinities in Hinduism and Buddhism.
RELIGION 302-0 Yoga and Tantra Origin and development of ascetic disciplines in the Hindu and heterodox traditions of India.
RELIGION 309-0 Topics in Hinduism Content varies. May be repeated for credit with change of topic.

Islam Courses

RELIGION 250-0 Introduction to Islam Principal beliefs and practices of Muslims set against the historic development of the faith.
RELIGION 350-0 The Qur'an Islam's sacred scripture and its origins; Muslim understandings of revelation and prophecy.
RELIGION 351-0 Muhammad, the Jews, and the Origins of Islam The rise of Islam, including a broad discussion of pre-Islamic Arabia.
RELIGION 353-0 Trends in Islamic Thought Qur'anic, medieval, and modern approaches to problems in faith and social action.
RELIGION 354-0 Sufism The Islamic mystical tradition. Content varies—e.g., Sufism and philosophy, Sufism in Africa. May be repeated for credit with change of topic.
HISTORY 355-0 Islam in Africa See History.
RELIGION 359-0 Topics in Islam Selected topics in Islamic history and thought. May be repeated for credit with different topic.

Judaism Courses

RELIGION 230-0 Introduction to Judaism Main concepts in the theology of Judaism, main rituals and customs, and main institutions.
RELIGION 330-0 Varieties in Ancient Judaism Introduction to the Judaisms that flourished from the fifth century B.C.E. to the third century C.E. Prerequisite: 220, 221, or 230.
RELIGION 331-0 Classical Jewish Thought Examination of the forms of expression of Rabbinic Judaism: legal, mystical, philosophical, and poetic.
RELIGION 332-0 Modern Jewish Thought How Judaism dealt with modernity and the problems it posed: Spinoza, Mendelssohn, Cohen, Buber, Rosenzweig, and Levinas.
RELIGION 333-0 Judaism in the Modern World Radical changes that emancipation and modernity have brought to the religious expression of Judaism.
RELIGION 339-0 Topics in Judaism Content varies. May be repeated for credit with change of topic.

Theory and Comparative Studies Courses

RELIGION 370-0 Religion and Mythology of the Ancient Near East Myths, religious ideologies, and cultic practices of Sumer, Babylonia, Assyria, and Canaan, including Phoenicia; relation to ancient Greece and Israel, women, and literature.
RELIGION 371-0 Religion and Film Content varies—e.g., films of Robert Bresson; Kieslowski's *Decalogue;* Dreyer and Tarkovsky. May be repeated for credit with change of topic.
RELIGION 372-0 Asian Religions in Literature and Film Representations of Hindusim and Buddhism in Indian classical texts, Western literature, and recent Western and Asian films.
RELIGION 373-0 Religion and Bioethics Analysis of contemporary dilemmas in medicine and the life sciences; responses to these dilemmas from religious perspectives.
RELIGION 374-0 Contemporary Religious Thought Content varies—e.g., convergence between religious paths, science and religion, politics and religion. May be repeated for credit with change of topic.
RELIGION 379-0 Topics in Comparative Religion Content varies. May be repeated for credit with change of topic.
RELIGION 395-0 Theories of Religion Ways of critically analyzing religious experience and its meaning. Phenomenology of religion, history of religions, comparative religions. For majors only.
RELIGION 396-1,2 Senior Seminar For honors students writing the senior thesis.
RELIGION 399-0 Independent Study Reading and conferences on special subjects for advanced students. Consent of instructor required.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

RUSSIAN

See Slavic Languages and Literatures.

SCIENCE IN HUMAN CULTURE

www.shc.northwestern.edu

The Science in Human Culture Program prepares students to confront the impact of science, medicine, and technology on society—and on their own lives. The adjunct major and the minor welcome both science majors

and premedical students interested in thinking beyond the problem sets assigned in their specialized courses. They also welcome students in the humanities and social sciences who wish to surmount the compartmentalization of knowledge that accompanied the rise of modern science. Courses seek to foster critical thinking about the limits, authority, and impact of science, a mode of understanding that is often said to be the defining feature of modern culture.

For an up-to-date listing of courses and more information about the adjunct major and minor, consult the program website. Questions may be directed to the program director at shC-program@northwestern.edu.

Adjunct Major in Science in Human Culture

Adjunct major requirements (10 units)

- Courses are chosen from the partial "Themes and Eligible Courses" list below or the approved list on the program website and must relate to a theme developed in consultation with the program director.
- 3 must be core courses.
  - 2 must be chosen from HISTORY 275-1,2, 325, 377, 378.
  - 1 must be chosen from HUM 220; PHIL 268, 269, 326; SOCIOL 220, 319.
- At least 6 of the 10 courses must be at the 300 level.
- Course substitutions may be allowed with the consent of the program director.
- All adjunct majors require completion of a stand-alone major as well. Up to 2 courses for the science in human culture adjunct major may be counted toward another major.

Minor in Science in Human Culture

Minor requirements (7 units)

- Courses are chosen from the partial list below or the approved list on the program website and must relate to a theme developed in consultation with the program director.
- At least 1 must be a 300-level seminar.
- At least 5 courses must not be double-counted toward a major.
- Course substitutions may be allowed with the consent of the program director.

Honors in Science in Human Culture

Majors with strong academic records and an interest in pursuing honors should submit a proposal to the program director by the end of the sixth week of spring quarter of junior year. To graduate with honors, students must take 9 courses toward the major (not counting the honors sequence) and must satisfy the core course requirements. In addition, they must write a senior thesis of sufficiently high quality while enrolled in the 3-quarter honors sequence 398-1,2,3.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information see the detailed explanation on the program website, contact the program director, and see Honors in the Major on page 38.

Themes and Eligible Courses

Some of the themes adopted by students have included medicine and society, technology and social change, science and gender, religion and scientific knowledge, and philosophy of science. For example, students interested in medicine and society might explore the interaction of medical knowledge and practice, medical ethics, and the boundaries between sickness and health. Topics addressed might include the authority of the physician, the role of the hospital, the social dimensions of racial and gender differences, and the changing conception of disease and healing.

Eligible courses include
ANTHRO 260, 315, 332, 334, 370
BIOL SCI 112
CLASSICS 342
COMM ST 229, 329, 343, 350, 374, 378, 385, 386, 388
ECON 307, 318, 323, 370
GBL HLTH 260, 301, 302, 303
GNDR ST 232, 250, 332
HISTORY 275-1,2, 325, 377, 378
HUM 220
JOUR 383
PHIL 254, 268, 269, 325, 326, 352, 355
POLI SCI 329, 349
PSYCH 340
RELIGION 173, 373
SOCIOL 220, 232, 312, 319, 355

Many other eligible courses are offered periodically and appear in the online quarterly class list posted on the program website.

Course

SHC 398-1,2,3 Science in Human Culture Senior Seminar
For students who wish to qualify for honors by writing a senior thesis.

SLAVIC LANGUAGES AND LITERATURES

www.slavic.northwestern.edu

The Department of Slavic Languages and Literatures offers a full program of study in Russian language and literature and a range of other courses on the languages, culture, and history of Eastern Europe. Russian study encompasses a broad discipline that touches on many others. The rich heritage of Russia includes much that is fundamental to Western culture. For example, Turgenev, Dostoevsky, Tolstoy, and Chekhov probe philosophical, social, political, and psychological issues that are central to the modern experience. Courses in Russian literature open

up the artistry and ideas of this intellectual tradition. Russian language study may also serve as an entrée into other Slavic languages; with a foundation in Russian, one can branch off into related Slavic traditions.

Nonmajors as well as prospective specialists are served by the department's courses. Many courses offering a general acquaintance with some facet of Slavic studies have no prerequisite. All periods of Russian literature are represented, with emphasis on the 19th, 20th, and 21st centuries. Russian language at all levels is taught by Americans and native speakers. Courses on Slavic linguistics are also offered. Northwestern's library is an excellent resource for undergraduate and graduate study in Russian literature.

Students major in Russian language and literature for a variety of reasons. Some want the rigorous intellectual training and the breadth of cultural exposure. Some students are primarily interested in acquiring language skills for use in government service, international law or trade, journalism, or scientific research. Others use the major as a foundation for graduate work in comparative literature, linguistics, history, or political science; a number of students combine the major in Russian with a second major in one of these fields.

Qualified advanced students may spend a fall quarter in Russia or Prague through Northwestern study abroad programs. Students should consult the undergraduate adviser in the department or an adviser in the Study Abroad Office to learn more about study abroad options.

Major in Slavic Languages and Literatures

Major requirements (17 courses)

- Intermediate Russian: 102-1,2,3 or equivalent
- 14 additional courses in Slavic languages and literatures and related fields in one of the following options:
  - **Option A: No study abroad**
    - 7 200-level courses: 203-1,2,3 and 4 courses chosen from 210-1,2,3; 211-1,2; 255
    - 7 advanced electives: 360 or 361; 5 other 300- or 400-level Slavic languages and literatures courses; and 1 course in a related field chosen with the undergraduate adviser
  - **Option B: Study in Russia**
    - 4 200-level courses chosen from 210-1,2,3; 211-1,2; 255
    - 4 or more study abroad units
    - 6 advanced electives: 360 or 361 and 5 other 300- or 400-level Slavic languages and literatures courses

Minor Concentrations in Slavic Languages and Literatures

The department offers minor concentrations in Central and Southeast European studies, Russian, and Slavic studies.

Central and Southeast European Studies

The minor concentration in Central and Southeast European studies prepares students to comprehend and confront the fascinating historical, cultural, linguistic, political, and sociological specificity of Europe's most misunderstood regions. Fostering a comparative and interdisciplinary approach to Central and Southeast Europe, the minor encompasses a wide variety of courses that deal with the lands stretching from Western Europe to Russia, from the Baltic Sea to the Mediterranean.

In consultation with the director of undergraduate studies, students develop a coherent theme that ties together their choice of 7 courses selected from an approved list of courses in history, Slavic languages and literatures, linguistics, political science, sociology, Jewish studies, and comparative literary studies.

Minor requirements: Central and Southeast European studies (7 units)

- 1 course each in three basic areas: history, culture, and contemporary society and linguistics
- At least 3 300-level courses
- Up to 1 course on Russia
- Up to 3 relevant language courses (e.g., Czech or Polish)
- Course selections require approval by the director of undergraduate studies.

Russian

The minor concentration in Russian is particularly suitable for students who wish to study the Russian language intensively (possibly for use in such fields as political science, international relations, law, or business) or for the increasing number of students of Russian background at Northwestern who major in other fields but wish to broaden their knowledge of their native language.

Prerequisite

- Completion of two years of college-level language or equivalent as demonstrated by coursework such as 102-3 or equivalent

Minor requirements: Russian (7 units)

- 203-1,2,3
- 4 courses chosen from 303-1,2,3, 359-1,2, 360, 361

Slavic Studies

The minor concentration in Slavic studies offers a broad survey of literature and culture but does not include a sequence of language courses. The 200-level offerings provide a background in literature and culture, and the 300-level courses offer the opportunity to deal with more specific issues.

Minor requirements: Slavic studies (8 units)

- 4 200-level courses in Slavic languages and literatures
- 4 300-level courses
  - At least 2 must be in Slavic languages and literatures.

- Up to 2 may be courses in a related field chosen with consent of the undergraduate adviser (HISTORY 345 is strongly recommended)

Honors in Slavic Languages and Literatures

Majors with strong academic records and an interest in pursuing honors should consult the honors adviser by the end of junior year. Most honors candidates research and write the thesis in 2 quarters of 399. Another option is to take a 400-level seminar followed by 399, in which the student pursues a topic arising out of the 400-level course. These courses may be counted for credit in the major.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information see the program website and Honors in the Major on page 38.

Courses in Language and Linguistics

SLAVIC 101-1,2,3 Elementary Russian Russian language and culture. Basic reading, writing, listening, and speaking. Must be taken in sequence. Prerequisite: consent of language director.

SLAVIC 102-1,2,3 Intermediate Russian Russian language and culture. Reading, writing, listening, and speaking. Prerequisite: 101-3 or consent of language director.

SLAVIC 106-1,2,3 Elementary Czech Czech language and culture. Basic reading, writing, listening, and speaking. Must be taken in sequence. Prerequisite: consent of language director.

SLAVIC 108-1,2,3 Elementary Polish Polish language and culture. Basic reading, writing, listening, and speaking. Prerequisite: consent of language director. Must be taken in sequence. Prerequisite: consent of language director.

SLAVIC 203-1,2,3 Russian Language and Culture Conversation, listening comprehension, reading, and composition. Contemporary readings on Russian culture and society. Third-year, multiskill course. Prerequisite: 102-3 or consent of language director.

SLAVIC 206-1,2,3 Intermediate Czech: Language and Culture Reading, writing, listening, and speaking on topics in Czech culture. Must be taken in sequence. Prerequisite: 106-3 or consent of language director.

SLAVIC 208-1,2,3 Intermediate Polish: Language and Culture Continuation of 108; reading on topics in Polish culture and society. Must be taken in sequence. Prerequisite: 108-3 or consent of language director.

SLAVIC 303-1,2,3 Advanced Russian Language and Culture Conversation, listening comprehension, reading, and composition. Topics in advanced grammar. Exploration of Russian culture and society through reading, video, and film. Third- and fourth-year multiskill course. Prerequisite: 203-3 or consent of language director.

SLAVIC 304-1,2,3 Russian for Advanced and Native Speakers Russian for advanced speakers, including those who grew up in the United States. Stress on advanced levels of reading and writing as well as speaking. Taught entirely in Russian. Content varies; may be repeated for credit. Prerequisite: consent of language director.

SLAVIC 320-0 Structure of Serbian and Croatian Phonological and syntactic structure of Serbian and Croatian. Historical background.

SLAVIC 340-0 History of the Russian Language Russian phonology and morphology from Proto-Indo-European to modern Russian. Effects of the changes on the contemporary language.

SLAVIC 341-0 Structure of Modern Russian Theories and methods of linguistics as applied to the description of modern Russian. Phonetics, morphology, and other topics.

SLAVIC 358-1,2 Polish for Advanced and Native Speakers Polish for advanced speakers, including those who grew up in the United States. Stress on advanced levels of reading and writing as well as speaking. Taught entirely in Polish. Content varies; may be repeated for credit. Prerequisite: consent of language director.

Courses with Readings and Discussion in English

SLAVIC 210-1,2,3 Introduction to Russian Literature Comprehensive overview of the central prose works and literary movements in 19th-century Russia. **1.** Thematic and formal study of major works by Pushkin, Gogol, Lermontov, Turgenev. **2.** Tolstoy, Dostoevsky. **3.** Turgenev, the late Tolstoy, Chekhov, Bunin.

SLAVIC 211-1,2 20th-Century Russian Literature Major works in cultural-historical context, from the revolutions of 1917 through the present. Variable content depending on instructor. **1.** Focus on one of the following: Russian modernism in literature, music, film, and visual art; nonconformism in Soviet literature and visual arts (1940s to 1986); and contemporary Russian culture. **2.** Russian literature, film, and visual art in the transition from communism to postcommunism. Writers examined may include Pasternak, Bulgakov, Solzhenitsyn, and Sinyavsky/Tertz.

SLAVIC 255-0 Early Slavic Civilization History, literature, and culture of the Slavs (Bulgarians, Macedonians, Serbs, Croats, Russians, Ukrainians, Byelorussians, Poles, Czechs, Slovaks) from antiquity through the 13th century.

SLAVIC 261-0 Heart of Europe: Poland in the 20th Century Study of key developments in Polish history, literature, and thought by way of texts drawn from literature, history, politics, journalism, memoirs, essays, and film. Poland as a microcosm for recent European history and culture.

SLAVIC 267-0 Czech Culture: Film, Visual Arts, Music Czech culture represented in film and visual arts.

SLAVIC 278-1,2 Visual Art in the Context of Russian Culture Introduction to the history of Russian art: survey of major trends in Russian visual art in the dual contexts of Russian culture and European visual art. Focus on interconnections among visual arts, literature, and political history. **1.** Russian art from the medieval period to the beginning of the 20th century. **2.** Russian art of the 20th century.

SLAVIC 310-0 Tolstoy Tolstoy's artistic and intellectual development through his major fiction.
SLAVIC 311-0 Dostoevsky Introduction to Dostoevsky's life and works: *Notes from the Underground*, *Crime and Punishment*, *Brothers Karamazov*.
SLAVIC 313-0 Nabokov Vladimir Nabokov's major Russian and American prose, from his émigré years *(The Defense*, *The Gift*, and *Invitation to a Beheading)* to his celebrated English-language works *(Lolita; Speak*, *Memory;* and *Pale Fire)*.
SLAVIC 314-0 Chekhov Introduction to the fiction and plays of Anton Chekhov, father of the modern short story. His writing in its Russian cultural context and his influence on English-language drama, fiction, and film. Readings include *The Cherry Orchard*, *The Seagull*, *Uncle Vania*, and short stories.
SLAVIC 350-0 Folklore, Music, Poetry Traditional folk and religious folklore and poetry: from Biblical and Greek origins through East Slavic, Russian, and Western European works. Forms, literary and political implications, Russian and Western European poetic and rhythmic interrelations.
SLAVIC 367-1,2 Russian Film Development of Russian film and film theory from the silent era to the 1980s. **1.** Golden Age of Russian cinema (Eisenstein, Pudovkin, Vertov, Protazanov, Vasiliev brothers, Dovzhenko, socialist realism). **2.** Russian film since World War II (more socialist realism, neorealism, Tarkovsky, Mikhalkov, Paradjanov, Abuladze; criticism and semiotic theory).
SLAVIC 368-0 Andrei Tarkovsky's Aesthetics and World Cinema Major films of Tarkovsky and of Russian and non-Russian directors whose work is related to his (Eisenstein, Wenders, Bergman, Kurosawa).
SLAVIC 369-0 Two Hundred Years of Russian Drama Dramatic and theatrical traditions of Russia from the 19th century through the rise of the Moscow Art Theater and Russian modernism to contemporary theater. Dramas by Gogol, Ostrovsky, Gorky, Chekhov, Blok, Mayakovsky, Vampilov, and Petrushevskaya; productions of Stanislavsky, Meierkhold, Evreinov.
SLAVIC 390-0 Literature and Politics in Central and Eastern Europe Literature has played a central role in defining the political agendas in central and eastern Europe. Course concerns the interaction of literature with cultural and political history. Content varies. May be repeated for credit with consent of director of undergraduate studies.
SLAVIC 392-0 Contemporary East European Literature Post–World War II literature of the Czech Republic, Hungary, Poland, Romania, and the former Yugoslavia; national identity, dissidence, and literary postmodernism.

Courses in Literature with Prerequisite in Russian

The prerequisite for 300-level courses is 203-3, 303-3, or consent of instructor.
SLAVIC 359-1,2 Russian Prose Selected works of Russian masters. **1.** Early 20th century. Russian modernist prose and socialist realism. **2.** 1940s to the present. Content varies; may be repeated for credit.
SLAVIC 360-0 Survey of 19th-Century Russian Poetry Introduction to the wealth of Russian 19th-century lyric poetry and basic techniques for its study: Pushkin, Baratynsky, Lermontov, Tyutchev, Fet.
SLAVIC 361-0 Survey of 20th-Century Russian Poetry Introduction to the major currents of Russian 20th-century lyric poetry and basic techniques for its study: Tsvetaeva, Mayakovsky, Khlebnikov, Blok, Akhmatova, Mandelshtam, Pasternak, Brodsky.
SLAVIC 398-0 Senior Seminar Topics vary yearly.
SLAVIC 399-0 Independent Study For majors selected as candidates for departmental honors; for other advanced students with consent of instructor.

SOCIOLOGY

www.sociology.northwestern.edu

The Department of Sociology offers preparation for careers in a wide range of fields requiring strong research and analytical skills and knowledge of social institutions and diverse cultures. It provides an excellent background for careers in business, advertising, nonprofits, the arts, public administration, law, medicine and health, journalism and communications, and planning, among others. The department also emphasizes the sociological perspective as a fundamental part of a liberal education and a complex understanding of the world.

The department is particularly strong in the areas of organizations and economic sociology; the sociology of law, health, science, and education; urban studies; international, comparative and historical sociology; the sociology of art and culture; and criminology. It offers a wide variety of approaches to social inequality and its origins and consequences, including class, race, ethnicity, gender, and sexuality.

To benefit from the department's strengths, most sociology majors concentrate in one of seven areas:

- economic sociology and development
- environment and society
- law and society
- social data research
- social inequality: class, gender, and race
- sociology of health and medicine
- urban sociology.

Concentrations guide the selection of both sociology and related courses. The department website lists approved courses by concentration. Majors may instead concentrate in general sociology, for which all sociology and related courses fulfill the concentration requirement.

Unusually good opportunities are available for independent study, field internships, and the use of quantitative and qualitative methods of research. In addition to the courses listed below, the department offers quarterly seminars on special topics of interest.

Major in Sociology

Department courses (12 units)

- 2 sociology courses at the 100 or 200 level (except 101 and 226)
- 3 courses in methods of social research
  - 226 (recommended to be taken by sophomore year)
  - 303 and 329 (recommended to be taken in junior year; Chicago Field Studies courses may be substituted for 329 with adviser approval)
- 306 (recommended to be taken in junior or senior year)
- 6 additional 300-level sociology courses
  - 398-1,2 (fall and winter quarters of senior year) may count as 2 of the 6 courses.
  - 376 may count repeatedly with different topics and adviser approval.
  - Although 399 may be taken more than once, only 1 unit may count toward the major.
  - A Chicago Field Studies course may count with adviser approval.

Related courses (4 units)

4 300-level courses in African American studies, American studies, anthropology, Asian American studies, communication studies, economics, gender and sexuality studies, global health studies, history, international studies, Latina and Latino studies, legal studies, linguistics, philosophy, political science, psychology, science in human culture, statistics, or other fields; must be approved by an adviser.

Minor Concentrations in Sociology

The Department of Sociology offers minor concentrations in sociological research and in sociological studies. Students seeking a minor in sociology must consult with the director of undergraduate studies.

Sociological Research

The minor concentration in sociological research prepares students to carry out their own research by offering an introduction to the discipline, followed by an array of courses in quantitative and qualitative methods. Students learn about the gathering and preparation of data for analysis as well as a variety of techniques and methods for presenting information, arguments, and conclusions; 2 300-level courses allow students to see how these methods are used in practice.

Minor in sociological research requirements (6 units)

- 110 or a 200-level sociology course
- 226
- 303 or equivalent
- 329 (a Chicago Field Studies course may be substituted with adviser approval)
- 2 additional 300-level sociology courses
  - Although 399 may be taken more than once, only 1 unit may count toward this requirement.
  - 2 units of 376 may count with different topics and adviser approval.
  - 1 Chicago Field Studies course may count with adviser approval.

Sociological Studies

The minor in sociological studies introduces basic information about the social world and provides the rudimentary tools to understand it. It prepares students to compare, evaluate, and critically analyze information about various institutions, processes of stratification, and social change.

Minor in sociological studies requirements (7 units)

- 226
- 2 additional sociology courses at the 100 or 200 level (except 101)
- 4 300-level sociology courses approved by the director of undergraduate studies
  - Although 399 may be taken more than once, only 1 unit may count toward the minor.
  - 2 units of 376 may count with different topics.
  - 1 Chicago Field Studies course may be substituted with adviser approval.

Honors in Sociology

Majors with strong academic records and an interest in pursuing honors should enroll in 398-1,2. All sociology majors are eligible to enroll in this course and are encouraged to write a thesis. Both quarters of 398 may count toward the requirements for the major.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the website or the director of undergraduate studies and see Honors in the Major on page 38.

The Teaching of Sociology

Weinberg College students pursuing a major in sociology who also wish to be certified for secondary teaching of sociology with history must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP at the earliest opportunity.

Courses

SOCIOL 110-0 Introduction to Sociology Broad overview of a wide range of social issues and ways of sociological thinking. Characteristics of group life. Interrelations of society, culture, and personality; major social institutions and processes.

SOCIOL 201-0 Social Inequality: Race, Class, and Power Origins and functions of stratification. Class, prestige, and esteem. Interaction of racial and cultural groups. Inequality

in workplaces, neighborhoods, schools, families, media, and other settings.

SOCIOL 202-0 Social Problems Emergence of social problems. How the media, politicians, lawmakers, and others define social issues. How lives and self-images are shaped when people are connected to a social problem.

SOCIOL 204-0 Individuals and Society Development of individual attitudes and behavior patterns through social interaction. Relation to students' everyday lives and problems.

SOCIOL 205-0 American Society Introduction to the major institutions of American society. How they interrelate and affect social stratification. Tensions associated with differential experiences of common and shared institutions.

SOCIOL 206-0 Law and Society Introduction to the role of law in American society. Relationship of law, inequality, and social change. Changes in legal institutions: the courts, the legal profession, and legal services for the poor. Taught with LEGAL ST 206; students may not receive credit for both courses.

SOCIOL 207-0 Cities in Society Introduction to issues of cities and metropolitan areas, including spatial, economic, and political trends; private and public decision making; class, race, and gender; and possible solutions to inequalities and planning challenges.

SOCIOL 208-0 Race and Society Critical analysis of the biological myth and social reality of race; factors responsible for persistent racial inequality in the United States; social and political implications of race.

SOCIOL 210-0 Families and Society Changes, continuities, and variations in family life in industrialized countries over the past century. Key concepts in sociology and the study of families. Explanations for changes and implications for inequality.

SOCIOL 212-0 Environment and Society Key environmental problems, such as climate change and oil spills; possible solutions. How the market, government regulations, and social movements shape these issues.

SOCIOL 215-0 Economy and Society Introduction to sociological approaches to economic life. Topics include property rights, illegal markets, money, economic inequalities, direct sales, and boycotts.

SOCIOL 216-0 Gender and Society How our society creates ideas of what gender and gender-appropriate behaviors are. How these ideas are linked to sexuality and relationships, and how they become part of political conflict.

SOCIOL 217-0 Global Perspectives on Education Global comparison of educational systems and learning experiences, with focus on inequality, trends in literacy and achievement, and social factors shaping schooling worldwide.

SOCIOL 220-0 Health, Biomedicine, Culture, and Society Provides a broad introduction to controversies surrounding health and biomedicine by analyzing culture, politics, values, and social institutions. Taught with HUM 220; students may not receive credit for both courses.

SOCIOL 226-0 Sociological Analysis Logic and methods of social research, qualitative and quantitative analysis of social data, and ethical, political, and policy issues in social research. Foundation for further work in social research.

SOCIOL 232-0 Sexuality and Society Examination of the role of sexuality in the cultural, economic, political, and social organization of the United States. Sex work, sex tourism, sexual migration, LGBT social movements, and moral panics. Taught with GNDR ST 232; students may not receive credit for both courses.

SOCIOL 276-0 Introductory Topics in Sociology Introduction to different key issues in the field. Topics vary. May be repeated for credit with a different topic.

SOCIOL 301-0 The City: Urbanization and Urbanism Theories of urbanization, housing, jobs, race and class, segregation, community and social networks politics, reform policies and planning. Research projects.

SOCIOL 302-0 Sociology of Organizations Structure and function of formal organizations, especially in business and government. Stratification, social control, and conflict. Discretion, rules, and information in achieving goals. Modes of participation. Development of informal norms.

SOCIOL 303-0 Analysis and Interpretation of Social Data Introduction to quantitative methods: the interpretation of descriptive statistics, relationships between variables, multiple regression, and the logic of inferential statistics.

SOCIOL 305-0 Population Dynamics Social causes and consequences of population dynamics (fertility, mortality, marriage, divorce, migration) and population structures (age, sex, size, density). Relationship between population changes and health, environmental, and economic outcomes.

SOCIOL 306-0 Sociological Theory Sociological perspectives developed by classic theorists. Elucidation and testing of sociological principles in contemporary research. Primarily for sociology majors. Open to others with consent of instructor.

SOCIOL 307-0 School and Society Reciprocal influences between formal institutions of education and the broader society from different theoretical perspectives. Internal organization of schools, inequality in educational settings and outcomes by gender, class, and race/ethnicity.

SOCIOL 308-0 Crime, Politics, and Society Politics of defining, counting, explaining, and responding to crime, with emphasis on the social organization of crimes of the streets and crimes of the suites; also, domestic and international war crimes.

SOCIOL 309-0 Political Sociology Selected topics in political economy and sociology: revolutions, the development of the modern state, third world development, international conflict, politics of memory and civil society.

SOCIOL 310-0 Sociology of the Family Influence of socioeconomic and other structural and cultural resources and constraints on family structure and dynamics. Historical and comparative perspectives on the modern family.

SOCIOL 311-0 Food, Politics, and Society Social groups, institutions, and policies shaping food production, distribution, and consumption around the world; their social and environmental consequences. Consideration of alternatives to existing food systems.

SOCIOL 312-0 Social Basis of Environmental Change The ways social patterns of production and consumption affect the natural environment, such as climate and biodiversity. Roles of social actors and structures in shaping environmental problems and policies.

SOCIOL 314-0 Sociology of Religion Sociological approach to the study of American religion. Communities, practices, race, gender, and politics in the shaping of religion.

SOCIOL 315-0 Comparative Industrialization The British Industrial Revolution as a benchmark revolution in Western societies; technological innovation, entrepreneurship, labor relations, class structure, and culture in industrialized and industrializing societies; industrialization as an engine of globalization.

SOCIOL 316-0 Economic Sociology Sociological approach to production, distribution, consumption, and markets. Classic and contemporary approaches to the economy compared across social science disciplines.

SOCIOL 317-0 Global Development Exploration of the economic and social changes constituting development, focusing on comparison between the historical experience in Europe and more recent processes in Africa, Asia, and Latin America.

SOCIOL 318-0 Sociology of Law Sociological analysis of legal institutions such as courts, the police, and lawyers. Law, inequality, and social change. Taught with LEGAL ST 308; students may not receive credit for both courses.

SOCIOL 319-0 Sociology of Science Science as social system. Personality, class, and cultural factors in scientific development, creativity, choice of role, simultaneous invention, and priority disputes. Social effects on objectivity and bias.

SOCIOL 320-0 Global Threats, Politics, and the Law Major threats to human security—nuclear proliferation, genocide, terrorism, oppression of minorities—and how they can be prevented by international courts and organizations, multilateralism, and the rule of law.

SOCIOL 321-0 Numbers, Identity, and Modernity Investigation of how we make and use numbers, how we know ourselves through numbers, the kinds of authority we grant to numbers, and how numbers inform our ethics.

SOCIOL 322-0 Sociology of Immigration Sociological approach to immigration addressing such issues as assimilation, race/ethnicity, gender, transnationalism.

SOCIOL 323-0 American Subcultures and Ethnic Groups Differentiation, organization, and stratification by ethnicity, race, lifestyle, and other traits. Maintenance of subgroup boundaries and distinctiveness. Consequences of difference: identity, political and economic participation, group solidarity.

SOCIOL 324-0 Global Capitalism Sociological aspects of the rise of industrial capitalism. Rise of industrial capitalism in Europe, different forms of capitalism across the world, and consequences for poverty and inequality. Development and underdevelopment.

SOCIOL 325-0 Global and Local Inequalities Inequalities in economic and social status, including in income, health, politics, social policy, the family, gender, and race. Contemporary US focus but also historical and global trends.

SOCIOL 326-0 Politics, Society, and Public Policy Social and political determinants of public policy in the United States from the New Deal to the present, including industrial relations, social policy, healthcare, and banking and financial regulation.

SOCIOL 327-0 Youth and Society How modern definitions of childhood and adolescence have evolved. Diversity across the lives of young people today and the development of social networks and transitions to adulthood.

SOCIOL 329-0 Field Research and Methods of Data Collection Practicum in firsthand data collection using observation and structured and unstructured interviewing. Issues of reliability and validity and qualitative analysis.

SOCIOL 330-0 Law, Markets, and Globalization The role of national and international law in recent economic globalization trends, global convergence in law, legal transplants, globalization and the environment.

SOCIOL 331-0 Markets, Hierarchies, and Democracies The forms and social structures for making economic and political decisions in modern societies.

SOCIOL 332-0 Work and Occupations Sociological perspectives on work. Work, class, status, and power. Society, economy, technology, and occupational structure; organization of workplace. Work in the global economy.

SOCIOL 333-0 Law and Power How laws and social rules are related to the exercise of power by some people over others.

SOCIOL 335-0 Sociology of Rational Decision Making Analysis of the role played by numerical and quantitative information in organizational decision making in the private and public sectors.

SOCIOL 345-0 Class and Culture The role that culture plays in the formation and reproduction of social classes. Class socialization, culture and class boundaries, class identities and class consciousness, culture and class action.

SOCIOL 350-0 Sociology of the Arts Art as collective activity. Conventions in art and aesthetics. Professionals and audiences and other aspects of culture.

SOCIOL 355-0 Medical Sociology Social construction of health and illness; inequalities in distribution of illness and health care; organization of health care work and occupations.

SOCIOL 356-0 Sociology of Gender Gender and issues of social reproduction and social change with sexuality and reproduction emphasized.

SOCIOL 376-0 Topics in Sociological Analysis Advanced work on special topics in sociological study. May be repeated for credit with different topic.
SOCIOL 380-7 Junior Year Tutorial Small seminar group in conjunction with various scheduled 300-level classes.
CFS 393-1,2 Field Studies in the Modern Workplace See Chicago Field Studies for a description.
SOCIOL 398-1,2 Senior Research Seminar Independent research projects carried out under faculty supervision. Prerequisite for 398-2: B-minus or better in 398-1.
SOCIOL 399-0 Independent Study (1–2 units) Open with consent of department. Students may reenroll for consecutive quarters.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

SPANISH AND PORTUGUESE

www.wcas.northwestern.edu/spanish-portuguese

The Department of Spanish and Portuguese offers courses in language, literature, and culture that speak to a variety of interests, whether focused on Latin American, Iberian, US Latino, or Lusophone African traditions or some aspect of literature, language, or culture that cuts across geographic divides. Instruction in most courses is in Spanish or Portuguese, and the development of fluency in reading, speaking, and writing the language is an important goal of courses at all levels. The major and minor programs offered in Spanish and Portuguese are flexible and depend on students' initiative in pursuing particular interests within a framework of simple rules. Each student's major or minor program is subject to the approval of an adviser. Students who study Spanish are encouraged to also study Portuguese.

The Department of Spanish and Portuguese encourages all its students to study abroad, whether in the programs in Spain approved by Northwestern, the programs in Mexico, Argentina, or Chile sponsored by Cooperative Programs in the Americas, the program at Fundação Getúlio Vargas in Rio de Janeiro, the summer programs at the Universidad de Guanajuato in Mexico, or other programs approved by the University's Study Abroad Office.

Spanish

Major in Spanish

The major in Spanish is designed to immerse students in the complexity and diversity of literary and intellectual traditions in Latin American and Iberian cultures while they achieve language fluency. Students are encouraged to focus on particular interests, such as literary and cultural history, Latina and Latino studies, Lusophone studies, race and ethnicity, film, and cultural history. Many students fulfill some of the major requirements through courses taken in study abroad programs.

Prerequisite
- SPANISH 203 or 207, AP credit, or placement by the online Spanish Language Placement Exam

Major in Spanish requirements (15 units)
- 204
- 220
- 3 courses chosen from 250, 251, 260, 261 (a 200-level Spanish or Portuguese course chosen from an approved list may substitute for 1 of these courses)
- 2 200- or 300-level elective courses related to Latin American, Iberian, or US Latino historical, literary, and/or cultural traditions; taken in the department, in another department (with prior approval of an undergraduate adviser), or in study abroad programs
- 8 300-level courses in the department
  - At least 1 that deals with a period before the 19th century
  - At least 1 that deals with the literature and/or culture of Latin America
  - At least 1 that deals with the literature and/or culture of Spain
  - Spanish or Portuguese courses taught in English or comparative literary studies courses that include an important component of Latin American, Iberian, or US Latino literatures or cultures may substitute for at most 2 of the 300-level courses. Adviser approval is required.

Minor in Spanish

The minor is designed primarily to enable students to achieve cultural, literary, and linguistic competence in Spanish by exploring the literatures and cultures of Latin America and Spain. Many students fulfill some of the minor requirements through courses taken in study abroad programs.

Prerequisite
- SPANISH 203 or 207, AP credit, or placement by the online Spanish Language Placement Exam

Minor in Spanish requirements (8 units)
- All courses must be above 203.
- At least 3 courses must be at the 300 level.

Honors in Spanish

Majors with strong academic records and an interest in pursuing honors should apply for the honors program during the quarter before independent study for honors is to begin. Students approved by the department enroll in 2 quarters of 399 during either fall-winter or winter-spring of senior year and complete a senior thesis; the 2 quarters of 399 count toward the 15 units required for the major.

Students whose theses and grades meet department criteria are recommended to the college for graduation with

honors. For more information see the department website, contact a faculty adviser, and see Honors in the Major on page 38.

The Teaching of Spanish

Weinberg College students pursuing a major in Spanish who also wish to be certified for secondary teaching must be admitted to the Secondary Teaching Program in the School of Education and Social Policy and complete all requirements as outlined in the SESP chapter of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Spanish Language Courses

SPANISH 101-1,2,3 Elementary Spanish For students who have studied Spanish less than two years. Communicative method used for development of speaking, listening, conversation, and grammar skills in a cultural context. Three class meetings a week. Outside online video lab twice a week.

SPANISH 115-1,2 Accelerated Elementary Spanish For students with some previous experience in Spanish. Communicative method used for development of speaking, listening, writing, and reading skills in a cultural context. Three class meetings a week. Outside online video program two or three times a week. Offered winter and spring. Prerequisite: sufficient score on Spanish Language Placement Exam.

SPANISH 121-1,2,3 Intermediate Spanish Communicative method. Further development of grammar, vocabulary, speaking, and writing skills through emphasis on cultural content and functional use of Spanish language. Three class meetings a week. Outside online video program twice a week. Prerequisite: 101-3, 115-2, or sufficient score on Spanish Language Placement Exam.

SPANISH 125-0 Accelerated Intermediate Spanish Communicative method. Further development of grammar, vocabulary, speaking, and writing skills through readings and short films. Three class meetings a week. Outside online video. Offered in fall only. Prerequisite: AP score of 3 or sufficient score on Spanish Language Placement Exam.

SPANISH 199-0 Language in Context: Contemporary Spain Introduction to the culture and politics of contemporary Spain, used for review of problematic grammatical patterns and skill building in Spanish. Prerequisite: 121-3, 125, AP score of 4, or sufficient score on Spanish Language Placement Exam.

SPANISH 201-0 Conversation on Human Rights: Latin America First course of a sequence designed to develop speaking strategies and structures through analysis of modern (20th- and 21st-century) Latin American culture. Emphasis on accurate informal conversation. Prerequisite: 199 or sufficient score on Spanish Language Placement Exam.

SPANISH 202-0 Conversation on Current Topics Second course of sequence designed to develop speaking strategies and structures through examination of culturally related topics in the Spanish-speaking world. Emphasis on formal conversation and specialized vocabulary. Prerequisite: 201, AP score of 5, or sufficient score on Spanish Language Placement Exam.

SPANISH 203-0 Individual and Society through Written Expression First course of a sequence that develops writing skills and structures through examination of the relationship between the individual and society. Emphasis on textual analysis and development of descriptive, narrative, and argumentative essays. Prerequisite: 201, AP score of 5, or sufficient score on Spanish Language Placement Exam.

SPANISH 204-0 Reading and Writing the Art of Protest Second course of a sequence designed to develop writing skills and structures through analysis of socially committed art. Emphasis on cultural analysis and development of longer essays. Prerequisite: 203 or 207.

SPANISH 205-0 Spanish for Professions: Health Care Advanced course to develop communication skills in Spanish for healthcare purposes. Emphasis on language skills for the medical field, specialized terminology and vocabulary, and cultural nuances. Prerequisite: 201 or AP score of 5.

SPANISH 206-0 Spanish for Professions: Business Advanced course to develop communication skills in Spanish for business purposes. Emphasis on language skills for the global marketplace: specialized terminology, writing, comprehension of cultural nuances. Prerequisite: 201 or AP score of 5.

SPANISH 207-0 Spanish for Heritage Speakers For heritage speakers without prior formal training in Spanish. Emphasis on writing, syntax, and formal modes of the language. Prerequisite: consent of department.

SPANISH 208-0 Spanish and the Community Development of advanced Spanish communication skills and of a thorough and personal cultural knowledge of the Chicago-area Hispanic community through readings, discussions, writing, and required volunteer commitment. Prerequisite: 203 or equivalent.

SPANISH 280-0 Introduction to Hispanic Linguistics Overview of the phonology, phonetics, morphology, syntax, and sociolinguistic and pragmatic elements specific to the Spanish language. Prerequisite: 204 or equivalent.

SPANISH 281-0 Spanish Phonetics and Phonology Theory and practice of Spanish sounds and phonology. Articulation and production, classification and description, combination and syllabification, sonority sequencing, prosodic features, and prevalent dialectal variations. Prerequisite: 280.

SPANISH 301-0 Topics in Language Special topics in historical, grammatical, or other linguistic aspects of Spanish. Prerequisite: 204.

SPANISH 302-0 Advanced Grammar Advanced course designed to polish Spanish usage through in-depth study and development in grammar, focusing on items most problematic for nonnative speakers. Prerequisite: 204 or equivalent.

Courses in Literature and Culture with Prerequisites in Spanish

SPANISH 210-0 Icons, Legends, and Myths in Spain Diverse representations of historical, literary, and popular figures in Spain, such as the *caudillo*, the *obispo*, El Cid, and Don Juan. Prerequisite: 204.

SPANISH 211-0 Icons, Legends, and Myths in Latin America Diverse representations of historical, literary, and popular figures in Latin America, such as the *conquistador*, the dictator, the *gaucho*, Simón Bolívar, Che Guevara, Evita, La Malinche, and Carlos Gardel. Focus on forms of representation such as films, documentaries, musical theater, biography, narrative fiction, poetry, and commercial art. Prerequisite: 204.

SPANISH 220-0 Introduction to Literary Analysis Introduction to textual analysis and to topics such as genre, narratology, prosody, and figurative language, aiming to prepare the student to read, discuss, and write analytically in Spanish about literature and culture. Prerequisite: 204.

SPANISH 250-0 Literature in Spain before 1700 Survey of the origins of the Spanish language and the development of Spanish literature from the Middle Ages to the end of the Spanish Golden Age. Study of representative figures and major literary developments in conjunction with political and cultural history. Prerequisite (may be taken concurrently): 220.

SPANISH 251-0 Literature in Spain since 1700 Survey of literature in Spain from the 18th to the 20th century. Study of representative figures and major literary developments in conjunction with political and cultural history. Prerequisite (may be taken concurrently): 220.

SPANISH 260-0 Literature in Latin America before 1888 Survey of pre-Hispanic, colonial, and romantic traditions in Latin America. Focus on authors and texts such as Popul Vuh, Cristóbal Colón, Inca Garcilaso de la Vega, Sor Juana Inés de la Cruz, Domingo Faustino Sarmiento, and Martín Fierro. Prerequisite (may be taken concurrently): 220.

SPANISH 261-0 Literature in Latin America since 1888 Survey of the modern period, including modernismo, the historical avant-garde, the "Boom," and recent literary trends. Authors such as Delmira Agustini, Jorge Luis Borges, Julio Cortázar, Rubén Darío, Gabriel García Márquez, José Martí, Pablo Neruda, Cristina Peri Rossi, and Elena Poniatowska. Prerequisite (may be taken concurrently): 220.

SPANISH 310-0 Origins of Spanish Civilization Introduction to Spanish civilization from its origins to 1453. Focus on the Roman, Visigoth, and Muslim conquests and their differences, the Christian reconquest, and the evolution of Spanish from Latin, with attention to representative literary, artistic, musical, and historical materials. Prerequisite: 250, 251, 260, or 261.

SPANISH 320-0 Golden Age of Poetry and Prose Major authors of the 17th century, including Garcilaso de la Vega, Fray Luis de León, and Santa Teresa de Jesús. Works by Cervantes other than *Don Quijote*. Prerequisite: 250, 251, 260, or 261.

SPANISH 321-0 Golden Age Drama Major dramatists of the 17th century, including Lope de Vega, Tirso de Molina, and Calderón de la Barca. Prerequisite: 250, 251, 260, or 261.

SPANISH 323-0 Cervantes's *Don Quijote* Close reading of *Don Quijote*, with attention to its historical and cultural context. Prerequisite: 250, 251, 260, or 261.

SPANISH 330-0 The Age of Romanticism in Spain Analysis of the principal literary forms of the romantics in relation to major themes and ideas of the age and to key historical events, such as the end of the Spanish Empire and the establishment of the new liberal regime. Prerequisite: 250, 251, 260, or 261.

SPANISH 331-0 Realism in Spain: The Problem of Representation Theories and practices of realist authors in modern Spanish literature. Issues of literary representation and mimesis. Aesthetic and ideological foundations of realism in the 19th century and in 20th-century variants such as social realism, antirealism, and postmodern documentarism. Prerequisite: 250, 251, 260, or 261.

SPANISH 332-0 Avant-Garde Writers and Experimental Fiction in Spain Aesthetic principles, modes of writing, and uses of media of avant-garde writers and artists in 20th-century Spain. The use of experimental forms in the critique of the bourgeois order and late capitalist society. Prerequisite: 250, 251, 260, or 261.

SPANISH 333-0 The Spanish Civil War: The Good Fight Analysis of the Spanish Civil War (1936–39) and its effects on 20th-century Spanish culture and society. Issues may include the relationship between utopic thought and artistic avant-gardes during this period; literary and filmic representations of the war; and the war's connections to Nazi Germany and World War II. Prerequisite: 250, 251, 260, or 261.

SPANISH 334-0 Memory, History, and Fiction in Spain since 1930 The uses of memory and history in fiction and film produced after the proclamation of the Second Republic. Approaches to rewriting myth and history in autobiography, historiography, and historical fiction. Prerequisite: 250, 251, 260, or 261.

SPANISH 335-0 Modern Fiction in Spain: Studies in Genre Study of literary genres (narrative, poetry, drama) or subgenres (detective fiction, autobiography, the fantastic). May be repeated for credit with different topic. Prerequisite: 250, 251, 260, or 261.

SPANISH 340-0 Colonial Latin American Literature Major texts and writers of the early colonial period, including

chronicles of discovery and conquest from both indigenous and Hispanic sources. Works by authors such as Alvar Núñez Cabeza de Vaca, Hernán Cortés, Bernal Díaz del Castillo, Inca Garcilaso de la Vega, Felipe Guaman Poma de Ayala, Bartolomé de las Casas, Sor Juana Inés de la Cruz, and Carlos de Sigüenza y Góngora. Prerequisite: 250, 251, 260, or 261.

SPANISH 341-0 Latin American Modernisimo Significant poetry, narrative, and criticism from the late 19th and early 20th centuries. Topics such as decadence, aestheticism, the *flâneur* and the *rastacuero*, cosmopolitanism, the modern city, and exoticism. Prerequisite: 250, 251, 260, or 261.

SPANISH 342-0 Region and Rootedness in Latin America Literary traditions evolving from Latin American conceptions of regional and indigenous cultures in the 19th and 20th centuries. Authors such as José María Arguedas, Miguel Ángel Asturias, Rosario Castellanos, Rómulo Gallegos, José Hernández, José Carlos Mariátegui, Clorinda Matto de Turner, and José Eustasio Rivera. Prerequisite: 250, 251, 260, or 261.

SPANISH 343-0 Latin American Avant-Gardes Poetry, prose, and visual art by major figures and groups in 20th-century vanguard movements. Works by authors such as Roberto Arlt, Jorge Luis Borges, Alejo Carpentier, Nicolás Guillén, Felisberto Hernández, Vicente Huidobro, Manuel Maples Arce, and César Vallejo. Prerequisite: 250, 251, 260, or 261.

SPANISH 344-0 Borges The poetry, essays, and short fiction of Jorge Luis Borges. Prerequisite: 250, 251, 260, or 261.

SPANISH 345-0 Reading the "Boom" Historical, literary, and cultural characteristics of the "Boom" in the 1960s and 1970s and the development of the "new" narrative in Latin America. Readings include novels, short fiction, and essays by authors such as Guillermo Cabrera Infante, Julio Cortázar, José Donoso, Carlos Fuentes, Gabriel García Márquez, Manuel Puig, Juan Rulfo, and Mario Vargas Llosa. Prerequisite: 250, 251, 260, or 261.

SPANISH 346-0 Testimonial Narrative in Latin America Study of the tradition of testimonial writing in Latin America with attention to cultural, political, and historical contexts and questions of truth, memory, and subjectivity. Works by authors such as Miguel Barnet, Gabriel García Márquez, Rigoberta Menchú, Alicia Partnoy, Elena Poniatowska, Jacobo Timerman, and Rodolfo Walsh. Prerequisite: 250, 251, 260, or 261.

SPANISH 347-0 Literature and Revolution in Latin America Revolutionary practices in Latin American literatures as well as literary representations of revolution. Authors such as Mariano Azuela, Nellie Campobello, Alejo Carpentier, Roque Dalton, Carlos Fuentes, Pablo Neruda, and Rodolfo Usigli. Prerequisite: 250, 251, 260, or 261.

SPANISH 348-0 Readings in Latin American Short Fiction Theory and practice of Latin American short fiction. Close reading of texts by authors such as Reinaldo Arenas, Jorge Luis Borges, Alejo Carpentier, Julio Cortázar, Rosario Ferré, Carlos Fuentes, Gabriel García Márquez, Augusto Monterroso, Elena Poniatowaska, and others. Prerequisite: 250, 251, 260, or 261.

SPANISH 360-0 Spain: Studies in Culture and Society Significant issues in the social, political, and cultural development of Spain. Prerequisite: 220.

SPANISH 361-0 Latin America: Studies in Culture and Society Analysis of the history of culture in Latin America with an emphasis on the intersection of politics, society, and literature and on the relationship between literary and visual culture. Prerequisite: 220.

SPANISH 363-0 Topics in US Latino Literary and Cultural Studies Analysis of diverse literary and/or cultural productions by and about US Latino/as. Topics may include the politics of representation, cultural and social identity, race, ethnicity and gender, transnationalism and globalization. Case studies vary across cultural practices, media, and literary texts. Prerequisite: 220.

SPANISH 380-0 Topics in Film: The Silver Screen in Latin America and/or Spain Introduction to film in Latin America and/or Spain during the 20th century. Topics vary and may include a historical survey of film, a study of films of a specific period, a comparative analysis of literary works and cinematic adaptations, or the work of specific filmmakers. May be repeated for credit with different topic. Prerequisite: 220.

SPANISH 395-0 Topics in Latin American, Latino, and/or Iberian Cultures Advanced study of topics in the literary traditions of either Latin America or Spain. Possible topics include intellectual history, transatlantic exchanges, the short story, literature of the fantastic, feminist traditions, hybrid cultures, and history and fiction. May be repeated for credit with different topic. Prerequisite: 250, 251, 260, or 261.

SPANISH 399-0 Independent Study Independent reading under supervision. Consultation with director of undergraduate studies required.

Courses with Readings and Discussion in English

SPANISH 223-0 Cervantes Introduction to *Don Quijote* and other selected works, with attention to the historical and cultural context of the 17th century.

SPANISH 225-0 Nationalism, Borders, and Immigration in Spain Interdisciplinary approach to national identity and nationalism in Spain with attention to political and cultural struggles for regional autonomy and to social conflicts arising from immigration.

SPANISH 230-0 Margins and Centers in Latin American Literature and Culture Interdisciplinary analyses of the complex dynamic between social, political, and cultural peripheries and centers as represented in literary and cultural production. Topics include city and country, cosmopolitanism and localism, graphic and oral cultures, and the original and its derivatives.

SPANISH 231-0 The "New" Latin American Narrative Emphasis on novels and short fiction from the Latin

American "boom" of the 1960s and 1970s, with attention also to important precursors and recent trends. Focus on works by writers such as Isabel Allende, Jorge Luis Borges, Julio Cortázar, Carlos Fuentes, Gabriel García Márquez, Manuel Puig, Severo Sarduy, and Luisa Valenzuela.

SPANISH 232-0 Discovering Jewish Latin America Exploration of the Jewish presence in Latin America; focus on diverse forms of cultural production (e.g., literature, testimonial writing, film, photography, theater, art, music) throughout the region.

SPANISH 277-0 Introduction to Latino Literature Survey of major writers and movements from the Spanish colonial era to the present, covering a range of genres and ethnicities. Taught with ENGLISH 277 and LATINO 277; students may receive credit for only 1 of these courses.

SPANISH 397-0 Topics in Latin American, Latino, and Iberian Literatures and Cultures Aspects of the literatures and cultures of Latin America and Spain. Possible topics include postcolonial criticism and its reception in Hispanic cultures, notions of translation, theories of poetics, orality and oral culture, literature and film, the memoir, and travel writing. May be repeated for credit with different topic.

Portuguese

Minor in Portuguese Language and Lusophone Cultures

The minor in Portuguese enables students to acquire competence in oral and written Portuguese and to explore the literatures and cultures of Brazil, Lusophone Africa, and/or Portugal.

The minor draws from faculty and courses in departments and programs such as Spanish, history, and African American studies. Students are encouraged to study abroad in the target cultures and may count up to 3 study abroad courses toward the minor.

Students who meet the prerequisite requirements and wish to declare a minor should meet with a department adviser.

Prerequisite

- 115-2, 121-3, or placement at the 200 level on the Portuguese Language Placement Exam

Minor requirements (6 units)

- 201, 202
- 4 additional courses
  - At least 3 at the 300 level
  - At least 2 in the Portuguese program, including 1 at the 300 level and 1 at the 200 or 300 level
  - At most 2 from outside the Portuguese program
    - Chosen with the consent of the minor adviser
    - At least 1 at the 300 level
    - Eligible courses include those in the Spanish program with a significant Brazilian or Portuguese component, provided that the final paper focuses on a relevant topic; and courses in other departments or programs (e.g., history, Latin American studies, comparative literary studies) with a significant Brazilian, Portuguese, or Lusophone African component.

Portuguese Language Courses

PORT 101-1,2,3 Elementary Portuguese Introduction to grammar and development of listening, speaking, reading, and writing skills in Brazilian Portuguese, as well as the history and culture of Portuguese-speaking countries. Prerequisite for 101-2: 101-1 or sufficient score on placement test; for 101-3: 101-2 or sufficient score on placement examination.

PORT 115-1, 2 Portuguese for Spanish Speakers For students proficient in Spanish. Comparative sociolinguistic and interactive approach to communicative competence emphasizing pronunciation, intonation, sentence structure, and patterns of spoken and written Portuguese. Prerequisite: AP 5 or equivalent on the Spanish Language Placement Exam.

PORT 121-1,2,3 Intermediate Portuguese Further development of listening, speaking, reading, and writing skills in Brazilian Portuguese. Emphasis on cultural content and the functional use of the Portuguese language, focusing on interaction and communication. Prerequisite: sufficient score on Portuguese Language Placement Exam or 101-3 for 121-1, 121-1 for 121-2, or 121-2 for 121-3.

PORT 201-0 Reading and Speaking Portuguese This intermediate course is designed to expand mastery in reading and speaking Brazilian Portuguese through select cultural videos, readings of literary *cronicas*, periodicals, and the Internet. Prerequisite: 115-2, 121-3, or sufficient score on placement examination.

PORT 202-0 Reading and Writing Portuguese Instruction in reading and writing expository and narrative prose. Emphasis on vocabulary, linguistic skills, and syntax appropriate to formal written Portuguese. Prerequisite: 115-2, 121-3, or sufficient score on placement examination.

PORT 210-0 Icons, Legends, and Myths in Brazil See courses taught in English. May include English or Portuguese discussion sections.

PORT 303-0 Topics in Advanced Portuguese Advanced review of grammar concepts and idiomatic use of spoken and written Portuguese. Deals with a variety of topics in the context of Brazilian culture, history, literature, and current events. May be taken more than once for credit with change of topic. Prerequisite: 202 or equivalent.

PORT 399-0 Independent Study Independent study under supervision. Consultation with the director of undergraduate studies required.

Courses Taught in English

PORT 210-0 Icons, Legends, and Myths in Brazil Representations in graphic materials, documentaries, film, theater,

folklore, narrative fiction, and popular music of historical, literary, and popular figures in the national imagination. May include English or Portuguese discussion sections. Prerequisite for Portuguese section: 201, 202, or sufficient score on placement exam. Prerequisite for English section: none.

PORT 380-0 Contemporary Brazil: Literature and Film Study of the literature and film produced in Brazil during the 21st century. Focus on narrative forms, genres, and sociocultural issues.

PORT 396-0 Topics in Lusophone Cultures Aspects of the literatures and cultures of Brazil, Portugal, and Lusophone Africa (Mozambique, Angola, Cape Verde, São Tomé and Principe, Guine-Bissao). Possible topics include Brazilian modernism, Lusophone African literature and film, race and sexuality in Brazilian literature, travel narrative, literature and ethnography, the Portuguese novel, nation and nationalism. May be repeated for credit with different topic.

STATISTICS

www.statistics.northwestern.edu

Statistics is the scientific discipline that deals with the collection, organization, analysis, and interpretation of numerical data. Statistical methods are widely used in observational studies and for the design and analysis of experiments, sample surveys, and censuses. Such analysis involves both description of the properties of groups of observations and problems of drawing inferences from such data. Applications to the biological, social, and physical sciences are widespread, and statistical analyses are increasingly required in actuarial work, accounting, finance, engineering, medicine, and law.

Major in Statistics

Department courses (9 units)

- 1 introductory course: 202, 210, or equivalent
- 320-1,2,3, 325, 350
- 3 additional 300-level courses offered by the department. MATH 310-2 (or IEMS 315) and IEMS 305 may each substitute for 1 of these 3 courses.

Related courses *(units depend on mathematics sequence taken)*

- MATH 220 and 224 (or 212, 213, and 214)
- MATH 230, 234, and 240 (or 281-1,2,3 or 285-1,2,3 or 290-1,2,3 or 291-1,2,3)

Minor in Statistics

Students who complete the minor in statistics receive serious exposure to probability theory, statistical estimation theory, statistical analysis, and the design of statistical data collection. Students choosing to minor in statistics are required to complete MATH 220 and 224 (or 212, 213, and 214) and 230, 234, and 240 (or 281-1,2,3, 285-1,2,3, 290-1,2,3, or 291-1,2,3).

Minor requirements (6 units)

- 202, 210, or equivalent
- 320-1,2,3, 325
- 350 or ECON 381-2

Honors in Statistics

Majors with strong academic records and an interest in pursuing honors should contact the director of undergraduate studies no later than the start of senior year. Accepted students take 2 quarters of 398, during which they develop and write a research paper; 398 does not count toward the major.

Students whose theses and grades meet department criteria are recommended to the college for graduation with honors. For more information consult the director of undergraduate studies and see Honors in the Major on page 38.

Courses

STAT 202-0 Introduction to Statistics Data collection, summarization, correlation, regression, probability, sampling, estimation, tests of significance. Does not require calculus and makes minimal use of mathematics. 202 and 210 cannot both be taken for credit.

STAT 210-0 Introductory Statistics for the Social Sciences A mathematical introduction to probability theory and statistical methods, including properties of probability distributions, sampling distributions, estimation, confidence intervals, and hypothesis testing. 210 is primarily intended for economics majors. 202 and 210 cannot both be taken for credit. Prerequisite: strong background in high school algebra (calculus is not required).

STAT 232-0 Applied Statistics Basic concepts of using statistical models to draw conclusions from experimental and survey data. Topics include simple linear regression, multiple regression, analysis of variance, and analysis of covariance. Practical application of the methods and the interpretation of the results will be emphasized. Prerequisites: 202, 210, or equivalent; MATH 220.

STAT 320-1,2,3 Statistical Theory and Methods 1. Distribution functions, densities, measurement of location and scale, random sampling, random variables, sampling statistics, hypothesis tests, confidence intervals, parameter estimation, and nonparametric methods. **2.** Correlation and regression, contingency tables, analysis of variance, design and analysis of experiments. **3.** Comparison of parameters, goodness-of-fit tests, regression analysis, analysis of variance, and nonparametric methods. Students may not receive credit for both 320-1 and any of 383, MATH 310-1, 385, EECS 302, or IEMS 202. Prerequisite for 320-1: 202 or 210; corequisite: MATH 234. Prerequisites for 320-2: 320-1, MATH 240. Prerequisite for 320-3: 320-2.

STAT 325-0 Survey Sampling Probability sampling, simple random sampling, error estimation, sample size, stratification, systematic sampling, replication methods, ratio and regression estimation, cluster sampling. Prerequisites: 2 quarters of statistics or consent of instructor.

STAT 328-0 Causal Inference Introduction to modern statistical thinking about causal inference. Topics include completely randomized experiments, confounding, ignorability of assignment mechanisms, matching, observational studies, noncompliance, and Bayesian methods. Prerequisites: 320-2, 350.

STAT 338-0 History of Statistics Historical survey of the development of modern statistics, from Bernoulli's law of large numbers to the contributions of R. A. Fisher. Prerequisite: 320-2 or equivalent.

STAT 342-0 Statistical Data Mining Methods for modeling binary responses with multiple explanatory variables. Potential topics include statistical decision theory, binary regression models, cluster analysis, probablistic conditional independence, and graphical models. Prerequisites: courses in probability and statistics comparable to 320-1,2; a course in multiple regression comparable to 350; familiarity with statistical computing software such as MINITAB or SPSS.

STAT 344-0 Statistical Computing Theoretical and practical problems in the development and use of statistical computing systems for numerical and graphical analysis of data. Prerequisites: 2 courses chosen from 320-2,3, 350, 351, PSYCH 351, MATH 240, or equivalent.

STAT 345-0 Statistical Demography Introduction to statistical theory of demographic rates (births, deaths, migration) in multistate setting; statistical models underlying formal demography; analysis of error in demographic forecasting. Prerequisite: 350, MATH 240, or equivalent.

STAT 348-0 Applied Multivariate Analysis Statistical methods for describing and analyzing multivariate data. Principal component analysis, factor analysis, canonical correlation, discrimination, and classification. Emphasis on statistical and geometric motivation, practical application, and interpretation of results. Prerequisites: 320-2, MATH 240.

STAT 350-0 Regression Analysis Simple linear regression and correlation, multiple regression, residual analysis, selection of subsets of variables, multicollinearity and shrinkage estimation, nonlinear regression. Prerequisite: 320-2 or equivalent.

STAT 351-0 Design and Analysis of Experiments Methods of designing experiments and analyzing data obtained from them: one-way and two-way layouts, incomplete block designs, factorial designs, random effects, split-plot and nested designs. Prerequisite: 320-2 or equivalent.

STAT 352-0 Nonparametric Statistical Methods Survey of nonparametric methods, with emphasis on understanding their application. Prerequisite: 320-2 or equivalent.

STAT 354-0 Applied Time Series Modeling and Forecasting Introduction to modern time series analysis. Autocorrelation, cross-correlation, spectral densities, periodograms; modeling and forecasting time series using linear models. Prerequisites: 320-2, 350.

STAT 355-0 Analysis of Qualitative Data Introduction to the analysis of qualitative data. Measures of association, log-linear models, logits, and probits. Prerequisite: 320-2 or equivalent.

STAT 356-0 Hierarchical Linear Models Introduction to the theory and application of hierarchical linear models. Two- and three-level linear models, hierarchical generalized linear models, and application of hierarchical models to organizational research and growth models. Prerequisites: 320-2, 350.

STAT 359-0 Topics in Statistics Topics in theoretical and applied statistics to be chosen by instructor. Prerequisite: consent of instructor.

STAT 365-0 Introduction to the Analysis of Financial Data Use of time series and regression models in the analysis of financial data. Topics covered include models for returns, portfolio theory, capital asset pricing model, and options pricing. Prerequisites: MATH 240 and at least 2 courses in probability and statistics.

STAT 370-0 Human Rights Statistics Development, analysis, interpretation, use, and misuse of statistical data and methods for description, evaluation, and political action regarding war, disappearances, justice, violence against women, trafficking, profiling, elections, hunger, refugees, discrimination, etc. Prerequisites: 2 of 325, 350, 320-2,3; ECON 381-1,2; MATH 386-1,2; IEMS 303, 304; or permission of instructor.

STAT 383-0 Probability and Statistics for ISP Probability and statistics. Ordinarily taken only by students in ISP; permission required otherwise. Students may not receive credit for both 383 and any of 320-1; MATH 310-1, 383, 385; or EECS 302. Prerequisites: MATH 281-1,2,3; PHYSICS 125-1,2,3.

STAT 398-0 Undergraduate Seminar

STAT 399-0 Independent Study Independent work under the guidance of a faculty member. Permission of department required.

Relevant Courses in Other Departments

- IEMS 202, 305, 315 (see McCormick School chapter)
- MATH 310-1,2,3

SWAHILI

See African Studies.

TURKISH

See Middle East and North African Studies.

URBAN STUDIES

www.urbanstudies.northwestern.edu

The Program in Urban Studies enables students to complement a major in Weinberg College or another Northwestern school with a second major in urban studies. The purpose of the program is to introduce students to an interdisciplinary perspective on the city and its problems and promises, bringing together faculty and students who share common interests but have different academic backgrounds. Courses are drawn primarily from such social sciences as anthropology, economics, geography, history, political science, and sociology, as well as from other departments when relevant. In addition to the following requirements, it is recommended that students who major in urban studies complete a methods or statistics course in one of the social science departments and participate in an urban-related field studies program.

Adjunct Major in Urban Studies

Adjunct major requirements (9 units)

- 7 urban-relevant courses
  - Courses must be approved by the program director, who maintains a list of routinely approved courses.
  - At least 4 courses must be at the 300 level.
- 398-1,2 senior thesis seminar, to be completed during fall-winter or winter-spring quarters of the senior year. Students who complete a thesis in another department may substitute 2 other 300-level urban-relevant courses with the approval of the program director.
- All adjunct majors require the completion of a stand-alone major as well. No course may be double-counted toward the urban studies adjunct major and another major.

Honors in Urban Studies

All urban studies majors complete a senior thesis in urban studies or in their primary major.

Those pursuing honors in urban studies typically enroll in the 2-unit 398 senior thesis seminar in fall and winter of senior year. Those whose theses and grades meet program criteria are recommended to the college for graduation with honors in urban studies.

Students writing a senior thesis and pursuing honors in the primary major are not eligible for honors in urban studies. Instead of a senior thesis in urban studies and enrollment in 398, they take 2 other 300-level urban-relevant courses approved by the program director.

For more information consult the program director and see Honors in the Major on page 38.

Course

URBAN ST 398-1,2 Urban Studies Seminar Open to senior majors in urban studies. Interdisciplinary approach to urban studies entailing design and execution of a research project over 2 quarters. Grade of K given in 398-1 changed to letter grade after completion of 398-2.

URBAN ST 399-0 Independent Study Independent work under the guidance of a faculty member. Permission of the program director required.

WRITING PROGRAM

www.writingprogram.northwestern.edu

The Writing Program is an independent Weinberg College unit that seeks to help all Northwestern undergraduates learn to write clearly and persuasively. A core faculty of experienced writing instructors teach the program's main sequence of introductory, intermediate, and advanced expository writing courses. These are listed as ENGLISH 105, 105-6, 106, 205, and 305. Writing courses are limited to 15 students, allowing instructors to comment extensively on students' writing and to meet regularly with students in individual conferences. Courses at every level emphasize revision, with the goal of strengthening each student's ability to think clearly, analyze carefully, argue convincingly, and communicate effectively.

The Writing Program also operates the Writing Place, a center that provides free composition tutoring and consulting for all Northwestern students. The Writing Place, located in University Library, is open most mornings, afternoons, and evenings during the academic year. Students may make appointments, use the schedule of drop-in hours, or interact with Writing Place tutors through the campus computer network.

In addition, the Writing Program helps to oversee writing requirements—and thus provides writing advising—for undergraduates in Weinberg College, the McCormick School, and the Henry and Leigh Bienen School of Music. Members of the Writing Program faculty teach specialized courses and workshops, as needed. In recent years the Writing Program has collaborated extensively with other University programs and departments, developing new ways to integrate writing instruction with instruction in other disciplines, such as engineering design. In all its courses and special offerings, the Writing Program concentrates on helping students develop skill, confidence, and insight as writers.

Students interested in a writing major should see the English Major in Writing in the English section.

Courses

ENGLISH 105-0 Expository Writing See English.
ENGLISH 106-1,2 Writing in Special Contexts See English.
ENGLISH 205-0 Intermediate Composition See English.
ENGLISH 304-0 Practical Rhetoric See English.
ENGLISH 305-0 Advanced Composition See English.

YIDDISH

See Jewish Studies.

School of Communication

www.communication.northwestern.edu

Communication is at the root of nearly everything we do, and mastering the art of communication can open doors in a wide range of careers, from law and medicine to acting, directing, writing, and producing.

The School of Communication's mission is based on a philosophy of performance. We seek to improve the practice of communication, whether on the stage or screen, at the podium, in the clinic, or in everyday life.

The school is committed to building the basic and applied sciences of communication; developing theoretical and critical perspectives on communicative performances; creating new technologies for communication and new modes of artistic expression; and helping students to be more effective in their work, at home, and in civic life by applying principles of communication. Undergraduates work in partnerships with world-class faculty to create new understandings and develop new approaches to human communication. The curriculum provides students with a solid liberal-arts education that broadens and enriches their studies of human expression and interaction.

Founded by Robert Cumnock in 1878, the School of Communication is now the third largest of Northwestern's six undergraduate divisions. It annually enrolls more than 1,200 undergraduate majors and 400 graduate students.

Originally, the curriculum and its related activities were concerned with public speaking and interpretative reading as performing arts. As the field grew, the school added instruction in theatre, speech pathology, audiology, radio, television, film, and other specialties in oral communication. Throughout its history the school has often been a pioneer in new fields of study, including film and audiology.

Today the five departments of instruction represent the diverse spectrum of study in the field of communication: communication sciences and disorders; communication studies; performance studies; radio/television/film; and theatre (including dance). All departments offer graduate courses. The School of Communication sponsors dance, debate, media arts, and theatre arts divisions of Northwestern's National High School Institute.

This wide range of educational activities is housed in the Frances Searle Building—which includes administrative offices, a student resource center, two departmental offices, and laboratory and research spaces—as well as in the school's original building, Annie May Swift Hall; two former residences on Chicago Avenue; the Theatre and Interpretation Center; and John J. Louis Hall, a state-of-the-art studio production facility.

In 2008 Northwestern opened a branch campus in Qatar, where programs in communication and journalism are offered. (See Campuses and Schools in The University chapter of this catalog.)

ACADEMIC POLICIES

Requirements for the Degree of Bachelor of Science in Communication and the Degree of Bachelor of Arts in Communication

The School of Communication grants the degree of bachelor of science in communication upon (1) the satisfactory completion of 45 course units; (2) the fulfillment of the distribution requirement of the student's major department; and (3) the completion of an approved program of study in communication and related fields suited to the student's special interests and needs. If students interrupt the program of study for an extended period of time and degree requirements are changed during this period, they are normally held to the new requirements.

In addition to, and independent of, the requirements set by the School of Communication, students must satisfy the Undergraduate Registration Requirement (see page 17).

The Departments of Communication Studies, Performance Studies, Radio/Television/Film, and Theatre (including dance) offer the bachelor of arts in communication. The requirements for this degree are identical to the requirements for the bachelor of science in communication with the addition of a foreign language requirement. (Regardless of whether the BA or BS is sought, the required programs of study for majors in the Departments of Communication Studies and Radio/Television/Film include specific foreign language requirements; for details, see the major requirements for each of those programs.) To earn the bachelor of arts in communication, students—in addition to completing the degree requirements for the bachelor of science—must demonstrate two-year proficiency in a classical or modern foreign language. This proficiency is established in precisely the same manner as in the Weinberg College of Arts and Sciences; see page 36 in the Weinberg College chapter of this catalog.

General Requirements

Of the 45 courses required for all major programs in the School of Communication, 35 must be completed with grades of A, B, or C (grades of C- do not satisfy this requirement). A minimum of 18 courses must be taken outside the major department (see distribution requirements, below). All distribution courses and all courses applied to a major or a minor must be completed with a grade of C- or higher. Courses offered by the major department may not be taken for a P grade regardless of how they are applied to degree requirements. D and P grades may apply only to the elective requirement.

A transfer student will be required to complete at least 11 courses in the School of Communication at Northwestern. A communication placement interview is required at the time of first registration for all transfer students.

Distribution Requirements

All major programs in communication require 18 courses outside the major department in the following areas:

- Science, mathematics, and technology
- Individual and social behavior
- Humanities and fine arts

Students should consult the department concerned for the range of disciplines within each category and the number of courses required.

Major Programs in Communication and Related Requirements

All students in the School of Communication must meet the requirements of one of the following major programs: human communication sciences, communication studies, performance studies, radio/television/film, theatre, or dance. Basic communication courses are required in all programs, and provisions are made for study in other divisions of the University to complement the major program.

Student Conduct in Communication Courses

All undergraduate students enrolled in School of Communication courses are held accountable to the University's standards of academic integrity (see Academic Integrity on page 21 in the Undergraduate Education chapter of this catalog). They also are responsible for compliance with the following standards:

- Attendance is required in all courses, and excessive absence is cause for failure.
- All assigned work must be completed to receive course credit.
- Assignments must be turned in on time, and examinations must be taken as scheduled; assignments cannot be made up or grades of incomplete given without prior approval from the instructor.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

ACADEMIC OPTIONS

Minor Programs

The School of Communication offers five minor programs: dance, film and media studies, human communication sciences, sound design, and theatre. Students may not earn both a major and a minor in the same area, except that radio/television/film majors may earn a minor in sound design. Students wishing to pursue a minor should contact the appropriate department to be assigned a minor adviser. No course for the minor may be taken utilizing the P/N option, and all classes must be completed at a grade of C- or higher in order to be counted toward the minor. School of Communication minors are open to all Northwestern undergraduate students. Please see the appropriate departmental sections for descriptions of the minors in human communication sciences, theatre, and dance. The Department of Radio/Television/Film administers the minor programs in film and media studies (see page 176) and sound design (see page 176).

Certificate Program

The Department of Theatre administers the Music Theatre Certificate Program (see page 180).

Modules

Modules are extended, structured learning experiences that take a student from an entry point to mastery of a specific learning objective. Modules are built around 4 to 6 courses that provide formal instruction related to the learning goal. Formal coursework is paired with cocurricular experiences that provide appropriate opportunities for application and practice. Modules provide a flexible way to build student-faculty cohorts, promote in-depth learning in areas of special significance, and guarantee that students can articulate what they have learned and demonstrate it through performance. For more information about modules, visit the School of Communication Learning Communities website at commons.soc.northwestern.edu/home.

Independent Study

Independent study is available by petition to juniors and seniors who have a minimum 3.0 grade-point average. Petitions are available in the Undergraduate Resource Center at Frances Searle 1-102, in department offices, and online at www.communication.northwestern.edu/src/forms. Students must secure a faculty sponsor to guide their independent study. The undergraduate dean must approve all independent study proposals. The School of Communication does not limit the number of independent studies that a student may take, but only 2 units of 399 may apply to the major degree requirements and only 2 units of 399 to the distribution requirements. Additional units of 399 are counted as electives. Independent study may not be taken using the P/N option. Some majors have additional

rules regarding independent study; see the major requirements for details.

Internships

www.communication.northwestern.edu/learn/internships/about.php

Internships (also sometimes referred to as field studies) allow students to gain valuable organizational experience and apply theoretical knowledge to situations outside the classroom. Students may receive up to four academic credits by enrolling in a weekly seminar led by an internship coordinator as well as working at an internship. One credit may be applied to the major requirements, and the remaining credits are electives. Full-time internships are available in Chicago, Los Angeles, and New York City and may be coordinated in other cities on a case-by-case basis. Internships are coordinated through the Office of External Programs, Internships, and Career Services (EPICS). Interested students should visit the website and contact their advisers.

Junior Tutorials

Junior tutorials are small seminars, open to juniors only, taught by School of Communication professors on unique topics. The tutorials may count as School of Communication courses and as major courses if taught by a professor in the student's major department. They are listed in CAESAR under CMN-related courses and are listed in Spotlight every quarter. Students may take one junior tutorial in the course of their undergraduate career; additional enrollments require approval of the undergraduate dean.

Student-Organized Seminars

A student-organized seminar (SOS) consists of a small group of students (under the sponsorship of one or more faculty members) who explore a specific topic not covered in the University curriculum. Typically, nine or fewer students participate, each preparing a written seminar paper and making an oral presentation at one of the class meetings. Before the School of Communication approves an SOS course, a copy of the seminar's proposal, signed by the sponsor and the department chair, must be submitted to the undergraduate dean. Guidelines for proposing an SOS are available in the Student Resource Center at Frances Searle 1-102 and online at www.communication.northwestern.edu/src/forms.

Research Practica

Opportunities sometimes arise for a student to work on a faculty member's research or project team. Sometimes faculty will invite students to participate in a practicum, but students may also approach a professor whose research or project particularly interests them.

Students are registered for research practica through the Student Resource Office at Frances-Searle 1-102 or via permission number from the professor or department. Professor approval is required to register.

Study Abroad

www.northwestern.edu/studyabroad

Students are encouraged to study abroad because it is an important educational experience. Most aspects of study abroad are handled by the Study Abroad Office, 629 Colfax Street. For more information see the Undergraduate Education chapter of this catalog.

Graduate Study

The School of Communication has been a national center for graduate study and research in the fields of communication arts and sciences for many years. Programs for the master of arts, master of fine arts, master of science, and doctor of philosophy degrees with majors in communication are administered by the Graduate School of Northwestern University. All candidates for these degrees must satisfy the Graduate School requirements. The School of Communication itself offers the doctor of audiology and master of science in communication degrees.

Requirements for the departmental and thesis master's degrees, the master of fine arts, and the doctor of philosophy degrees in any division of the School of Communication are described in the Graduate School catalog. Requirements for the master of science in communication and doctor of audiology degrees are available from the School of Communication.

STUDENT RESOURCES

Academic Advising

Each student is assigned an adviser within the School of Communication. This adviser is available for consultation, especially for the purpose of planning for the next registration. Freshmen have a separate advising period before the fall registration. Ultimate responsibility for meeting degree requirements rests with the student.

Cocurricular Activities and Programs

A variety of cocurricular opportunities are available to School of Communication students. Each fall Northwestern's Activities Fair offers information on options in addition to those listed here.

Arts in the City

Arts in the City is a program offered exclusively to students of the School of Communication. It gives them the opportunity to experience the best arts in Chicago for a nominal fee that includes ticket and transportation. These events particularly showcase the talents of those connected with Northwestern and allow students to socialize with faculty and peers.

Block Cinema

Dedicated to providing the campus, the North Shore, and Chicago with a high-quality venue for repertory cinema, Block Cinema screens classic and contemporary films three nights a week in the Block Museum's state-of-the-art projection facility.

Dean's Advisory Council

The Dean's Advisory Council consists of 20 undergraduate students currently enrolled in the school (4 from each of the five departments, representing the freshman, sophomore, junior, and senior classes). The council meets once each quarter and holds additional meetings as needed. Applications are available from the Student Resource Center at Frances Searle 1-102.

Debate Society

The Northwestern debate program was founded in 1855, making it the oldest in the country. Debaters develop valuable analytical and communication skills by participating in more than 600 rounds of intercollegiate competition each season, in addition to hosting debate tournaments on campus and debating teams from other countries. Headquartered in Hardy House, the debate program has achieved unequaled success in competition, winning the National Debate Tournament a record 14 times. For more information see www.debate.northwestern.edu.

Inspire Films

Inspire Films is a Northwestern student initiative aiming to produce social-issue films that engage with topics affecting our local and international communities. Believing that film has the power to motivate thoughtful discussion and action, Inspire Films produces media and relevant programs that inspire thought, dialogue, critical discussion, and action with regard to various social issues. Inspire's goal is to create an interdisciplinary approach to filmmaking, allowing students from across disciplines to work together in creating socially responsible and critical media. For more information see inspiremedianu.com.

Lambda Pi Eta

Lambda Pi Eta is the official communication studies honor society of the National Communication Association. Its purpose is to recognize, foster, and reward outstanding scholastic achievement in communication studies; stimulate interest in the field of communication; promote and encourage professional development among communication majors; provide an opportunity to discuss and exchange ideas in the field of communication; establish and maintain closer relationships between faculty and students; and explore options for graduate education in communication studies. The Pi Theta chapter was established at Northwestern as a selective academic honor society that seeks to represent and serve the School of Communication through academic and social events and projects. The chapter also seeks to provide resources and information to the student community; encourage a free exchange of ideas among the student body; and create a common meeting ground for the diverse fields of interest within the School of Communication.

Niteskool

Niteskool Productions is Northwestern's student-run music, music video, and concert production company. It is the oldest undergraduate student-run label in the country. Supported by the School of Communication and Northwestern's Associated Student Government, Niteskool has established itself as the leader in promoting and producing student music in the Chicago area. Niteskool's goal is to develop and distribute the nation's highest-quality music album that is completely conceived, performed, directed, and produced by students.

Speech Team

Sponsored by the School of Communication, Northwestern's speech team serves to develop what is arguably the most important skill of any profession—the art of communication. Through the forum of public speaking, students learn to communicate effectively in a competitive environment that stresses logic, quick thinking, breadth of knowledge, and, ultimately, persuasion. Eligibility is open to any Northwestern undergraduate, regardless of major, who wishes to explore or cultivate public speaking skills. No prior experience is necessary. For more information see http://communication.northwestern.edu/learn/student_activities/speech.

Student Theatre and Performance Groups

Northwestern offers many performance-oriented student theatre groups. For a listing see northwestern.collegiatelink.net/organizations.

Studio 22

Studio 22 Productions is a student-run not-for-profit film production company dedicated to student productions and creativity. Based at Northwestern, the group is funded through contributions from the School of Communication and generous individual donors. Each year Studio 22 gives grants for student projects: major grants for two or three projects, a minor grant, and a number of minigrants. Also, multimedia grants are awarded for a variety of projects. All Studio 22 productions are screened in the Technological Institute's Ryan Family Auditorium the first week of June. For more information see www.studio22nu.com.

Theatre, Performance Studies, and Dance Productions

All students are eligible to audition for theatre, performance studies, and dance productions. Audition notices are posted on the Theatre and Interpretation Center's first-floor bulletin board. For more information on the

school's mainstage productions, see www.communication.northwestern.edu/tic.

Undergraduate RTVF Student Association
The Undergraduate RTVF Student Association is the official student council of the Department of Radio/Television/Film. The council meets with faculty to voice student concerns, fosters community within the program, and develops programs to enhance the radio/television/film experience.

WNUR
WNUR 89.3 FM is a noncommercial radio station operated and managed by students. Staff membership is open to all Northwestern students. WNUR's studios are located in John J. Louis Hall. For more information see www.wnur.org.

Facilities

The School of Communication provides outstanding facilities where faculty and students work, perform, pursue research, and engage in media ventures. The Theatre and Interpretation Center encompasses multiple performance and rehearsal spaces as well as scene shops. The Marjorie Ward Marshall Dance Center houses two dance studios. Cahn Auditorium offers the largest performance space on campus. Fisk Digital Media Studio is a lab where radio/television/film students complete film and media projects. John J. Louis Hall, home to production and postproduction facilities for the Department of Radio/Television/Film, includes the studios of WNUR-FM and the Barbara and Garry Marshall Studio wing, a film sound stage. Block Cinema, part of the Block Museum, screens repertory film. The Media Services Group circulates and services technical equipment for students and faculty. The interdepartmental Kresge Digital Media Lab is a high-end teaching facility.

Annie May Swift Hall, completed in 1895, was the school's original home. Recently renovated, it houses the departmental and faculty offices of performance studies and radio/television/film as well as a film library, a lecture theater-auditorium, and classrooms. The Frances Searle Building is the epicenter of the School of Communication, housing the Dean's Office, the departmental offices of communication studies and communication sciences and disorders, digital centers, classrooms, and research laboratories and clinics. 1815 Chicago Avenue houses offices for faculty in the Department of Communication Studies. Hardy House is home to the debate team.

ACADEMIC OFFERINGS

INTRODUCTORY AND RELATED COURSES IN GENERAL COMMUNICATION

GEN CMN 101-0 Interpersonal Communication Laboratory experience in human interaction. Analysis of communication within groups.

GEN CMN 102-0 Public Speaking Theory, composition, delivery, and criticism of public speeches.

GEN CMN 103-0 Analysis and Performance of Literature Critical reading, written analysis, and performance of literary texts; general introduction to performance studies.

GEN CMN 104-0 Argumentation and Debate Theories of argumentation and debate, with many opportunities for practice. Analysis and evaluation of the discourse related to public controversies.

GEN CMN 108-0 Communication Disorders Basic facts and principles of human communication and its disorders. Participation in or review of current research is included in this introduction to human communication science.

GEN CMN 110-0 Voice for Performance Intensive individual development and use of voice for performance. Open to theatre, dance, and performance studies majors only.

GEN CMN 115-0 Freshman Seminar Small courses that feature investigations of complex contemporary social issues explored in pedagogically innovative ways.

GEN CMN 203-0 Performance, Culture, and Communication Explores how live performance and dramatic forms of communication are methods used to examine social behavior and cultural expressions.

INTERDEPARTMENTAL COURSE

CMN 340-0 Internship in Communication Enrollment only by petition in advance. Arrangements for winter quarter must be made by November 1 and for spring quarter by February 1.

COMMUNICATION SCIENCES AND DISORDERS

www.communication.northwestern.edu/departments/csd
The Roxelyn and Richard Pepper Department of Communication Sciences and Disorders offers a major in human communication sciences, providing undergraduate students with a foundation for the study of disorders of hearing, speech, language, and learning. The department's classroom, clinical, and research facilities are located in the Frances Searle Building on the Evanston campus. The undergraduate program emphasizes the basic science principles underlying all human communication and cognition and introduces students to clinical issues and research findings that pertain to disorders of communication and learning. The major in human communication sciences is particularly appealing to students who plan to attend graduate or professional school in fields such as medicine,

dentistry, and neuroscience as well as audiology and hearing sciences, learning disabilities, and speech and language pathology. Students who do not pursue medical, clinically based, or research graduate degrees may enter careers in health-related private industry or the public sector.

Undergraduate majors in human communication sciences have the option of pursuing a general course of study, typical for most premed students, or of choosing among three areas of concentration: audiology and hearing sciences, learning disabilities, and speech and language pathology.

Audiology and hearing sciences encompasses the study of hearing, hearing disorders, and the treatment of hearing disorders. Emphasis is on basic communication science, including study of the anatomical, physiological, and physical bases of hearing. Undergraduate courses present information on normal communication processes and provide an introduction to audiologic assessment and hearing loss management.

Learning disabilities is concerned with learning processes and their dysfunctions, including disorders of perception, memory, language, and conceptualization. Such disorders lead to problems in the acquisition and use of oral language, reading, writing, and math skills that require specialized remediation. Undergraduate course work stresses theoretical, scientific, clinical, and educational issues as a foundation for advanced training.

Speech and language pathology introduces students to the psychological, linguistic, neurological, acoustic, anatomical, and physiological bases of normal speech and language behavior. As their knowledge of normal speech, language, learning, and hearing processes increases, students are introduced to the communicative disorders that result from the disruption of these processes. Advanced undergraduate courses are concerned with the nature, recognition, and management of common communicative disorders and present issues related to administration and public policy.

Accelerated Degree Program in Medical Education

Students admitted to the Honors Program in Medical Education with an emphasis in human communication sciences must meet the 300- and 400-level course requirements of the department (see following description). However, because they spend only three years on the Evanston campus, they take fewer 100- and 200-level courses in the department and the School of Communication than some four-year undergraduates.

For information on applying to HPME, see Special Admission Programs on page 11. For a description of the program, including requirements, see page 29 in the Cross-School Options chapter of this catalog.

Honors in Communication Sciences and Disorders

An honors program is available for students in their senior year who have maintained an outstanding undergraduate record through their junior year. Upon successful completion of an honors project, they will graduate with honors in communication sciences and disorders. Also see Honors and Prizes on page 23 in the Undergraduate Education chapter of this catalog.

Research Practicum

Students may register for a research practicum in which they gain research experience by working with a faculty member on design, execution, and presentation of a research project. Students may develop ideas for an independent study based on their research practicum experience. A combined total of only 3 units of research practicum and independent study may apply toward the major degree requirements.

Independent Study

Students may register for units of independent study, in which they work closely with a faculty member on a topic of mutual interest. Students interested in independent study should select courses that may lead to more advanced library or laboratory research. A combined total of only 3 units of research practicum and independent study may apply toward the major degree requirements.

Major in Human Communication Sciences

There is one set of requirements for a major in human communication sciences. However, well-designed course plans are recommended for each area of concentration. Students should consult their adviser for details.

Major requirements (15–16 units)

- 2 GEN CMN courses: 108 and a choice of 101, 102, or 103; both must be passed with a grade of C (not C-) or higher
- 13 CSD courses, all of which must be passed with a grade of C (not C-) or higher, and which include the following:
  100-level course: 112
  200-level course: 202
  10 300- and 400-level courses in communicative disorders, including 3 clinically oriented courses (typically chosen from 318, 334, 336, 339, 373, 376, 419, 438, 444, 465, and 491) and 3 basic science courses (typically chosen from 301, 302, 303, 305, 306, 307, 309, 310, 342, 382, 392, 398, 399, and 406)
- Statistics: a choice of 304 (which fulfills both the statistics requirement and 1 of the 13 CSD course requirements) or 1 of 2 non-CSD statistics courses—PSYCH 201 or STAT 210—neither of which fulfills 1 of the 13 CSD course requirements

Additional requirements (29–30 units)

- Writing proficiency: requirement for all students
- Distribution requirements: 18 courses outside the department, including 3 in the School of Communication's science, mathematics, and technology distribution area (1 in mathematics, 1 in biology, and 1 in physics or chemistry; either the biology or the physics/chemistry course must have a lab component); 3 in the school's individual and social behavior distribution area; 3 in the school's humanities and fine arts distribution area; and 9 additional courses outside the department, including 3 in any combination of science, mathematics, technology, and/or individual and social behavior
- Electives in communication and other areas to complete a minimum of 45 courses

Also see the description of requirements for students admitted to the Honors Program in Medical Education on page 29.

Minor in Human Communication Sciences

www.communication.northwestern.edu/programs/minor_human_communication_sciences

A minor in human communication sciences requires at least 7 courses in the communication sciences and disorders department. No courses for the minor may be taken using the P/N option, and all classes must be completed with a grade of C- or higher in order to be counted toward the minor.

Minor requirements (7 units)

- 202 (or another 200- or 300-level course if granted a waiver based on course work in another department)
- At least 3 300- or 400-level basic science courses typically chosen from 301, 302, 303, 305, 306, 307, 309, 310, 342, 382, 392, 398, 399, and 406 (students should consult with their adviser for other course options)
- At least 3 300- or 400-level clinical courses typically chosen from 318, 334, 336, 339, 373, 376, 419, 438, 444, 465, and 491 (students should consult with their advisers for other course options)

Courses for Undergraduate and Graduate Students

Undergraduates may take 400-level courses with permission of the instructor.

GEN CMN 108-0 Human Communication Disorders See Introductory and Related Courses.

CSD 112-0 The Scientific Exploration of Communication Introduction course to the biology and physics of human communication. Basic properties of speech sounds and how they are produced and received by the listener; relation between human anatomical structures involved in sound production, modulation, and reception; brain mechanisms involved in processing the sounds of speech.

CSD 202-0 Neurobiology of Communication Human anatomy, physiology, and neurology in relation to communicative behavior. Sensory, perceptual, cognitive, and motor processes.

CSD 205-0 Study of Learning and Learning Problems in the Classroom Study of children's learning in classroom settings. Field placement, using informal assessments of social, cognitive, and communication functioning, for children with and without exceptionalities.

CSD 207-0 Seminar in Communication Sciences and Disorders Major topics of research interest in communicative disorders. Principles of research in communicative disorders.

CSD 301-0 Anatomy and Physiology of the Vocal Mechanism Anatomical and physiological mechanisms of breathing, phonation, and articulation. Laboratories include dissection and participation in physiological research. Prerequisite: sophomore standing or above.

CSD 302-0 Anatomy and Physiology of the Peripheral Hearing Mechanism Gross and fine structure; function of the peripheral auditory system. Prerequisites: junior standing or above, 202, 307, or consent of instructor.

CSD 303-0 Brain and Cognition Neural bases of cognitive processing with emphases on neuroimaging approaches in the areas of encoding, perception, attention, memory, language, reading, motor control, and executive functioning. Taught with PSYCH 365; students may not earn credit for both courses.

CSD 304-0 Statistics in Communication Sciences and Disorders Introduction to research design and data analysis in communication sciences and disorders; statistical inference.

CSD 305-0 Phonetics Training in transcription of English speech sounds. Introduction to phonological analysis, dynamics of articulation, and dialect variations.

CSD 306-0 Psychoacoustics Principles underlying perception of pitch, loudness, auditory space, auditory patterns, and speech. Psychophysical procedures for studying psychoacoustics and the impact of hearing impairment are considered.

CSD 307-0 Acoustic Phonetics Acoustic theory of speech production and perception. Emphasis on acoustic cues underlying speech sound identification and their physiologic correlates. Laboratory and lecture.

CSD 309-0 Culture, Language, and Learning Language and culture; transmission of culture through language; effects of cultural variety on perception, cognition, and learning; implications of cultural and linguistic diversity in communicative disorders.

CSD 310-0 Biological Foundations of Speech and Music Anatomy and physiology of the central auditory pathway, experience-related neural plasticity, right/left brain specialization, audiovisual integration, auditory learning and perception, and neural encoding of speech and music. Prerequisite: junior standing or consent of instructor.

CSD 311-0 Motor Development and Learning (.5 unit) Stages of development for speech production, principles of motor learning, and differences between oral and limb motor development. Tools and procedures for assessing motor development and learning related to speech production. Prerequisite: 301.

CSD 314-0 Topics in Cognitive Neurosciences Introduction to the study of cognitive neuroscience, with emphasis on cross-disciplinary approaches to understanding the mechanisms of the mind.

CSD 318-0 Introduction to Audiology Introduction to the measurement of hearing in humans. Basic anatomy of the ear, measurement of hearing, potential disorders of hearing. Lecture/laboratory.

CSD 331-0 Clinical Studies and Writing Critical observation skills for working with adults and children with communication disorders; clinical writing skills. Students discuss and write about clinical sessions that they observe both in videos and in actual clinical settings. Prerequisites: senior standing and consent of instructor.

CSD 332-0 Clinical Assisting in Speech and Language Pathology Introduction to clinical practice, the dynamics of the client-clinician relationship and general clinical protocol, and the development and execution of therapy goals and procedures. Prerequisites: 392 and 331, or consent of instructor.

CSD 333-0 Introduction to Clinical Procedures in Speech and Language Pathology Beginning practicum experience in a clinical setting. Emphasis on planning and executing a remedial program for individuals with problems of speech sound production and language usage. Prerequisites: senior standing, consent of instructor, 332, and 392 or 491-1.

CSD 334-0 Delivery Systems in Speech and Language Pathology Organization and administration of speech-language pathology services in schools, health care agencies, and private practice. Prerequisite: senior standing.

CSD 336-0 The Field of Special Education Criteria for in-school evaluation, eligibility, and intervention for students with disabilities. Legal basis of policies and regulations.

CSD 339-0 Early Communication Intervention with Infants and Toddlers Models of service systems, current practices in early intervention, legislation, infant development processes, and risk factors. Emphasis on individual family service planning, assessment, and intervention.

CSD 342-0 Typical and Atypical Development in Infants and Toddlers Description and theory relevant to the physical, motor, cognitive, linguistic, and social development of both typical and atypical children during the first three years of life.

CSD 343-0 Family Systems: Theory and Intervention Strategies in Early Intervention Models of family-systems theory and application pertaining to the functioning of families with disabled infants or toddlers. Intervention strategies appropriate for early-intervention professionals. Prerequisite: advanced status in developmental disabilities or consent of instructor.

CSD 351-0 Development and Disorders of Memory Scientific models and evidence for memory development. Memory disorders in relation to developmental and life-span issues.

CSD 369-0 Special Topics in Communication Sciences and Disorders Current scientific and professional problems in communication sciences and disorders. Topics vary by quarter.

CSD 370-0 Special Topics in Learning Disabilities Current scientific and professional problems in learning disabilities.

CSD 373-0 Introduction to Learning Disabilities Psychological, neurological, and linguistic theories of language and learning as related to learning disabilities.

CSD 374-0 Behavior Assessment and Management in Children Theories and application of behavior analysis and management principles. Emphasis on assessment techniques, classroom management approaches, and strategies for the facilitation of learning.

CSD 376-0 Diagnostic and Remedial Approaches for Children with Learning Problems Introduction to the field of learning disabilities and its theoretical perspectives, assessment, and instruction principles and to the process of clinical teaching. Emphasis on instruction, accommodation, service delivery, progress monitoring, and transition. Prerequisite: 373.

CSD 377-0 Learning Disabilities in Early Childhood Theoretical issues, assessment, and educational principles for young children with learning disabilities. Emphasis on problems of language, cognition, and pre-academic learning. Instruction and home management.

CSD 380-0 Introduction to Clinical Procedures in Learning Disabilities Practicum experience in clinical settings. Learning processes and application of instructional approaches. Field studies, reading, and weekly seminars. Prerequisite: 376.

CSD 381-0 Social Development in Normal and Learning-Disabled Children Current theories of and empirical research on social-emotional development from infancy through adolescence; identification and treatment of social deficits in learning-disabled children.

CSD 382-0 Autism Spectrum Disorders Overview of autism, considering in depth its clinical presentation and potential causes. How autism is diagnosed; commonly used assessments for characterizing autistic features in research; theories of the causes of autism and evaluation of those theories based on studies of behavior, cognition, neuroimaging, and genetics. Discussion of controversial issues such as changing prevalence and myths about autism's causes.

CSD 388-0 Attention Deficit Disorder and Related Disorders Identification and treatment of attention deficit disorders and related childhood behavior disorders. Emphasis on objective and subjective assessment, life-span issues, and medical and psychological interventions.

CSD 392-0 Language Development and Usage Development of spoken and written language as it relates to child development; includes phonological, morphological, syntactic, semantic, and pragmatic components. Cultural and individual linguistic diversity.

CSD 396-1 Diagnostic Procedures Evaluation of speech and language disorders. Interviewing, report writing; use of standardized tests; examination of speech sensory and motor functions. Prerequisite: senior standing or above, 392, or consent of instructor.

CSD 398-0 Research Practicum in Communication Sciences and Disorders Working with a faculty member on design, execution, and presentation of a research project. Activities may include a review of literature, design of an experiment, data collection, coding, analysis, and spoken or written presentation of experimental results.

CSD 399-0 Independent Study Prerequisite: consent of undergraduate dean after submission of petition.

COMMUNICATION STUDIES

www.communication.northwestern.edu/departments/communicationstudies

The Department of Communication Studies offers courses that explore the major media, practices, and problems of a communication-intensive society. Topics include—but are not limited to—bargaining and negotiation, collective decision making, organizational innovation, human-computer interaction, Internet use, popular culture, social movements, and the history of political discourse in the United States. Students work with scholarship from the humanities and the social sciences, and course work emphasizes the analytical and ethical requirements of responsible persuasion. Both required and elective courses are intended to prepare students for personal success and civic leadership.

Honors in Communication Studies

The Undergraduate Honors Program in Communication Studies offers an opportunity for highly motivated students to conduct original scholarly research. Each student works closely with faculty to produce an original research project in an interest area determined by the student. Seniors who successfully complete the program will be eligible to graduate with departmental honors. Also see Honors and Prizes on page 23 in the Undergraduate Education chapter of this catalog.

Major in Communication Studies

Program requirements (14 units)

14 School of Communication courses:

- GEN CMN 102
- 205, 270, and one of these three: 215, 225, 275; students should complete these courses before the end of the sophomore year because the material covered is prerequisite to more advanced courses
- 294, which includes the lower-division writing requirement; must be taken in fall quarter of freshman year
- 394, which includes the upper-division writing requirement; must be taken during the junior year
- 8 additional 200- or 300-level School of Communication courses, at least 5 of which must be in the department; of those 5, at least 4 must be at the 300 level (the following courses may be combined to fulfill no more than 2 of the required units: 1 unit of 290 Forensics, 1 unit of CMN 340 Internship, 1 or 2 units of 389 Practicum in Communication Research, 1 or 2 units of 399 Independent Study)

Additional requirements (31 units)

- A field of concentration outside the School of Communication (normally one of the disciplines of the Weinberg College of Arts and Sciences), consisting of at least 6 courses; of these 6, at least 3 must be 300- or 400-level courses (courses taken to satisfy the School of Communication distribution requirement may be applied to the field of concentration if they fall within the discipline in which the student chooses to concentrate; a non–School of Communication minor, dual major, or adjunct major satisfies this requirement)
- Language requirement: proficiency in a classical or modern foreign language equivalent to the work covered in a second-year college-level course (proficiency is established in precisely the same manner as in the Weinberg College of Arts and Sciences; see the section on foreign language requirements on page 36 in the Weinberg chapter of this catalog)
- Distribution requirements: 18 courses outside the department, including 3 courses from each of the three School of Communication distribution areas: science, mathematics, and technology; individual and social behavior; and humanities and fine arts
- Electives in communication and other areas to complete a minimum of 45 courses

Courses used to satisfy the major, distribution, and field of concentration requirements must receive a grade of C- or higher and cannot be taken P/N.

Courses Primarily for Freshmen and Sophomores

GEN CMN 101-0 Interpersonal Communication See Introductory and Related Courses.

GEN CMN 102-0 Public Speaking See Introductory and Related Courses.

GEN CMN 104-0 Argumentation and Debate See Introductory and Related Courses.

COMM ST 201-0 Research Methods in Communication Foundations of knowledge in many areas of the field, including the nature of interpersonal interaction and the impact of mass media. How communication researchers do their work; how to judge the quality of research products. Prerequisite for many other courses in the department.

COMM ST 205-0 Theories of Persuasion Survey of major theories that explain how to change another person's attitudes and behaviors. Applications to persuasion within a variety of contexts, including relationships, organizations, legal campaigns, and the mass culture.

COMM ST 215-0 Principles of Rhetorical Criticism Students in this introductory course learn techniques of rhetorical analysis that assist them in describing, evaluating, and participating in discussions of public issues. Historical and contemporary examples of public discourse illuminate the ways that symbolic action affects decision making and power relations in public life.

PERF ST 216-0 Performance and Culture See Performance Studies.

COMM ST 220-0 Theories of Argumentation Fundamental principles and practice of critical reasoning and public argument. For students interested in legal, academic, or political realms of communication and advocacy.

COMM ST 221-0 Speech Writing Theory and practice in the principles of composition and in the preparation and delivery of manuscript speeches.

COMM ST 225-0 Communication and Culture How the concept of "culture" is constituted and disseminated through the practices, processes, and mechanisms that structure "communication." Engagement with theory on myriad forms of mediation—interpersonal, off- and online, popular, and mass-mediated—shaping our relationships with ourselves and the world around us.

COMM ST 229-0 Communication Technology, Community, and Personal Identity Philosophical, critical, and scientific analysis of how the intensification of technology in cultural, professional, and recreational domains is affecting our social relations and personal identities.

COMM ST 241-0 Theories of Relational Communication An overview of communication theories and research dealing with developing, sustaining, and terminating interpersonal relationships. Direct application to friendship, work, and romantic relationships.

COMM ST 250-0 Collaborative Leadership and Decision Making Theories and research relating to communication in small groups and group decision making.

COMM ST 270-0 Theories of Mediated Communication Introductory survey of current issues in research on the mass media, the Internet, and computer-mediated communication.

COMM ST 275-0 Persuasive Images: Rhetoric of Popular Culture Analysis of image-making in all forms of popular culture—in film and television but also shopping malls, supermarkets, car dealers, and doctors' offices.

COMM ST 290-0 Forensics Independent research and analysis in conjunction with participation in intercollegiate forensics. Credit may not be earned for 290 more than once.

COMM ST 294-0 First-Year Seminar Study in seminar format of a topic in communication. Assignments emphasize expository writing.

COMM ST 298-0 Undergraduate Seminar Student- or faculty-initiated seminars to consider special topics. Credit for 298 may be earned more than once. No more than 2 units of such credit may be applied toward fulfillment of the major requirements.

Courses Primarily for Juniors, Seniors, and Graduate Students

COMM ST 301-0 Current Issues in Privacy The texture of interactions affecting privacy: government and workplace monitoring and surveillance, invasion of privacy by social media, disclosure to unintended Internet audiences, database aggregation, privacy and the person.

COMM ST 302-0 Law of the Creative Process Principles of copyright, contracts, and entertainment business practices from the perspective of the producer, artist, and creator.

COMM ST 310-0 Rhetoric, Democracy, and Empire in Classical Athens Students will read Thucydides' *History of the Peloponnesian War* along with texts in classical rhetoric to address perennial problems regarding the role of speech in a democratic society.

PERF ST 311-0 Performance in Everyday Life See Performance Studies.

COMM ST 314-0 Rhetoric and Public Commemoration Public commemoration as a rhetorical phenomenon. Through discussion of scholarly literature and production of research papers, students investigate questions such as: How do societies remember the past? What do the strategies for remembering the past teach us about the present? How are "collective memories" produced and challenged?

COMM ST 315-0 Rhetoric of Social Movements Study of traditional theories of opposition derived from sociological and rhetorical analyses of mass movements. Examines new social movements such as advocacy groups related to abortion, animal rights, feminism, and other local and national issues.

PERF ST 316-0 Folklore and Oral Traditions See Performance Studies.

COMM ST 317-0 Voice, Violence, and Democracy Understanding how and why "democracy" has come to be regarded today as the only "legitimate" form of government; explored by examining alternative roads to modernity and democratic polity taken by different countries through the dialectic of voice (rhetoric) and violence in contemporary democracies.

COMM ST 320-0 High School in US Public Culture The phenomenon of "high school" in the United States, how it is portrayed in public culture, and its central role in the national imaginary. Through analysis of its history, culture, and social and political effects, consideration of how it functions as a social sorting mechanism and how it

produces, reproduces, and maintains a differentiated society with the aid of public culture and the mass media.

COMM ST 321-0 Media and Publics across Cultures Relationship between culture and media in an increasingly globalized world, examined through analysis of ethnographic case studies and theoretical texts.

COMM ST 322-0 Rhetoric of the American Presidency Offers students the opportunity to conduct an in-depth, quarter-long study of the rhetoric of particular presidents. May only be taken twice for major credit; additional credits count as electives.

COMM ST 323-0 New Media as Popular Culture How rituals, practices, and relationships enabled by new media cultural forms shape and reconstitute everyday life. Emphasis on research implementing qualitative and interpretive methods.

COMM ST 324-1,2 Rhetoric of US Women's Rights Today women cause no sensation when they address public gatherings, but in the 1820s, when American social reformers broke the taboo, such behavior was scandalous. **1.** Development of the new women's oratorical tradition from its origins through the early 20th century. **2.** Continued development from 1920 to the present.

COMM ST 325-1,2,3 Rhetorical History of the United States History of the United States, as studied through key rhetorical texts. Focus on moments of political crisis and cultural change. **1.** Colonial period to the outbreak of the Civil War. **2.** Civil War to World War I. **3.** World War I to the 1960s.

COMM ST 326-0 African American Rhetoric Survey of key texts of 20th-century African American public discourse as well as a forum to discuss those texts and engage them analytically and critically.

COMM ST 330-1,2 Contemporary Problems in Freedom of Speech Personal freedom and public communication under the US Constitution. **1.** Principles, forms of reasoning, and court decisions governing conflicts between freedom of speech and public order, property rights, personal security, morality, and racial and gender equality in traditional, mass, and new electronic media. **2.** Analysis of selected issues introduced in 330-1. Prerequisite: 330-1.

COMM ST 332-0 The Rhetoric of Multiculturalism Examination of debates about the meaning and significance of cultural pluralism in American and global politics and about the rhetorical, communicative, and political challenges this condition raises.

COMM ST 333-0 Girlhood in Public Culture Why girls have figured so centrally in 20th-century popular culture; why the concept of girlhood itself has been so widely debated within public culture more generally; how girls themselves have responded to public representations of girlhood.

COMM ST 334-0 Media and the Making of Social Class The nature of the relationship between the media, middlebrow culture, and the rise of the American middle class; the future of middlebrow culture in the wake of digital production, audience segmentation, and globalization.

COMM ST 335-0 Philosophy of Language and Communication Relationship between language and human communication behavior. How language structures individual world views; the process of meaning formation; therapeutic communication; the experience of creativity.

COMM ST 340-0 Community Integration of Labeled People Examination of local integration initiatives, the role of professionals, the language used to describe the initiatives, the social service system's responses, and the agents and communities that have constructed inclusive environments for people labeled with disabilities.

COMM ST 341-0 Communication and Aging Relationship between adult developmental processes and changes in communication behavior.

RTVF 341-0 Technological Innovations See Radio/Television/Film.

COMM ST 343-0 Health Communication Examination of how communication can enhance and maintain the well-being of citizens in intentional health care contexts.

COMM ST 344-0 Interpersonal Conflict In-depth analysis of theories and research examining conflict within relationships. Special emphasis on conflict within friendships, dating relationships, and family. Prerequisite: 205.

COMM ST 345-0 Family Communication An overview of the family as a communication system. Intergenerational interaction patterns, intimacy and conflict patterns, decision making, environmental and cultural factors, and enrichment efforts. A wide range of family types and research methods are considered. Prerequisite: 241.

COMM ST 351-0 Technology and Human Interaction Understanding human interactions that take place both with and through technology; design, creation, and evaluation of technologies to support such interactions.

COMM ST 352-0 Social Network Analysis Use of social network analysis to understand the growing connectivity and complexity in the world around us on different scales, ranging from small groups to the web. How we create social, economic, and technological networks; how these networks enable and constrain our attitudes and behavior.

COMM ST 353-0 Collaboration Technology Understanding communication and behavior in groups; focus on issues raised by the collaborative use of communication and computing technologies. Topics include theories of group and organizational behavior, interpersonal awareness, privacy, trust, technology-mediated communication, and technology evaluation and adoption.

COMM ST 355-0 Audience Analysis Methods used to analyze electronic media audiences; emphasis on quantitative research techniques. Prerequisites: 201 (or equivalent) and 270.

COMM ST 356-0 Games and Social Change Examination of the evolution of games for social change, from late-19th-century board games for moral instruction to basketball, role plays, video games, and contemporary computer-based networked simulations for civic education.

COMM ST 357-0 Serious Games Introduction to the psychological and behavioral theories of entertainment media with the goal of implementing these theories in designing and evaluating serious video games. Focus on the games' psychological, behavioral, and social aspects more than on their technical aspects.

COMM ST 360-0 Theories of Organizational Communication Theories and research dealing with communication in formal organizations and institutions.

COMM ST 363-0 Bargaining and Negotiation Communication in bargaining and negotiation in organizational settings. Cognitive and motivational theories emphasizing bargaining and negotiation strategies.

COMM ST 364-0 Collective Decision Making and Communication in Organizations Research on how organizations make, communicate, and implement collective decisions. Assessing decision effectiveness, group decision making, leadership in organizations, and organizational design.

COMM ST 365-0 Solving Problems in Applied Organizational Communication Advanced concepts and techniques for defining and analyzing organizational problems. Preparation for recognizing and working with problems in business organizations.

COMM ST 366-0 Organizational Behavior and Innovation Organizations and communities depend on innovative ideas, products, or processes to help them solve their problems and grow in new directions. This course looks at a number of interpersonal and organizational variables as they relate to the production, acceptance, and adoption of new ideas.

COMM ST 367-0 Nonprofit Communication Management Nongovernmental organizations and the campaigns they create. Examined through three interrelated modules: defining nongovernmental organizations as distinct from business and government organizations; issues nongovernmental organizations must address that their government and business counterparts do not; nonprofit campaigns and public communication.

COMM ST 373-0 News and Information as Politics and Culture Examination of the news form, content and meaning of the news, and the role of the news media in social continuity and change. Prerequisite: 270.

COMM ST 375-0 Sociology of Online News Survey of sociological research on the production and consumption of online news.

COMM ST 377-0 Developing and Marketing of Popular Culture The invention and packaging of popular culture products, including film, music, television, and celebrities. Prerequisite: 275.

COMM ST 378-0 Online Communities and Crowds: Organization, Innovation, and Mobilization Examination of the types of collaborations that occur in online communities and crowds. Emphasis on sociological, economic, and political analysis of how and why large-scale online collaborations work.

COMM ST 380-0 Political Communication Nature and functions of communication within established political institutions; decision-making strategies, deliberative discourse, and electoral campaigns; field study of advocacy and interest groups. Prerequisites: 220 and either 205 or 210.

COMM ST 385-0 Technology and the American Cultural Landscape Research seminar focusing on the history of technology in American culture and how it might affect our experience.

COMM ST 386-0 Science, Technology, and Society Examination of developments in information and communication technology in the larger context of American science and technology since 1900. Prerequisite: previous course work on the historical or social dimensions of information and communication technology.

COMM ST 388-0 Internet and Society The social, cultural, political, and economic implications of information technologies.

COMM ST 389-0 Practicum in Communication Research Collaboration with a faculty member on design and execution of a communication research project. Students learn how to complete a research project and write a report.

COMM ST 390-0 Children's Culture Examination of children's media from psychological, sociological, historical, and other perspectives. Discussion of the role of media in children's development.

COMM ST 392-0 Global Culture and Communication Examination of current topics and events to familiarize students with the cultural dimensions of globalization and the critical importance of culture and communication in understanding the globalized world.

COMM ST 394-0 Undergraduate Research Seminar Small seminars in research topics led by different members of the department faculty. Students complete a research paper on a topic related to the seminar theme. Prerequisite: 220 or 294.

COMM ST 395-0 Topics in Communication Studies Reading, research, and discussion in areas of significance. Topics vary.

COMM ST 397-0 Senior Honors Thesis Students work on a 2- to 3-quarter project, culminating in a senior thesis, with the guidance of a faculty adviser. Upon successful completion a student is eligible to graduate with departmental honors.

COMM ST 398-0 Undergraduate Seminar Student- or faculty-initiated seminars to consider special topics. Credit for 398 may be earned more than once. No more than 2 units of such credit may be applied toward fulfillment of the major requirements.

COMM ST 399-0 Independent Study Enrollment only by petition in advance.

DANCE

See Theatre.

HUMAN COMMUNICATION SCIENCES

See Communication Sciences and Disorders.

PERFORMANCE STUDIES

www.communication.northwestern.edu/departments/performancestudies

The Department of Performance Studies integrates artistic and analytical approaches to a wide range of performance texts, events, and processes. The courses explore an interdisciplinary range of literary, cultural, and personal texts in performance. The department has particular strengths in the study of literature through solo performance; the ensemble adaptation and staging of poetic, narrative, and nonfictional texts; intercultural performance; performance art; cultural studies and the ethnography of performance; and performance theory and criticism. Internships and field study for performance studies majors extend and deepen their classroom work with experiential learning. Extracurricular work provides students with a variety of opportunities to perform, adapt, and direct, enabling their creative work to reach an audience outside the classroom.

Performance studies majors have been successful in many professions that require intelligence and imagination as well as critical and creative skills. In addition to pursuing careers in professional theatre and arts development, many graduates teach literature, theatre, humanities, and performance studies. Majors have found performance studies an excellent preparation for law school and complementary to their interests in creative writing, communication, new media, anthropology, dance, literature, or social work. Performance studies can be thought of as a major that bridges artistic expression and conceptual analysis, theory and practice. Performance, in its manifold forms, is the subject and the method of study.

Honors in Performance Studies

Performance studies majors may apply in their junior year to participate in the departmental honors program. The program is intended to provide highly qualified students with an opportunity to complete a substantial research investigation; to introduce students to graduate-level, faculty-mentored research; and to provide formal honorary recognition to students who have excelled in course work and in independent research. More information is available from the department office.

Major in Performance Studies

Program requirements (16 units)

- Introductory courses: GEN CMN 102 and 103
- A minimum of 4 200-level courses in communication, including the following courses in the department: 216, 224, and 2 units of 210-1, 210-2, or 210-3
- Production courses in theatre: 2 quarters of THEATRE 119; 2 quarters of PERF ST 119; or 1 quarter of THEATRE 119 and 1 quarter of PERF ST 119 (0 units)
- 10 additional courses in communication, at least 8 of which must be in the department at the 300 or 400 level; not more than 1 unit of either 399 Independent Study or 331 Field Study may apply toward the required 8 300-level performance studies courses, and not more than 2 units of 399 Independent Study and 1 unit of 331 Field Study may apply toward the required total of 10 courses in communication

Additional requirements (29 units)

- 6 courses at the 200 level or above outside communication; if they apply, courses taken to meet the distribution requirement may be used to satisfy this requirement
- Distribution requirements: 18 courses outside the school, including 10 courses from the School of Communication distribution areas: 2 from science, mathematics, and technology; 3 from individual and social behavior; and 5 from humanities and fine arts
- Electives in communication and other areas to complete a minimum of 45 courses

Courses Primarily for Freshmen and Sophomores

GEN CMN 103-0 Analysis and Performance of Literature See Introductory and Related Courses.

GEN CMN 203-0 Performance, Culture, and Communication See Introductory and Related Courses.

PERF ST 119 Production Laboratory Registration for performance studies majors fulfilling production crew requirements. Students perform duties for run crews and house crews in connection with department-sponsored productions in Annie May Swift Hall's Krause Performance Lab.

PERF ST 210-1 Performance of Poetry Introduction to the analysis and performance of poetry. Prerequisite: GEN CMN 103 or equivalent.

PERF ST 210-2 Performance of Narrative Fiction Introduction to the study of narrative performance. Prerequisite: GEN CMN 103 or equivalent.

PERF ST 210-3 Performance of Drama Introduction to drama and theatricality from a performance studies perspective. Prerequisite: GEN CMN 103 or equivalent.

PERF ST 216-0 Performance and Culture Performative bases of culture; ritual, festival, and ceremony.

PERF ST 224-0 Adapting Narrative for Group Performance Introduction to theories and methods of adapting narrative for the stage, with special emphasis on chamber theatre. Prerequisite: GEN CMN 103 or equivalent.

Courses Primarily for Juniors, Seniors, and Graduate Students

Unless otherwise indicated, 1 200-level course in the department is a prerequisite.

PERF ST 307-1,2 Studies in Gender and Performance **1.** Introduction to theories on gender in relation to selected literary texts. How gender is prescribed, reinforced, and transgressed; how race, class, and sexuality disrupt and/or affirm these representations. **2.** Examination of theories of

gender performance from a cultural studies perspective. Close attention to live performance, including drag, performance art, and film. A third course in this series (THEATRE 307) is offered by the Department of Theatre.

PERF ST 308-0 Performing Modern and Contemporary Poetry Use of performance in the analysis and criticism of modern and contemporary poetry.

PERF ST 309-0 Performance of Black Literature Exploration of black poetry, short fiction, and novels, as literary texts and cultural texts, through solo, duo, and group performance. The literary genre will vary from year to year.

PERF ST 310-0 Literature and Performance of Women of Color Literary expressions by native, Latina, African, and Asian American women reflecting intersections of gender, sexuality, ethnicity, class, and culture in the United States. Feminisms considered across race and culture. Includes poetry, fiction, autobiography, drama, and critical theory.

PERF ST 311-0 Performance in Everyday Life Conceptual view of human beings as actors. Dramatism and the perspective of life as theatre.

PERF ST 315-0 Nonfiction Studies Exploration of the dramatic impulse in nonfiction texts. Emphasis on autobiographical one-person shows.

PERF ST 316-0 Folklore and Oral Traditions Genres of oral literature and an introduction to the methods and aims of folklore research. The nature of verbal art as performance and the importance of cultural context.

PERF ST 318-1 Shakespeare's English Histories Use of performance in the analysis and criticism of Shakespeare's two tetralogies of English history plays.

PERF ST 318-2 Shakespeare Adaptations Use of performance in the analysis and criticism of selected Shakespeare plays and their adaptations by other writers.

PERF ST 321-0 Performing the American '50s Use of performance in the analysis and criticism of selected postwar American literature.

PERF ST 322-1,2 Staging the Novel Theory and practice of adapting novels for stage performance. **1.** Film adaptation as a model for stage adaptation. **2.** Staging narrative voice and style; fiction in relation to nonfiction.

PERF ST 324-1,2 Presentational Aesthetics 1. Theatrical convention, presentational mode, and conscious artifice in the performance of dramatic literature, poetry, and nonfiction. **2.** Theory and practice of chamber theatre, its conventions and presentational modes; adaptation, staging, and performance of prose fiction. Choice of performer's or director's perspective. Prerequisite: 224.

PERF ST 326-1,2 Performance Art 1. History, development, and theories of performance art as a live-art genre from the modernist avant-garde to contemporary cross-cultural forms. Media in all forms, with emphasis on performance process and audience relationship. **2.** Further theoretical and laboratory exploration of compositional processes and political strategies of performance, media, and event/audience contexts.

PERF ST 327-0 Field Methods in Performance Studies Theory and practice of fieldwork on performance; practical fieldwork experience.

PERF ST 328-0 Studies in James Joyce Primary emphasis on extensive critical study and performance of Joyce's *Ulysses*, resulting in either a lecture-performance, a recital, or a research paper.

PERF ST 329-0 Performing Individual Poetic Styles Content varies. Major poems of a significant writer or writers, permitting in-depth encounter with the writer, cultural context, and performance-related issues.

PERF ST 330-0 Topics in Performance Studies Readings, discussion, and creative work in performance studies research and artistic practice. Topics vary. May be repeated for credit.

PERF ST 331-0 Field Study/Internship in Performance Studies Intensive participation in off-campus production and/or field research experience. Departmental approval required.

PERF ST 332-0 Urban Festivity Ethnographic study of festivals, parades, exhibitions, civic celebrations, and other genres of urban cultural performance. Multiethnic expressions of Chicago identity. Field research methods.

PERF ST 334-0 Human Rights and Radical Performance How social movements, local communities, and individual activists from specific regions around the world use performance to seek political empowerment and social justice. Performance as theory, method, and event in the arts of resistance; human rights as ideology and praxis within indigenous histories, imaginaries, and contexts.

PERF ST 335-0 Social Art Tactics Exploration of historical and theoretical foundations of social art practice, including work focused on social change in such genres as performance, digital media, relational art, and photography. Performance/art workshops; development of performance-based interventions.

PERF ST 336-0 Performance of Latina/o Literature Exploration of US Latina/o literature through narratives of migration, annexation, exile, and diaspora; focus on the arrival and development of Latina/o cultural enclaves in the United States. Use of performance to understand further such materials as autobiography, narrative fiction, drama, poetry, and radio commentary.

PERF ST 338-0 Family Stories, Memoirs, and Diaries Use of performance to explore family stories, memoirs, diaries, and other biographical and autobiographical sources.

PERF ST 399-0 Independent Study Prerequisite: consent of undergraduate dean after submission of petition.

RADIO/TELEVISION/FILM

www.communication.northwestern.edu/departments/rtf

The Department of Radio/Television/Film offers education in the history, theory, and production of media. Broad-based and interdisciplinary in orientation, the department offers a range of perspectives on media forms from cinema to broadcast and cable television to alternative media to

emerging technologies. Courses emphasize that media are social and cultural practices in dialogue with the broader context of the humanities. The department is dedicated to integrating theory and practice, creating intersections with other disciplines, and fostering cutting-edge media production. Originality, critical analysis, and vision are valued in both scholarly research and creative work. The department's goal is to educate students and citizens to critically interpret contemporary media, envision alternative structures in theory and practice, and reinvent the media of the future.

Production facilities include 16mm film and HD equipment, sound stage, and editing; field video and multiple-camera television studio facilities; linear and nonlinear video editing; advanced audio postproduction; and state-of-the-art computer graphics. Students operate the 7,200-watt FM radio station WNUR, which serves the Chicago area and also broadcasts on the Internet. The School of Communication funds four active student-run cocurricular production groups and offers juniors and seniors numerous opportunities for internships at television and radio stations and production companies in the Chicago, New York, and Los Angeles areas. Frequent guest lectures are offered by alumni with careers in media and by other well-known professionals.

Major in Radio/Television/Film

Program requirements (15 units)

- Introductory courses: 190 (190 and second-year standing—not through AP credits—are the prerequisites for all 300-level production courses); a minimum of 3 courses, at any level, inside the School of Communication and outside the Department of Radio/Television/Film
- 3 200-level courses: 220, 230, and 1 other 200-level course in the department or COMM ST 275
- 8 additional courses in communication at the 300 and 400 levels, including at least 6 courses in the department at the 300 and 400 levels, and including no more than a total of 2 units of independent study, practicums, or internships

Additional requirements (30 units)

- 6 courses at the 200 level or above outside communication, including at least 3 courses at the 300 level or above; courses taken to meet the distribution requirement may be used to fulfill this requirement
- Language requirement: two-year proficiency in a classical or modern foreign language as defined by the Weinberg College foreign language proficiency requirement
- Distribution requirements: 18 courses outside the school, including 8 courses from the School of Communication distribution areas: 2 from science, mathematics, and technology; 3 from individual and social behavior; and 3 from humanities and fine arts
- Electives in communication and other areas to complete a minimum of 45 units

Minor in Film and Media Studies

www.communication.northwestern.edu/programs/minor_film_media_studies

The Film and Media Studies Program brings together faculty and students from across the University who are interested in thinking about film and media within a broad intellectual framework. Students in this interdisciplinary program acquire critical tools for analyzing traditional and new media, as well as knowledge of some crucial historical and interpretive problems raised by the study of media within the context of the humanities and social sciences. Students who minor in film and media studies are encouraged to participate in the rich and varied media offerings of the University, including film series and individual film screenings, workshops, performances, exhibitions, and presentations by invited speakers. Students must formally apply to minor in film and media studies in the School of Communication's Department of Radio/Television/Film.

Minor requirements (7 units)

- RTVF 220 Analyzing Media Texts
- COMP LIT 206 Literature and Media
- 5 additional courses with a primary emphasis on film and/or media studies, including at least 3 at the 300 level

Relevant courses are offered by departments and programs in both Weinberg College and the School of Communication, including comparative literary studies, some language departments, and radio/television/film. A list of eligible courses is available from program advisers and on the program's website. Other courses also may be counted toward the minor with the approval of a film and media studies adviser. The minor is open to all Northwestern undergraduates except radio/television/film majors.

Minor in Sound Design

www.communication.northwestern.edu/programs/minor_sound_design

The minor in sound design allows students to study and create work in sound as it relates to film/video, new media, theatre, radio, and installation/exhibition projects. The minor draws on courses offered through the School of Communication, Bienen School of Music, and Weinberg College of Arts and Sciences. The minor is open to all Northwestern undergraduate students.

Minor requirements (6 units)

The minor requires 6 courses, selected from the following:

- RTVF 379 Topics in Film/Video/Audio Production (sound design topics may include Advanced Audio Postproduction, Sound Design for Horror, Sound Design for Comedy, Advanced Foley, Sound Design for the Web)
- RTVF 383 Foundations of Sound Design
- RTVF 384 Advanced Audio Production
- RTVF 398 Symposium: Issues in Radio/Television/Film (History/Aesthetics of Sound Design)

- RTVF 399 Independent Study
- THEATRE 263 Theatre Sound
- THEATRE 363 Theatre Sound
- MUS TECH 321 Producing in the Virtual Studio
- MUS TECH 335 Selected Topics in Music Technology (sound design topics may include Recording and Basic Audio, Studio Techniques for Electroacoustic Media)
- MUS TECH 337 Multimedia for the Web
- MUS TECH 338 Programming
- MUS TECH 340 Composing with Computers
- MUS TECH 342-1,2 Computer Sound Synthesis
- MUS TECH 348 3-D Sound and Spatial Audio
- MUS TECH 441 Advanced Computer Composition
- MUS TECH 450 Advanced Audio Processing

Courses Primarily for Freshmen and Sophomores

RTVF 190-0 Media Construction Introduces the core components of media—idea, image, sound, and sequence—with the technical fundamentals involved in shooting and editing video. Students work with SLR and digital video cameras, with Photoshop and Final Cut Pro editing software, completing four projects in different genres during the quarter. Prerequisite for all upper-level production courses. Required for majors; typically taken freshman year.

RTVF 202-0 Freshman Topics Seminar Beginning seminar focused around a special topic of media analysis, history, or theory. Freshmen will learn research, analytic, and writing skills while focusing on issues relevant to film, media and/or digital arts and culture.

RTVF 220-0 Analyzing Media Texts Introduction to the study of the moving image. Basic elements of style across media including film, television, and interactive media. Focus on close analysis of texts to find significance. Prerequisite for upper-level courses in the department. Required for majors; typically taken in freshman year.

RTVF 230-0 Understanding Media Contexts Media industries as social and cultural forces; economic and political dimensions of the global media. Required for majors; typically taken freshman year.

RTVF 260-0 Foundations of Screenwriting Introduction to writing for the screen (film, television, and/or computer). Structure, character, dialogue, format, voice, scope, pace, context. Lecture/workshop. Prerequisite for upper-level writing courses in the department.

COMM ST 275-0 Persuasive Images: Rhetoric of Contemporary Culture See Communication Studies.

RTVF 298-0 Studies in Media Topics Theoretical or practical or both; emphasis on evolving trends.

Courses Primarily for Juniors, Seniors, and Graduate Students

RTVF 301-0 Race and Ethnicity in Film and TV How race and ethnicity are depicted in film and media; audience response, activism, and/or alternative media production by groups of color.

RTVF 310-0 Television History Political, cultural, social, and industrial history of television, from the classic network era to the postnetwork contemporary period of media convergence. Exploration of programs as well as major events and shifts in television history.

RTVF 312-1, 2 History of Film International survey of motion pictures as a distinctive medium of expression from its prehistory to the present.

RTVF 313-1 Documentary Film: History and Criticism Survey of the schools, styles, and purposes of documentary film as a unique form of artistic expression and sociopolitical persuasion.

RTVF 313-2 Documentary Film and Video Contemporary work and issues in documentary film and video.

RTVF 321-0 Radio/Television/Film Authorship Idea of authorship in the media and an examination of different uses of author theory related to the work of particular artists.

RTVF 322-0 Radio/Television/Film Genre Concept of genre in the media, with reference to popular American forms.

RTVF 323-1 Experimental Film: History and Criticism Films and theories of experimentalists since the 1920s; contemporary underground movement.

RTVF 323-2 Experimental Film and Video Contemporary work in experimental film and video.

RTVF 325-0 Film, Media, and Gender Explores issues of gender in film and media. Introduces students to major debates and theories regarding gender and sexuality in the media.

RTVF 326-0 Film and TV Criticism Contemporary critical methods applied to film and/or television. Students read literature on critical methods and analysis and write critical analyses of films and television programs.

RTVF 330-0 Culture Industries Overview of business and social organization of film and television industry. Introduction to how media industries produce cultural products for local, national, and transnational audiences.

RTVF 331-0 Regulation of Broadcasting Government regulation and industry self-regulation; historical perspective and examination of current issues.

RTVF 334-0 Media Arts and Visual Culture An exploration of the way artists use electronic media as forms of visual expression and how artists have historically appropriated communication technologies such as radio, video/television, and computers.

RTVF 341-0 Technological Innovations How technology develops and is assimilated into mass media.

RTVF 342-0 Program Planning and Programming Programming broadcast stations, networks, and cable in relation to audiences, markets, coverage, policies, and facilities.

RTVF 345-0 History of Hollywood Cinema Overview of the development of the classical Hollywood cinema, with particular emphasis on the 1920s through the early 1960s. Explores the relationship between industry practices and aesthetic features of classical narrative film genres.

RTVF 351-0 National Cinema Historical aspects of cinema in a culture outside the United States or a social/cultural/intellectual movement within cinema's general evolution.
RTVF 353-0 Film, Media, and Globalization Explores theories of media's role in the globalization of cultures. Examines transnational production, marketing, and reception of film, television, and/or digital media.
COMM ST 355-0 Audience Analysis See Communication Studies.
RTVF 360-0 Topics in Media Writing Various approaches to screenwriting, emphasizing different modes and genres, such as the short film, the feature film, screenplays based on preexisting material, the teen film, interactive computer scenarios. May be taken multiple times for credit, depending on the change in topic. Prerequisite: 260.
RTVF 372-0 Editing The technique and art of editing for film. Topics include editing for continuity, controlling pace and rhythm, and editing nonlinear narratives. Prerequisites: 190, 380, and second-year standing (not through AP credits).
RTVF 375-0 Designing for the Internet Design concepts as they relate to the web in an intensive studio/workshop environment. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 376-0 Interactive Media Exploration of the techniques and aesthetics of interactivity using various media. Prerequisites: 190, second-year standing (not through AP credits), and consent of instructor.
COMM ST 377-0 Developing and Marketing of Popular Culture See Communication Studies.
RTVF 379-0 Topics in Film/Video/Audio Production In-depth study and practice of one area of film, video, or television. May be taken more than once for credit, depending on changes in topic. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 380-0 Lighting and Cinematography Techniques, aesthetics, and technologies of lighting and camera skills, including film and video. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 383-0 Foundations of Sound Design Film sound aesthetics, theory and design, and techniques of the sound-image relationship in media. Introduction to Pro Tools. This course is a prerequisite for 384-0.
RTVF 384-0 Advanced Audio Production Advanced techniques and technologies of audio production, emphasizing location recording. Techniques for film, video, experimental audio, and radio production. ADR, Foley, synch sound, and advanced work with Pro Tools. Prerequisite: 383-0 or Pro Tools experience.
RTVF 389-0 Practicum in Radio/Television/Film Research Collaboration with a faculty member on design and execution of a media research project. Students learn how to construct and complete a research project and document results. Requires a paper or other form of work product as determined by the faculty member.
RTVF 390-0 Directing Single-camera dramatic directing, including visualization and breakdown of scripts, camera blocking, and working with actors. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 391-0 TV Studio Directing Directing, crewing, and technical skills for multiple camera live-on-tape television production in narrative and nonnarrative genres; preproduction, directorial communication, blocking, pacing, visualization. Prerequisite: 380.
RTVF 392-0 Documentary Production Students examine documentary practices and produce their own shorts. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 393-0 2-D Computer Animation Animation techniques in the 2-D sphere and incorporation of visual design principles. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 394-0 Experimental Media Production Creation of an experimental work as a linear film or video, an interactive website, an installation, a game, or a multidisciplinary performance. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 395-0 Computer Animation: 3-D The fundamental concepts and techniques of 3-D computer modeling and animation. Use of concepts acquired in camera-based production techniques to create a rendered animation. Prerequisites: 190 and second-year standing (not through AP credits).
RTVF 397-1, 2 Advanced Directing I, Advanced Directing II Two-quarter sequence for students creating advanced artistic production, with critique of work throughout the production and postproduction process; conceptual resources offered as needed. Students may work in any genre (documentary, narrative, experimental) and any medium. Admission based on portfolio of previous media work and proposal for project, including script and budget.
RTVF 398-0 Symposium: Issues in Radio/Television/Film Special issues and topics in the analysis of radio, television, film, and popular culture.
RTVF 399-0 Independent Study Prerequisite: consent of undergraduate dean after submission of petition.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

THEATRE

www.communication.northwestern.edu/departments/theatre

Of all the performing arts, none draws on the rich variety of human experience more fully than theatre. Theatre communicates the drama of life—whether the past, present, or future, and whether real or imagined—with immediacy, excitement, and eloquence. The student of theatre, therefore, must be a student of human society and must

understand how social forces impinge on human behavior. To paraphrase Boswell, students of the theatre take as their subject the entire system of human life.

For this reason students who major in theatre at Northwestern combine a liberal arts education with intensive training in the theories and arts of the theatre. At the heart of the theatre program lies the idea that the best theatre artist is the one who combines a broad knowledge of the literature and theory of the field with highly developed skills in its practice.

Students spend approximately one-third of their program studying in the Department of Theatre, including courses in history, literature, and criticism; acting, voice, and movement; directing; devising theatre; stage production; design; playwriting; dramaturgy; creative drama and theatre for young audiences; and dance. Students develop the ability to approach problems and issues from a variety of perspectives while developing skills in research and writing, laboratory work, group discussion, oral presentation, performance, and production. Another third of the program comprises distribution requirements outside the department, and a final third is devoted to elective courses selected from a wide spectrum of University offerings.

A major in dance is also available within the Department of Theatre (see page 184).

Honors in Theatre

The honors program provides theatre majors who have demonstrated records of academic achievement with the opportunity to explore a sustained project in their senior year. It exposes majors to the rigors of research and creative work comparable with graduate-level programs in theatre studies and offers preparation for future graduate-level study. Projects may be proposed in any area of the theatre department's pursuits (design, directing, choreography, performance, history, criticism, or playwriting), provided that supervisory personnel are available and willing to participate, and provided that appropriate facilities are available.

Eligibility for the honors program will be determined by the faculty. Contact the theatre department for more information.

Major in Theatre

Program requirements (15 units)

- Introductory courses
  THEATRE 140-1, 140-2, 140-3
  GEN CMN 110
  GEN CMN 103, GEN CMN 203, or 1 performance studies or radio/television/film course
- Production: one registration for 119, taken in the sophomore year (0 units)
- 10 200- and 300-level theatre courses, with a minimum of 5 courses at the 300 level or above, with courses from each of the following groups:

Performance (at least 2 courses)
- 210 Training the Actor's Voice
- 243-1,2,3 Acting I: Principles of Characterization
- 253-1,2 Mime
- 260 Fundamentals of Stage Directing
- 310 Advanced Voice/Styles
- 311 Dialects for the Stage
- 312-1 The Art of Storytelling
- 330 Special Topics
- 340-1,2 Stage Directing
- 341-1,2,3 Acting II: Analysis and Performance
- 346-1,2,3 Playwriting
- 347 Theatre for Young Audiences
- 348-1 Creative Drama
- 348-2 Advanced Creative Drama
- 349-1,2,3 Acting III: Problems in Style
- 359 Directing for the Open Stage (see Graduate School catalog)
- 442 Theatre Practice (includes the Children's Theatre Tour; see Graduate School catalog)

Design/technology (at least 2 courses at the 200 level)
- 201 Introduction to Design for the Theatre
- 240-1,2,3 Stagecraft
- 241-1,2,3 Design Process
- 242 Stage Makeup
- 249-1 Introduction to Stage Management
- 249-2 Advanced Stage Management
- 263 Theatre Sound
- 330 Special Topics
- 342 Lighting Design II
- 343 Scene Design II
- 344 Costume Design II
- 350 Production Management
- 353 Topics in Stagecraft
- 354 History of Costume and Décor
- 355 Scene Painting
- 356-1,2,3,4 Graphic Arts for the Stage Designer
- 357-1,2 Freehand Drawing for the Stage Designer
- 361 Textile Arts and Crafts for the Costume Designer
- 363 Theatre Sound
- 364-1,2,3 Period Pattern Drafting and Draping
- 379 Topics in Stage Management and Leadership

History, literature, and criticism (at least 3 courses, chosen from the list below or from additional courses that have been approved to satisfy this requirement; students should consult their advisers as to whether a particular course has been approved)
- ENGLISH 212 Introduction to Drama
- DANCE 215 Dance History
- ENGLISH 234 Introduction to Shakespeare
- 244-1,2,3 Development of Contemporary Theatre
- AF AM ST 259 Introduction to African American Drama
- PERF ST 307-1,2 Studies in Gender and Performance
- 307 Studies in Gender and Performance
- ENGLISH 312 Studies in Drama

DANCE 315 Cultural Study of Dance
PERF ST 318-1 Shakespeare's English Histories
PERF ST 318-2 Shakespeare Adaptations
PERF ST 321-0 Performing the American '50s
PERF ST 322-1 Staging the Novel: Noir Film and Fiction
ENGLISH 322 Medieval Drama
ENGLISH 332 Renaissance Drama
PERF ST 336 Performance of Latina/o Literature
ENGLISH 339 Special Topics in Shakespeare
345-1,2,3 History of Western Theatrical Practice
354 History of Costume Design and Decor
365-1,2 Theatre and Performance in the Americas
366 Special Topics in History, Literature, or Criticism
367 Music Theatre History
368 African Theatre and Drama
369 Latin American Theatre
374 Text Analysis for Theatrical Production

Additional requirements (30 units)
- Courses outside communication: 6 courses at the 200 level or above, including at least 3 courses at the 300 level or above (may include courses taken to meet the distribution requirement)
- Distribution requirements: 18 courses outside the school, including 8 courses from the School of Communication distribution areas: 2 from science, mathematics, and technology; 3 from individual and social behavior; and 3 from humanities and fine arts
- Electives in communication and other areas to complete a minimum of 45 courses

Minor in Theatre

www.communication.northwestern.edu/programs/minor_theatre

The minor in theatre encourages students majoring in other fields to organize their theatre studies in a coherent manner. The minor requires students to gain both depth and breadth in the study and practice of theatre.

The minor in theatre requires 7 courses. Of these 7 courses, 3 must be 300-level courses. At least 5 of the 7 courses for the minor must be offered by the theatre department; the other 2 may be approved courses in departments or programs outside theatre (e.g., performance studies, gender studies, comparative literature). No courses for the minor may be taken using the P/N option, and all classes must be completed with a grade of C- or higher in order to be counted toward the minor.

Minor requirements (7 units)
- 2 courses in theatre history, literature, criticism, or theory
- 1 course in theatre performance
- 1 course in theatre design
- 2 additional courses in one of the above areas to form a required concentration
- 1 elective

Certificate in Music Theatre

www.communication.northwestern.edu/programs/certificate_music_theatre

The Certificate in Music Theatre provides the opportunity for School of Communication students majoring in theatre, dance, or performance studies and Bienen School of Music students majoring in voice to create a second area of specialization that is important to their development as musical theatre artists. For voice majors the program provides training in acting and other theatre courses. Theatre, dance, and performance studies majors have weekly voice classes and exposure to other music offerings.

The prescribed sequence of courses is open only to students accepted into the program through audition. The auditions are held annually in the fall quarter. Only freshman and sophomore students enrolled as theatre, dance, or performance studies majors in the School of Communication or as voice majors in the Bienen School of Music are eligible to audition for the Music Theatre Certificate Program; other students will not be admitted. Auditionees are required to perform a vocal selection and a monologue and to participate in a dance audition.

Program requirements for theatre, dance, and performance studies majors (8.5 units)
- THEATRE 202-1,2,3 Sophomore Applied Voice (1.5 units)
- THEATRE 262-0 Musicianship for Actors (.5 unit)
- THEATRE 272-1,2 Sophomore Music Theatre Techniques (1 unit)
- THEATRE 302-1,2,3 Junior Applied Voice (1.5 units)
- THEATRE 352-1,2 Junior Music Theatre Techniques (2 units)
- THEATRE 367 Music Theatre History (1 unit)
- Dance technique (must be taken in order listed) (1 unit)
  DANCE 130-1 Music Theatre Ballet (.34 unit)
  DANCE 130-2 Music Theatre Dance I (.34 unit)
  DANCE 130-3 Music Theatre Dance II (.34 unit)

Program requirements for voice majors (9 units)
- THEATRE 243-1,2,3 Acting I: Principles of Characterization (3 units)
- THEATRE 272-1,2 Sophomore Music Theatre Techniques (1 unit)
- THEATRE 352-1,2 Junior Music Theatre Techniques (2 units)
- THEATRE 367 Music Theatre History (1 unit)
- DANCE 130-1,2,3 Music Theatre Dance (1 unit)
- Design, dance, or acting elective (1 unit)

Theatre Courses Primarily for Freshmen and Sophomores

THEATRE 119-0 Production Laboratory (0 units) Registration for students fulfilling production crew requirements.

THEATRE 140-1,2 Theatre in Context 1. Combination of lecture, discussion, assignments, play viewing, and text analysis. **2.** Seminar emphasizing theatre history, literature, and criticism; research; and writing skills. Prerequisite: consent of department.

THEATRE 140-3 Production in Context A combination of lecture, discussion, and production lab participation implementing the directing and design process of a theatrical production. Prerequisite: consent of department.

THEATRE 143-0 Acting: Basic Techniques For nonmajors. Introduction to the study of acting: sensory response, imagination, and characterization work leading to prepared scenes from selected plays.

THEATRE 201-0 Introduction to Design for the Theatre Introduces the principles and elements of visual design as they relate to the theatre design areas of scenery, costume, and lighting. Applies these principles and elements to a play by creating scenery, costume, and lighting design ideas based on text analysis, point of view, and research in a production notebook format. Course is a requirement and prerequisite for all 200-level design courses for the theatre minor.

THEATRE 202-1,2,3 Sophomore Applied Voice (.5 unit per quarter) Individual singing instruction for Music Theatre Certificate students. One 45-minute lesson per week. Prerequisite: admission to the Music Theatre Certificate Program.

THEATRE 210-0 Training the Actor's Voice Training and development of the actor's voice, integrating work in GEN CMN 110 with use of heightened text. Students work to develop optimal pitch and vocal range, improve articulation, and develop skills in intonation and stress through performance of scenes, monologues, and Shakespeare sonnets. Prerequisites: GEN CMN 110 and consent of instructor.

THEATRE 240-1,2,3 Stagecraft Craft and technology used in mounting a theatrical production. Crew participation in department productions. **1.** Lighting: mechanics, physics, and practices of the stage lighting technician. **2.** Scenery: construction, rigging, and handling. **3.** Costumes: sewing techniques, fitting, equipment, and fabrics. Prerequisite: sophomore standing or consent of instructor.

THEATRE 241-1,2,3 Design Process Development of stage design for the theatrical designer, from initial reading of the script to final design. Crew participation in department productions. **1.** Scene design I. **2.** Costume design I. **3.** Lighting design I. Prerequisite: sophomore standing and consent of instructor.

THEATRE 242-0 Stage Makeup Theory and practice of stage makeup. Crew participation in department productions. Prerequisite: consent of instructor.

THEATRE 243-1,2,3 Acting I: Principles of Characterization **1.** Basic concepts. **2.** Dramatic imagination. **3.** Dramatic characterization. Prerequisites: 140-1,2 (or equivalent) and consent of instructor.

THEATRE 244-1,2 Development of Contemporary Theatre Critical study of major dramatists, theories, and production styles. **1.** 1870–1920. **2.** 1920–present.

THEATRE 249-1 Introduction to Stage Management Preproduction, rehearsal, and technical rehearsal process of theatrical productions. Basic stage management tools taught in theory: assembling a production book, blocking, scheduling, communication, and cueing. Prerequisite: consent of instructor.

THEATRE 249-2 Advanced Stage Management Problem solving in the stage manager's leadership role; advanced study in production realization and communication. Students will be required to stage manage or assistant stage manage a department production and will prepare a production book based on the production. Prerequisite: consent of instructor.

THEATRE 253-1,2 Mime 1. Basic training in the arts of mime, including physical awareness, imagination, object techniques, illusion, sculpture, creation of environments, and the process of formulating performable mime pieces. **2.** Creation of solo and group mime dramas, culminating in a recital performance at the end of the quarter. Prerequisite: consent of instructor.

THEATRE 260-0 Fundamentals of Stage Directing An introductory course focusing on defining the role of the director while discovering a variety of directorial strategies. Prerequisite: consent of instructor.

THEATRE 262-0 Musicianship for Actors (.5 unit) Designed to develop a high level of musical literacy for every student actor, regardless of incoming musical ability. Practical application of music's pitch elements (harmony and melody) and temporal elements (rhythm, meter, etc.). Daily class activities include sight-singing, ear training, keyboard applications, improvisation, and critical listening. Musical material will be drawn from the music theatre repertoire.

THEATRE 263-0 Theatre Sound An introductory class in sound design for the theatre. Crew participation in department productions. Prerequisite: consent of instructor.

THEATRE 272-1,2 Sophomore Music Theatre Techniques (.5 unit per quarter) Basics of music theatre performance. The student performer is guided through contact and expression of self, connection to the material, and exploration of the craft of interpreting a song. Both quarters are required for students in the Music Theatre Certificate Program and are open to others by consent of instructor only.

Theatre Courses Primarily for Juniors, Seniors, and Graduate Students

Unless otherwise noted, these courses are open only to students who have completed the departmental 200-level requirements or their equivalents.

THEATRE 302-1,2,3 Junior Applied Voice (.5 unit per quarter) Individual singing instruction for Music Theatre Certificate students. One 45-minute lesson per week. Prerequisites: admission to the Music Theatre Certificate Program and 202-3.

THEATRE 307-0 Studies in Gender and Performance Exploration of recent research on the social and political background of gender, particularly women's access to performative expressions. Historical aesthetics: changing debates on women's participation in the public theatre and the significance of the body in performance. PERF ST 307-1,2 are the first 2 courses in this series.

THEATRE 310-0 Advanced Voice/Styles Advanced vocal techniques of the stage actor. Vocal styles include Molière, Restoration comedy, Shaw, Coward, Stoppard. Prerequisites: GEN CMN 110 (or equivalent) and consent of instructor.

THEATRE 311-0 Dialects for the Stage Using the International Phonetic Alphabet, dialect recordings, and selected text, students learn dialects for stage and film performance. Principal dialects covered: standard British, Cockney, Irish, French, Russian, German. Prerequisites: GEN CMN 110 (or equivalent) and consent of instructor.

THEATRE 312-1,2 The Art of Storytelling Ancient traditions and current renaissance of storytelling. Strategies for selecting, preparing, and sharing stories in performance. Applications in theatre, communication, education, religion, law, healing professions, leadership, and business. **1.** Basic techniques. **2.** Advanced techniques of research, preparation, and performance, culminating in a public event. Students use storytelling in presentations and performance. Prerequisites for 312-2: 312-1 and consent of instructor.

THEATRE 330 Special Topics Content varies. May be repeated with change of topic. Prerequisite: consent of instructor.

THEATRE 335 Playwriting I: Introduction to Playwriting Students read plays, complete writing exercises based on the readings, see plays off campus, and ultimately research and write the beginning of a full-length play. Open to students in any major and to writers of all levels of experience.

THEATRE 336 Playwriting II: Genres Topics change every year (such as history plays, hip-hop theatre, gothic plays, flash drama/flash fiction, epic theatre, plays for young audiences). Students read plays in a genre, complete writing exercises based on the readings, see related plays off campus, and ultimately write short genre plays. Open to students in any major and writers of all levels of experience.

THEATRE 339 Advanced Acting Scene-study course in advanced acting techniques emphasizing scene analysis and character development. Focus on creation of realistic characters from modern theatre. Primarily intended for graduate students and undergraduate transfer students. Prerequisite: consent of instructor.

THEATRE 340-1,2 Stage Directing 1. Staging fundamentals: blocking, movement, business, tempo, script selection and analysis, casting, and rehearsal planning. **2.** Special problems: exposition, suspense, surprise, marking of climaxes, and creation of mood. Prerequisite: consent of instructor.

THEATRE 341-1,2,3 Acting II: Analysis and Performance Theory, principles, and techniques of interpretation of drama from the point of view of the actor. **1.** Greek tragedy. **2.** Shakespeare. **3.** Modern drama. Prerequisite: consent of instructor.

THEATRE 342-0 Lighting Design II For advanced undergraduate lighting design students and graduate students studying lighting design as a secondary area. Lectures and design projects. Prerequisites: 241-3 and consent of instructor.

THEATRE 343-0 Scene Design II For advanced undergraduate set design students and graduate students studying scene design as a secondary area. Lectures and design projects. Prerequisites: 241-1 and consent of instructor.

THEATRE 344-0 Costume Design II For advanced undergraduates studying costume design and graduate students studying costume design as a secondary area. Lectures and design projects. Prerequisites: 241-2 and consent of instructor.

THEATRE 345-1,2,3 History of Western Theatrical Practice Comprehensive survey of the theory and history of theatre and drama. **1.** The classical period. **2.** The Middle Ages, Renaissance, and early 17th century. **3.** Late 17th century through the modern era.

THEATRE 346-1,2,3 Playwriting Fundamental techniques of playwriting. A yearlong sequence aimed at developing an original full-length play. Prerequisites: junior or senior standing and consent of instructor.

THEATRE 347-0 Theatre for Young Audiences Selection, evaluation, direction, and production of plays for children. Prerequisite: consent of instructor.

THEATRE 348-1 Creative Drama Process-centered improvisation and its applications to teaching, performance, therapy, writing, recreation, and other areas. Prerequisite: consent of instructor.

THEATRE 348-2 Advanced Creative Drama Explores improvised drama as a teaching method and a means of learning for the elementary school child. Theory and practice through reading, discussion, films, and observation. Course culminates in extended teaching projects with children from local schools. Prerequisites: 348-1 (or equivalent) and consent of instructor.

THEATRE 349-1,2,3 Acting III: Problems in Style Advanced problems in acting theories and styles. **1.** Comedy. **2.** Contemporary drama. **3.** Special topics. Prerequisite: consent of instructor.

THEATRE 350-0 Production Management Role and duties of a production manager. Experience in production management. Production management of modern shows in different venues. Prerequisite: consent of instructor.

THEATRE 351-0 Staging of Contemporary Drama Production problems peculiar to directing of plays for contemporary theatre. Prerequisite: 340-1,2 or equivalent.

THEATRE 352-1,2 Junior Music Theatre Techniques A history-based performance class that provides an understanding of the music theatre repertoire from 1900 to the present. Focuses on students' ability to discover and interpret material that supports their performing talents. Required for students in the Music Theatre Certificate Program and open to others by consent of instructor only. Prerequisites: junior standing and 243-1,2,3.

THEATRE 353-0 Topics in Stagecraft Seminars with guest or resident faculty on topics in stagecraft. Prerequisite: consent of instructor.

THEATRE 354-0 History of Costume and Décor Style and aesthetics of art, architecture, fashion, and decorative arts. Special emphasis on periods of theatrical production. Current topic will be listed in the quarterly class schedule. May be repeated for credit with change of topic. Prerequisite: consent of instructor.

THEATRE 355-0 Scene Painting Traditional and contemporary theory and practice of scene painting. Lecture and studio. Lab fee required. Prerequisite: consent of instructor.

THEATRE 356-1,2,3,4 Drawing and Painting for the Theatre Techniqes and Materials Techniques and materials of graphic communication for the stage designer. **1.** Model Building. **2.** Rendering Theatrical Space and Light. **3.** Rendering the Theatrical Figure. **4.** Hand Drafting. May be repeated for credit with change of topic. Prerequisite: consent of instructor.

THEATRE 357-1,2 Drawing and Painting for the Theatre: Principles of Drawing and Composition Drawing and composition using a variety of drawing materials and media for scenery, costume, and lighting designers. **1.** Freehand Drawing. **2.** The Figure in Space. Lecture and studio. Prerequisite: consent of instructor.

THEATRE 360-0 Agnes Nixon Master Class New play development for undergraduate writers, actors, directors, and dramaturges. Students research, workshop, and develop three original full-length plays for staged readings in the Agnes Nixon Festival at the end of spring quarter.

THEATRE 361-0 Textile Arts and Crafts for the Costume Designer For advanced undergraduate and graduate students studying costume design. Topics may include fabric dying, fabric modification, wig ventilation, millinery construction, and yarn arts. May be repeated for credit with change of topic. Prerequisites: 344 and consent of instructor.

THEATRE 362-0 20th-Century Stage Design Major stylistic developments in 20th-century scenography and scene, costume, and lighting design. Emphasis on the American artist in context of the major influences that have shaped the craft. Prerequisite: consent of instructor.

THEATRE 363-0 Theatre Sound Planning and execution of sound for theatrical production; design of the actor's acoustical environment. Crew participation in department productions. Prerequisites: junior standing and consent of instructor.

THEATRE 364-1,2,3 Period Pattern Drafting and Draping Techniques of flat pattern drafting and advanced construction used to create historical garment patterns for the stage. **1.** Flat patterns. **2.** Draping. **3.** Period patterns. Prerequisites: junior standing and consent of instructor.

THEATRE 365-1,2 Theatre and Performance in the Americas Survey of American theatre and drama; examines relevance of plays, performances such as pageants and blackface minstrelsy, theatre companies, and their original contexts to their national identity. **1.** Beginnings through the 1930s. **2.** 1940s to present. Prerequisite: 140-1,2 or consent of instructor.

THEATRE 366-0 Special Topics in History, Literature, or Criticism Content varies. Studies of individual playwrights, national or regional theatres, historical periods, performance practices, or theoretical inquiries. Prerequisite: 140-1,2 or consent of instructor.

THEATRE 367-0 Music Theatre History A survey class on the repertoire, literature, critical thinking, and historical context of music theatre as a central part of theatre history from Sophocles to Sondheim. Explores the evolution of music storytelling from its emergence as an essential part of classical Greek and Roman theatre through the fully integrated use of music, dance, and theatre that represents the apotheosis of the art form today.

THEATRE 368-0 African Theatre and Drama Major practices in African theatre and drama. Topics may include festival practices, traveling and popular theatres, Anglophone drama, nationalist dramas, reappropriation of the Western canon, or theatre for development. Prerequisite: 345-1, -2, or -3 or AF AM ST 259 or consent of instructor.

THEATRE 369-0 Latin American Theatre Explores the intersection of theatre and politics in modern and contemporary Latin American theatre by linking dramatic texts to readings in history, genre, and theory.

THEATRE 373-0 Computer Graphics for the Theatre Artist Computer graphics for the stage designer. Investigation of available software programs and strategies for use in theatre. Current topic will be listed in the quarterly class schedule. May be repeated for credit with change of topic. Lecture/laboratory. Crew participation in department productions may be required. Prerequisite: consent of instructor.

THEATRE 374-0 Text Analysis for Theatrical Production Seminar in analysis of dramatic and nondramatic texts as it relates to the problems of realized theatrical production. Prerequisite: consent of instructor.

THEATRE 376-0 Participation Theatre for Young Audiences Participation and story theatre, incorporating

improvisation into the structure of a scripted play for the child audience. Prerequisite: consent of instructor.

THEATRE 379-0 Topics in Stage Management and Leadership Leadership versus management, delegating, team building, theatrical hierarchy, organizing the design process. Advanced study in leadership, management, communication, and actor-director-designer relationships. Course requires stage managing a mainstage production. Prerequisite: consent of instructor.

THEATRE 380-0 Internship in Theatre Practice (3 units for undergraduates; 2 units for graduates) Production and/or management activities in a theatre company. Prerequisite: consent of department.

DANCE 387-0 Theatre/Dance Practicum See Dance.

THEATRE 399-0 Independent Study Prerequisite: consent of undergraduate dean after submission of petition.

Major in Dance

www.communication.northwestern.edu/programs/major_dance

The Department of Theatre also offers a major in dance. The dance major prepares students for further advanced academic work or a wide range of positions in professional dance. The major's comprehensive curriculum emphasizes the study of dance as well as the act of dancing. Students are prepared for lifetime involvement in the field and for continued development intellectually, artistically, and professionally within the dance world. In addition to dance technique and choreography, the program provides students with opportunities for writing, research, and analysis in the field. The major presents a well-integrated view of dance while also providing sound technical training in a variety of forms, with modern dance and jazz as the foundation techniques. The department offers a number of dance organizations and performing opportunities.

Honors in Dance

The Dance Program offers an honors program for students who have demonstrated academic excellence in the dance major. Contact the Dance Program for more information on eligibility and requirements.

Requirements for a Major in Dance

Program requirements (16 units)

- Introductory courses: 101-1,2,3 and and 225 (101-3 is prerequisite)
- Production: two registrations for THEATRE 119 (0 units)
- 395 Senior Seminar
- 200- or 300-level communication courses: 3 courses
- Dance technique classes: a minimum of 4 units from the following list (each dance technique class carries .34 unit; 3 classes add up to 1 unit of credit); classes in a dance form must be taken sequentially, each in consecutive quarters in a single academic year; classes in a sequence need not be taken at the same level

  Specific requirements:
  - 2 yearlong sequences in Modern, chosen from 150, 250, 350
  - 1 yearlong sequence in Jazz, chosen from 160, 260, 360
  - 1 .34-unit class in Jump Rhythm Technique Tap or Jazz; may be counted as part of the yearlong sequence in Jazz
  - 1 additional yearlong sequence in a single form chosen from the classes listed below
  - In addition to the 4 required yearlong sequences, an additional .34-unit class, 140 Cultural Forms

  110 Movement for the Stage
  120 Topics in Preparation for Performance
  130 Music Theatre Dance
  140 Cultural Forms
  150 Modern I
  160 Jazz I
  170 Ballet I
  180 Tap I
  250 Modern II
  260 Jazz II
  270 Ballet II
  280 Tap II
  350 Modern III
  360 Jazz III
  370 Ballet III
  380 Tap III
- At least 4 courses chosen from the following categories:

  Performance (at least 2 units)
  235 Choreography for Music Theatre
  325 Advanced Choreographic Study
  326 Advanced Improvisation
  345 Studies in Collaboration
  387 Theatre/Dance Practicum
  465 Studies in Dance (see Graduate School catalog)

  Dance studies (at least 2 units)
  201 Cultural Studies of Dance
  215 Dance History
  315 Dance Criticism
  335 Special Topics in Dance Research (methods or history topics)
  365 American Rhythm Dancing and the African American Performance Aesthetic
  THEATRE 367 Music Theatre History
  399 Independent Study

Additional requirements (29 units)

- Courses outside communication: 6 courses at the 200 level or above, including at least 3 courses at the 300 level or above (may include courses taken to meet the distribution requirement)

- Distribution requirements: 18 courses outside the school, including 8 courses from the School of Communication distribution areas: 2 from science, mathematics, and technology; 3 from individual and social behavior; and 3 from humanities and fine arts
- Electives in communication and other areas to complete a minimum of 45 courses

Minor in Dance

www.communication.northwestern.edu/programs/minor_dance

The Dance Program offers courses that introduce the many areas of study within the dance world as well as the many opportunities to contribute to the field. Technique study in the program focuses primarily on contemporary modern dance and Jump Rhythm Technique supported by study in ballet, tap, and other movement classes.

All students are eligible for this minor, as space allows.

The minor in dance requires 7 courses in the program. No courses for the minor may be taken using the P/N option, and all classes must be completed with a grade of C- or higher in order to be counted toward the minor.

Admission to the minor is by application. Applications are available winter quarter so that students may begin the minor in spring quarter. Students must demonstrate academic progress beyond technique study within the first full year of enrollment in the minor.

Minor requirements (6.68 units)

- 4 courses from the primary and secondary core:
  101-1,2,3
  225
- 1 yearlong sequence (3 .34-unit classes taken in consecutive quarters in a single year) in Modern Dance chosen from 150, 250, 350; classes need not all be in the same level
- 1 class in 140 Cultural Forms (.34 unit)
- 1 class in Jump Rhythm Technique Tap or Jazz (.34 unit), chosen from 160, 260, 180, or 280
- 1 elective reflecting the student's special interests (a dance technique sequence may not be used to satisfy this requirement)
- 1 registration in THEATRE 119 (0 units) for students not majoring in theatre or performance studies

Dance Technique Courses Open to Undergraduates

DANCE 110-0 Movement for the Stage Movement and body awareness. Improvisational techniques using time, space, weight, and effort as the instrument of expression.

DANCE 120-0 Topics in Preparation for Performance Different techniques each quarter to help prepare students for performance. Techniques include Pilates, yoga, Alexander technique, and the Feldenkrais method.

DANCE 130-1 Music Theatre Ballet Basic ballet technique. Taken during sophomore year; prerequisite for 130-2 and 130-3.

DANCE 130-2 Music Theatre Dance I Music theatre styles, explored through the study of jazz, tap, and modern repertoire. Taken during junior year.

DANCE 130-3 Music Theatre Dance II Advanced class focusing on a range of Broadway choreography, dance styles, specialty forms, and audition technique. Taken during junior or senior year.

DANCE 140-0 Cultural Forms Sections offer instruction in different ethnic dance forms; sections offered in the past include flamenco, Indian, salsa, and African.

DANCE 150-0, 250-0, 350-0 Modern Offered at levels I, II, and III each quarter to develop modern dance technique. Higher levels progress more rapidly with a greater level of complexity, as class work focuses on a wider range of qualities and aesthetics. Style of modern technique varies with each instructor.

DANCE 160-0, 260-0, 360-0 Jazz Offered at levels I, II, and III each quarter to develop jazz technique. As class advances, students learn more advanced rhythmic phrases, more complex body-part isolations, and quicker direction changes in space. Style of jazz technique varies with each instructor.

DANCE 170-0, 270-0, 370-0 Ballet Offered at levels I, II, and III each quarter to cover ballet from basic principles through advanced skills. Terminology and movements are based on class level. Dancers begin at the barre and continue in the center, across the floor, and from the corner with combinations of steps, including turns and jumps.

DANCE 180-0, 280-0, 380-0 Tap Tap technique. One level is offered each quarter, starting at beginning level. The fundamentals of tap are developed through each level, and rhythmic awareness is expanded.

Dance Academic Courses Open to Undergraduates

DANCE 101-1,2,3 Introduction to the Dance Experience Foundation for further studies in dance technique, science, history, and analysis. **1.** Movement awareness: introduction to body-mind approaches to movement study, including Laban movement analysis, yoga, tai chi, body-mind centering, and Feldenkrais. **2.** Dance in context: places dance in the context of other aspects of human behavior, exploring social dance, ritual, and theatrical performance. **3.** Introduction to improvisation: dance and movement improvisation as a tool for developing a personal movement vocabulary.

DANCE 201-0 Cultural Studies of Dance Dance as a force in culture and society amid ethnic, social, and theatrical traditions. Participation in labs, class lectures, and discussions. Required readings; independent video viewing and concert attendance.

DANCE 202-0 Experiential Anatomy for Performers The language and analysis of anatomy; heightening of bodily awareness using kinesthetic sensation and imagery. Combines theory and practice to achieve both intellectual and experiential awareness of the kinesthetics of anatomy.

DANCE 215-0 Dance History Choreographic accomplishments in the major developmental periods of American dance. Readings, discussion, video screenings, movement workshops, and research.

DANCE 225-0 Dance Composition Fundamental choreographic elements: time, space, shape, form, dynamics, and design. Choreographic exploration of the basic principles of dance composition.

DANCE 235-0 Choreography for Music Theatre How to manipulate space, time, and energy in short movement studies; creating a movement study in dramatic action that relies on those manipulations; choreographing a short dance to music for other dancers using the previous movement studies as guideposts.

DANCE 315-0 Dance Criticism Critical and theoretical thought of writers on Western theatrical dance.

DANCE 325-0 Advanced Choreographic Study Manipulation of space, time, and energy according to the principles of organic compositional development to produce personal, poetically charged choreographic statements. Lecture-laboratory investigation of advanced choreographic concepts; abstraction, style, use of music, group work, humor in dance. Prerequisite: 225 or consent of instructor.

DANCE 326-0 Advanced Improvisation Improvisation as a source for composition and performance. Recommended for musicians and actors wishing to expand knowledge and/or command of dance vocabulary and for dancers wishing to investigate the musical and theatrical dimensions of their art. Emphasis on interrelationships between people moving and between the performing arts that students bring to the course. Prerequisite: 101-3 or consent of instructor.

DANCE 335-0 Special Topics in Dance Research Research methodologies, dance scholarship, criticism, and historical reconstruction. Critical issues and contemporary problems. Content varies.

DANCE 345-0 Studies in Collaboration Workshop exploration of collaboration as well as historical and theoretical perspectives. Seminar, practicum. Through studio work, reading, and discussion, dancers and musicians will explore our shared language.

DANCE 355-0 Dance in Education Organizing and teaching dance technique and creative movement for children and adolescents. Creative play, movement exploration, acquisition of basic motor skills, links to the classroom. Lecture, laboratory, and field experiences.

DANCE 356-0 Theories of Dance and Expressive Arts Therapies Overview of dance, drama, and art therapies as currently practiced in treating disabled, mentally ill, or other special populations. Introduces diverse theoretical perspectives in the role and use of art forms as therapeutic modalities. Symbolic meaning, group dynamics, and the language of movement as it relates to personality, body image, and expression.

DANCE 365-0 American Rhythm Dancing and the African American Performance Aesthetic Viewing (via video) and evaluating the sources and contemporary influences of jazz, tap, Broadway, and other vernacular forms of theatre dance. Light movement exercises to convey the kinesthetic basis of American rhythm dancing.

DANCE 375-0 Summer Dance Institute One-week summer workshop exploring various forms of dance with guest artists.

DANCE 387-0 Theatre/Dance Practicum Offered during the summer to provide academic credit to students participating in a Northwestern performance.

DANCE 395-0 Senior Seminar A forum for addressing issues of transition, career planning, and support, providing a structure for analyzing opportunities in the professional dance world. The seminar is also responsible for creating and producing the Senior Concert, the culminating activity of the dance major. The course meets as a year-long sequence with grade and 1 credit unit awarded in the spring.

DANCE 399-0 Independent Study Prerequisite: consent of undergraduate dean after submission of petition.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

School of Education and Social Policy

www.sesp.northwestern.edu

The mission of the School of Education and Social Policy is to understand and improve learning communities, defined as groups of people working together in structured social and/or technical environments that influence human development. Learning communities include not only schools and classrooms but also workplaces, families, neighborhoods, and other societal arrangements where learning takes place. Through broad-based interdisciplinary research, teaching, and outreach activities, SESP's faculty strive to better understand how social, psychological, and economic factors shape human development and learning and how innovations in pedagogy, technology, and social policies can benefit lives. They learn to understand human development and improve learning in its various social contexts by applying the social and behavioral sciences.

The school provides undergraduates with an interdisciplinary curriculum, practical experiences, and research activities that are closely linked to its faculty and graduate programs. Four concentrations lead to the degree of bachelor of science in education and social policy. The intellectual core of the human development and psychological services and social policy concentrations comes from SESP's human development and social policy graduate program. The intellectual core of the learning and organizational change and secondary teaching concentrations is grounded in the school's learning sciences graduate program.

The four concentrations offer preparation for a number of career options. Students are encouraged to design their concentrations with career objectives or graduate and professional school admission policies in mind. They enroll with a wide variety of academic and career goals. Some intend to go immediately to graduate and professional schools, while others plan to enter a profession upon graduation.

Students in Northwestern's other schools may choose to complete the requirements of SESP's secondary teaching concentration in order to qualify for teacher certification.

SESP offers advanced degrees and programs in elementary and secondary teaching, higher education administration and policy, learning and organizational change, learning sciences, and human development and social policy.

ACADEMIC POLICIES

Requirements for the Bachelor's Degree in Education and Social Policy

A minimum of 45 course units are required for the degree of bachelor of science in education and social policy. The concentrations in human development and psychological services, learning and organizational change, and social policy have similar distribution and core requirements, though each has different major courses; the secondary teaching curriculum is markedly different, largely due to Illinois Board of Education requirements.

Grade and Registration Requirements

The following requirements concerning grade point average (GPA) and registration apply to all students seeking the bachelor's degree:

- 45 course units are required for graduation.
- Students are required to maintain a minimum GPA of 2.0 in all work presented for the degree. To qualify for teacher certification, students must earn a minimum grade of C in all professional core courses and maintain minimum GPAs of 2.5 overall and 3.0 in teaching subject–area courses. Students in the human development and psychological services, learning and organizational change, and social policy concentrations must earn a minimum grade of C- in all distribution requirements, core courses, and concentration courses.
- Full-time students may elect to enroll in some Northwestern courses with the understanding that they will not receive a regular letter grade but the notation P (pass) or N (no credit). They may elect 1 unit per quarter under the P/N option, which may be used only toward elective requirements.
- Not more than six of the grades in courses taken at Northwestern and presented for graduation may be P's and D's.
- Students may double-count up to 3 course units from their concentration toward a second major and up to 2 units toward an adjunct major or a minor. Required related courses in Weinberg College are not subject to these limits.
- Coursework taken at institutions other than Northwestern that is to be counted toward SESP requirements must be approved in advance by the student's adviser and the SESP assistant dean for student affairs; if a course taken for credit is outside SESP's curriculum,

the relevant academic department at Northwestern must also approve. Students taking community college courses must earn a grade of B or higher for SESP to accept the credit.

- A student typically may not have more than a total of three majors plus minors: three majors, two majors and one minor, or one major and two minors. Exceptions require permission from the SESP assistant dean for student affairs and are not granted during the freshman year.
- All degree candidates must file an application for the degree with their advisers in advance of their degree completion. The adviser will forward the application, when approved, to the Office of the Registrar.
- Students who wish to transfer into SESP from another Northwestern school must
  - Have a minimum cumulative GPA of 2.0 (students in the secondary teaching concentration must maintain minimum GPAs of 2.5 overall and 3.0 in teaching subject–area courses).
  - Attend the appropriate information and orientation sessions.
- Students transferring from another university must complete their final 23 units at Northwestern.
- Additional requirements are stipulated in the *SESP Undergraduate Handbook*. All students are expected to be familiar with and observe these policies. When requirements or policies change, notification is provided on the SESP website.

In addition to and independent of the requirements set by SESP, all students must satisfy the Undergraduate Registration Requirement (see page 17).

Probation

In addition to the University regulations regarding academic probation, undergraduate students in SESP are ordinarily placed on academic probation when, in any one quarter, they do not receive at least three final grades of A, B, C, or P, or they have a cumulative GPA below 2.0. Students on probation must work with their advisers to meet the conditions set by the probation and address the deficiencies that resulted in probation. Failure to do so may result in dismissal from the University.

Petitions for Exemptions

Students must petition if they wish to be exempted from or request a change in any of the SESP degree or specific course requirements of SESP. Petition forms are available electronically in the SESP Office of Student Affairs and on the SESP website. No petition is considered unless it is approved by the student's adviser and the SESP assistant dean for student affairs. Petitions requesting that a course substitute for a degree requirement must be submitted before the posted deadline.

ACADEMIC OPTIONS

SESP concentrations are interdisciplinary and flexible, allowing many undergraduates to enroll in University-wide programs or to pursue up to two additional majors, one additional major and one minor, or as many as two minors along with their concentration. Options include the five-quarter Certificate in Civic Engagement Program and the Summer Field Studies Programs administered by SESP; see page 198 for more information. Many students also elect to spend one or more quarters in a University-approved study abroad program.

Honors

Students who maintain records of academic distinction may qualify for the honors program. Any student who has attained a cumulative GPA of 3.5 or above after winter quarter of the junior year is eligible for provisional admission to the program beginning in spring quarter of the junior year. Students considering both study abroad and the honors program must plan their study abroad programs accordingly.

Students who successfully complete SESP 391 Advanced Research Methods in spring quarter of the junior year and are recommended for the honors program may formally enter the honors program by registering for SESP 398 Honors Thesis in fall quarter of the senior year. In this three-quarter program students work with a faculty adviser on a research project. If progress is satisfactory, students are eligible to register for 398 in winter and spring quarters of the senior year. Grades are based on performance throughout the program and on readers' evaluations of the project report. All honors students present their projects to SESP faculty, students, and guests at a poster session at the end of the year. Students earn 3 units for successful completion of an honors thesis. They receive departmental honors only on the recommendation of the faculty adviser and the approval of the program director.

Other Academic Opportunities

Many programs offered by other Northwestern undergraduate schools or across the University are popular among SESP students. They include the following:

Business Institutions

Students pursuing the business institutions minor study business through an investigation of the cultural, political, and social consequences of business institutions. More information is in the Weinberg College chapter of this catalog and at www.wcas.northwestern.edu/bip.

Global Health Studies

Combining coursework and international experience, this interdisciplinary minor is designed to provide skills for dealing with national and international health issues. Students learn about health crisis management and get perspectives on health issues within the diverse US

population. More information is in the Weinberg College chapter of this catalog and at www.wcas.northwestern.edu/globalhealth.

International Studies
In the undergraduate minor or adjunct major in international studies, students explore our interconnected world system and its political and economic organization. More information is in the Weinberg College chapter of this catalog and at www.intstudy.northwestern.edu.

Legal Studies
In the minor or adjunct major in legal studies, students apply various academic perspectives and methodologies to study legal issues and use the conceptual framework of the law to illuminate empirical and theoretical concerns in the social sciences and humanities. More information is in the Weinberg College chapter of this catalog and at www.northwestern.edu/legalstudies.

Student-Organized Seminar
As its title denotes, SESP 298 Student-Organized Seminar is a course in which the topic, reading list, assignments, written examinations, prerequisites, and meeting schedule are proposed by students in consultation with a faculty sponsor. Proposals must be submitted by the posted deadline and approved by the director of undergraduate education before the seminar can be offered.

Study Abroad
Students are encouraged to explore the myriad options for study abroad. Credit may be applied toward concentration, distribution, and elective requirements with the consent of the student's adviser. More information is in the Undergraduate Education chapter of this catalog and at www.northwestern.edu/studyabroad.

Undergraduate Leadership
The Undergraduate Leadership Program, a cross-school certificate program open to all undergraduates, helps students understand the nature of leadership and prepares them to become leaders. More information is in the Cross-School Options chapter of this catalog and at www.northwestern.edu/ulp.

Undergraduate Research
The school's curriculum includes a variety of innovative learning opportunities. Students taking SESP 390 complete an apprenticeship as assistants in faculty research projects. In SESP 399 students carry out their own independent research under faculty supervision. Additional information about undergraduate research opportunities and faculty research projects may be obtained through the academic advisers in the SESP Office of Student Affairs and the *SESP Undergraduate Handbook*.

STUDENT RESOURCES

Academic Advising
Each student is assigned to an adviser in the SESP Office of Student Affairs. For the advising system to work, students must take all academic questions to their advisers. Advisers are responsible for helping students plan academic programs that meet the requirements for completion and graduation. Advisers also help students make use of academic, professional, and personal development resources. Students consult with faculty as well about research and professional interests.

Students are encouraged to meet with their advisers at least once per quarter to develop an individualized plan of study. Failure to do so may result in a hold being placed on a student's registration.

Organizational Involvement
Membership in the student organization Promote 360: A Cycle of Minority Empowerment and Support is open to all SESP students. The organization promotes, supports, and sponsors efforts to enhance the social, academic, and professional well-being of students from minority and underrepresented groups. The group organizes career-exploration, academic skill–building, and social support programs for SESP students and mentoring for Chicago high school students. See www.sesp.northwestern.edu/ugrad/opportunities/promote-360.html for more information.

Support for Research and Special Projects
The SESP Undergraduate Opportunities Fund provides support for special academic projects and community endeavors that students or student organizations undertake either on their own or under a faculty member's direction. Students who pursue research may also seek support from the G. Alfred Hess Jr. Fund to defray the costs of data collection and analysis, travel, equipment, and other expenses directly related to their projects. More information about SESP undergraduate research opportunities and awards programs is available at www.sesp.northwestern.edu/ugrad/opportunities/research.html.

ACADEMIC OFFERINGS

NONSECONDARY TEACHING PROGRAMS

Concentrations in Human Development and Psychological Services, Learning and Organizational Change, Social Policy
Students in SESP's human development and psychological services, learning and organizational change, and social policy concentrations focus on the interdisciplinary study of human behavior as it is influenced by social institutions, understanding the behaviors that people bring

to various institutional contexts, identifying and analyzing how behaviors are shaped in these environments, and establishing criteria by which to evaluate the purposes and effectiveness of institutional activities.

Common Coursework

Distribution and core requirements are the same for all students in SESP's three nonsecondary teaching concentrations. Students also complete an off-campus practicum (SESP 386, 387, or 388, as appropriate; or 384 or 389) that entails engagement in professional activities and projects in such areas as program development and management, learning design, therapeutic rehabilitation, or policy research and evaluation. It is taken during junior year (or during the summer before or after junior year) in the Chicago area or, during Summer Session only, in Washington, DC, or San Francisco. Concurrent with the practicum, students meet weekly for the practicum analysis seminar, which is taught by a faculty member and culminates in a final research paper.

Up to 3 units of a research apprenticeship (390) or independent study (399) may be counted toward the concentration requirements. Credit for a student-organized seminar (298) may be used only as elective credit.

Students are encouraged to develop a course plan within their concentration that reflects their individual interests and career goals. Working with their advisers, students may develop an interdisciplinary specialization comprising 5 or more courses from across the University; course selection is subject to approval by petition. See each concentration's requirements for examples.

Distribution Requirements (10 units)

- 2 natural sciences courses
- 2 formal studies courses (mathematics, logic, etc.)
- 2 historical studies courses
- 2 ethics and values courses (philosophy, religion, etc.)
- 2 literature and fine arts courses

Selected courses from Weinberg College and professional schools across the University may be used to fulfill distribution requirements with the consent of the student's adviser and the SESP assistant dean for student affairs.

SESP Core (8 units)

Basic courses—2 units

- SESP 201 or 203
- 1 course focusing on inequality and diversity issues, chosen from LOC 214, SESP 317, 320, 321, or an approved equivalent

Research methods—2 units

- SESP 210; 372 (prerequisite for 384, 386, 387, 388, 389)

Practicum—4 units

- SESP 386, 387, or 388, as appropriate; or 384 or 389

This 4-unit course may be taken either for 1 quarter during the junior year or for nine weeks during the Summer Session before or after the junior year; no fifth unit may be taken concurrently without special permission. At least 2 quarters before registering for the course, students must consult the SESP practicum director regarding procedures and site-placement application materials; for Summer Session practicums, consultation should be scheduled at least 3 quarters in advance.

Electives (9 units)

Courses from any school across the University may be used to fulfill elective requirements. Students are encouraged to discuss their elective plans with their advisers; they may be able to pursue a second major or a minor using elective credits.

Courses

First-year students are restricted from most SESP 300-level courses, with the exception of research courses.

SESP 195-1,2 Community Engagement Critical reflection on community engagement experiences in relation to broader societal issues. Conceptual frameworks for understanding the meaning and nature of community. For Certificate in Civic Engagement students only.

SESP 201-0 Human Development: Childhood and Adolescence Personal, social, and cognitive development from birth through adolescence. Interplay of biological and experiential factors on linguistic and conceptual development, ego, and personality.

SESP 202-0 Introduction to Community Development Historical and contemporary community-building efforts, focusing on Chicago's neighborhoods. Community development strategies: the settlement house, community organizing, and community economic development.

SESP 203-0 Human Development: Adulthood and Aging Psychological, sociological, and biological factors influencing socialization and development from young and middle adulthood through old age. Influences of family, school, and work on the individual.

SESP 210-0 Introduction to Statistics and Research Methodology Definitions and classifications of terms used in quantitative methods; measures of typical and maximum performance, reliability, and validity checks; reporting and displaying data; interpreting results.

SESP 295-0 Theory and Practice of Community Consulting Course on the importance of community capacity building and the community-consulting process; start of preliminary work for the Certificate in Civic Engagement capstone project.

SESP 298-0 Student-Organized Seminar Courses proposed by students and supervised by faculty sponsors on topics not covered in regular courses. Offered only after course content and design have been formally approved by the SESP undergraduate education director. May be taken only once per quarter; pass/no credit only. Consultation with the SESP student affairs assistant dean advised.

SESP 299-1,2 Civic Engagement Capstone Research Independent study courses leading to completion of the Certificate in Civic Engagement capstone project.
SESP 303-0 Program Design and Implementation Characteristics of successful programs in a variety of areas, including human development, education, social welfare, and health promotion.
SESP 317-0 Gender and the Life Course How age and sex serve as a basis for the social construction of men's and women's lives. How social forces operate to create contrasting life trajectories, role patterns, and transitions; the role of social policies. Comparative view of different societies and periods in recent history.
SESP 318-0 Adult Development and Work Careers Adult development and careers from the perspectives of psychology, sociology, and organizational behavior. Individual career-development strategies and alternative career systems.
SESP 319-0 Family Development in a Changing Society Societal changes and their effects on the family.
SESP 320-0 Race and Education Conceptual underpinnings of the construct of race and how conceptions of race have influenced the course of education in the United States.
SESP 321-0 Child Development: The African American Experience Variety of socially important topics and debates regarding African American children's development, including their physical development and health; general cognitive development and achievement; Ebonics and language issues; and how economic status, media, social stereotypes, racism, family dynamics, peer groups, African American cultural norms, and other social factors affect racial identity and social and personality development.
SESP 351-0 Special Topics Advanced work on special topics.
SESP 372-0 Methods of Observing Human Behavior Guided practice in systematic and participant observation. Observer bias, field notes, unobtrusive measures.
SESP 384-0 Field Studies in Washington, DC (4 units) See description for 386. Offered during Summer Session only. Prerequisites: 372; consent of SESP practicum director 3 quarters before registration. For participants in the Washington, DC, field studies program only.
SESP 386-0 Practicum (4 units) Real-world participant observation in professional activities and projects; development of analytical field studies of the practicum experience based on field notes, recorded observations, and class discussions; culminates in a final research paper. Prerequisites: 372; consent of SESP practicum director 2 quarters before registration (3 quarters if a Summer Session practicum). For HDPS students only.
SESP 387-0 Practicum (4 units) See description and prerequisites for 386. For LOC students only.
SESP 388-0 Practicum (4 units) See description and prerequisites for 386. For SOC POL students only.
SESP 389-0 Field Studies in San Francisco (4 units) See description and prerequisites for 386. Offered during Summer Session only. For participants in the San Francisco field studies program only.
SESP 390-0 Research Apprenticeship Opportunity to participate in faculty research projects. Prerequisites: consent of the faculty member and the SESP assistant dean for student affairs; submission of completed Request for Independent Study/Special Courses Form at registration.
SESP 391-0 Advanced Research Methods Overview of research methods that may be used to design and implement the honors thesis. Prerequisites: 210 and 372 recommended.
SESP 398-0 Honors Thesis (3 units) Students develop, design, implement, and evaluate a research project under a faculty adviser's guidance. Prerequisites: senior status; 3.5 cumulative GPA by the end of winter quarter of the junior year; recommendation for the honors program from SESP 391 instructor(s); consent of program director.
SESP 399-0 Independent Study Faculty-supervised study of special topics of the student's own choosing and not covered in regular courses. Prerequisites: consent of the supervising faculty member(s) and the SESP assistant dean for student affairs; submission of completed Request for Independent Study/Special Courses Form at registration.

Human Development and Psychological Services

www.sesp.northwestern.edu/ugrad/human-development-and-psychological-services

The human development and psychological services concentration explores how human development is influenced by family, schools, community, and the workplace. Students interested in such fields as child development, social work, clinical psychology, medicine, and counseling normally enter this concentration.

Courses focus on theories of individual development and on family, group, and organizational dynamics. The interdisciplinary concentration draws from current practice and research in counseling, personality psychology, and human development as well as on the disciplines of psychology, sociology, gender studies, communication studies, cognitive science, and anthropology to give students the opportunity to combine theory with practice and develop pragmatic skills grounded in a deep understanding of human psychology, growth, and adaptation throughout the life span. Examples of interdisciplinary specializations include child development, family development, premedical studies, and gender and human development.

Students are encouraged to include in their concentration the prerequisites in psychology and quantitative methods needed for graduate work in psychology and in the human services professions.

***Total requirements*—**45 units
***Distribution requirements*—**10 units (see page 190)
***SESP core*—**8 units (see page 190)
***Electives*—**9 units (see page 190)

***Concentration program*—**18 units
- Required courses (5 units)
  - HDPS 201, 301
  - 3 courses chosen from the following, with no more than 1 in CSD: HDPS 305, 311, PSYCH 215, SESP 303, SOC POL 304, CSD 303, 342, 373, 392
- Concentration courses (13 units)
  - Must be selected from an approved list of courses in human development and psychological services, other SESP concentrations, and disciplines such as anthropology, communication studies, linguistics, psychology, and sociology.
  - Must include at least 5 courses at the 300 level. Up to 3 units of SESP 390 or 399 and 3 units of SESP 398 may be counted toward this requirement.

Courses

HDPS 201-0 Introduction to Psychological Services
Overview of professional degrees, sites, and various populations in psychological services. Introduction to the most common mental disorders and counseling fundamentals used in clinical mental health careers.

HDPS 222-0 Career Development: Theory and Counseling
The career-development process and its relation to the world of work. Discussion of career-development theories. Focus on self-assessment; decision-making and job-seeking skills; and educational, occupational, and community information.

HDPS 301-0 Introduction to Counseling Overview of theories, techniques, client systems, and service settings.

HDPS 305-0 Identity and Motivation Examines the connection between conceptions of the self and goal-oriented motivation, with particular attention to the influence of social, structural, and cultural forces.

HDPS 306-0 Developmental Psychopathology Study of models of risk and resilience, developmental pathways, and the transactional model of development.

HDPS 341-0 Building Loving and Lasting Relationships: Marriage 101 The intricacies and problems of close, committed, interpersonal relationships, especially marriage. Open to first-year students.

HDPS 351-0 Special Topics in Human Development and Psychological Services Advanced work on special topics.

Learning and Organizational Change

www.sesp.northwestern.edu/ugrad/learning-and-organizational-change

Students who are interested in such fields as management, consulting, change management, training, design of knowledge systems, and human resources in for-profit and not-for-profit organizations normally enter the learning and organizational change concentration. They combine core coursework in learning sciences, organization behavior, psychology, and human development with the necessary work in economics, quantitative methods, communications, and computer science to prepare for careers as organizational leaders and change agents and for graduate study in education, the social sciences, and management.

***Total requirements*—**45 units
***Distribution requirements*—**10 units (see page 190)
***SESP core*—**8 units (see page 190)
***Electives*—**9 units (see page 190)
***Concentration program*—**18 units
- Required courses (7 units)
  - LOC 211, 213 or 214, 306, 310
  - COG SCI 211 or PSYCH 228
  - 1 course chosen from LOC 311, 391, SESP 303, 318, HDPS 311
  - 1 course chosen from LOC 313, 346, 351, PSYCH 335
- Concentration courses (11 units)
  - Must be selected from an approved list of courses in LOC, other SESP concentrations, and disciplines such as cognitive science, communication studies, computer science, economics, psychology, and sociology.
  - Must include at least 5 courses at the 300 level. Up to 3 units of SESP 390 or 399 and 3 units of SESP 398 may be counted toward this requirement.
  - Students who are interested in the business field are encouraged to take 3 or more units in economics (e.g., ECON 201, 202), business institutions (e.g., BIP 260), technology, international studies, or a foreign language.

Courses

LOC 211-0 Introduction to Organization Theory and Practice
Examines major organizational behavior theories and practices through organizational analysis.

LOC 213-0 Cognition in Context Explores how thinking and learning are organized in everyday settings.

LOC 214-0 Culture and Cognition Surveys research and theory on the interrelatedness of culture and thought.

LOC 306-0 Studies in Organizational Change Examines theories and methods of organizational change through analysis of organizational adaptations; applies theories from learning sciences and organizational behavior.

LOC 310-0 Learning Organizations for Complex Environments
Major change factors, including technology, globalization, and demographics, and their impact on organizations; how organizations are creating and responding to these changes through organizational design, learning systems, and human resource changes.

LOC 311-0 Tools for Organizational Analysis Understanding cause-and-effect relationships pertaining to organizational behavior and performance.

LOC 313-0 Learning and Thinking in Organizations Examines how human learning and thinking can facilitate organizational growth and change through methods such as instructional design, modeling, and evaluation of learning outcomes.

LOC 346-0 Psychology of Technology and Instructional Design Introduction to theory and practice in the development of technologies for formal and informal learning in the classroom, workplace, and everyday world.
LOC 351-0 Special Topics in Learning and Organizational Change Advanced work on special topics.
LOC 391-0 Organizational Planning and Analysis Culminating experience involving application of knowledge and skills to analyze real-world problems and solutions in learning and organizational change.

Social Policy

www.sesp.northwestern.edu/ugrad/social-policy
The social policy concentration explores how policies function as the guiding principles on which social programs are based. Students interested in public service, public policy, public health, and law typically choose to follow the requirements of the social policy concentration.

Courses analyze how social policies and social institutions influence the course of human lives and how people can influence social policies. Students develop a strong interdisciplinary foundation in the social sciences and gain an understanding of current social policy issues, drawing on research in African American studies, anthropology, communication studies, economics, gender studies, history, philosophy, political science, public health, and sociology. Examples of interdisciplinary specializations include education policy and reform, urban issues and policy, health care issues and policy, legal issues, and environmental issues and policy.

Students are encouraged to use elective credits to build specialties in such areas as juvenile justice, advocacy programs, and policy analysis and to develop the oral and written communication skills important to success in law school and public policy positions.

***Total requirements*—**45 units
***Distribution requirements*—**10 units (see page 190)
***SESP core*—**8 units (see page 190)
***Electives*—**9 units (see page 190)
***Concentration program*—**18 units

- Required courses (7 units)
  - SOC POL 201; 304 or 312
  - SESP 202
  - ECON 202
  - POLI SCI 220
  - 1 course chosen from SOC POL 305, 307, 311, 332
  - 1 course chosen from SOC POL 330, 331, 332
- Concentration courses (11 units)
  - Must be selected from an approved list of courses in SOC POL, other SESP concentrations, and disciplines such as African American studies, communication studies, economics, political science, and sociology.
  - Must include at least 7 courses at the 300 level. Up to 3 units of SESP 390 or 399 and 3 units of SESP 398 may be counted toward this requirement.

Courses

SOC POL 201-0 Introduction to Social Policy Social policy formulation: the substance of major American social policies, the agenda-setting process, and how the political system shapes social policy in this country.
SOC POL 304-0 Social Policy and the Human Services Development of social policy for human services in the United States. Human service policies for education, mental health, physical health, prisons, income, and aging.
SOC POL 305-0 Law and Social Policy Use and influence of the legal system in and on social institutions and policy.
SOC POL 307-0 Educational Policy Conflict between societal imperatives to select and prepare young people for future careers and to offer youths opportunity; how society and schools address this conflict; various approaches to policy reform.
SOC POL 310-0 Legal Aspects of Education School governance structure and decision making; relevant state and federal legislation; role of the US Supreme Court in affecting public schooling.
SOC POL 311-0 Social Policy and the US Health Care System Examines the health care delivery system in the United States through a review of US health policy issues.
SOC POL 312-0 Social Policymaking and Implementation Examines the process by which social policies are made, the process and realities of their implementation, and the attendant politics.
SOC POL 330-0 Economics of Social Policy Students learn core economic concepts and empirical tools to analyze the design and effects of social policies. Topics include the social safety net (welfare, food stamps, Social Security, earned income tax credit, unemployment insurance), health insurance, minimum wage, and taxation. Prerequisites: ECON 202 and SESP 210 or equivalent.
SOC POL 331-0 Economics of Inequality and Discrimination Students learn core economic concepts and empirical tools to analyze the causes and consequences of inequality and discrimination. Topics include neighborhoods and stratification, housing policy, crime, earnings inequality, and the role of education in creating and reducing disparities. Prerequisites: ECON 202 and SESP 210 or equivalent.
SOC POL 332-0 Economics of Education Policy Students learn core economic concepts and empirical tools to analyze the design and effects of education policies. Topics include school choice, accountability, education finance, class size policy, teacher compensation and retention, higher education policy, returns to education, and the human capital model. Prerequisites: ECON 202 and SESP 210 or equivalent.
SOC POL 351-0 Special Topics in Social Policy Advanced work on special topics.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

SECONDARY TEACHING

www.sesp.northwestern.edu/ugrad/secondary-teaching

SESP's interdisciplinary secondary teaching concentration combines subject-area courses in a chosen field from Weinberg College—such as art, biological and physical sciences, English, foreign languages, mathematics, or social sciences—with courses in child and adolescent development, educational philosophy, and urban education.

Secondary teaching students must complete a one-quarter student teaching internship and be enrolled in TEACH ED 388 or 389 Student Teaching Seminar. SESP students who wish to pursue secondary teaching certification must complete the requirements of the secondary teaching concentration and apply for formal admission to the SESP Teacher Preparation Program (see page 196). Students completing degree requirements within SESP receive the bachelor of science degree in education and social policy; 45 units are required for the degree.

Weinberg College students who wish to pursue secondary teaching certification must complete the requirements of the secondary teaching concentration and apply for formal admission to the SESP Teacher Preparation Program (see page 196). They also must complete a major and fulfill the degree requirements of Weinberg College.

Students who wish to transfer into SESP's secondary teaching concentration must plan carefully throughout their undergraduate program in order to meet the requirements.

***Total requirements*—**45 units
***Distribution requirements*—**14 units
***Professional core*—**11 units
***Teaching subject–area requirements*—**12–19.36 units
***Electives*—**8 or more as needed to complete the 45-unit degree requirement

Distribution Requirements (14 units)

- 1 oral communication course
- 1 multicultural studies course reflecting a non-Western perspective
- 2 intensive writing courses
- 2 natural sciences courses
- 2 formal studies courses (mathematics, logic, etc.)
- 2 historical studies courses
- 2 ethics and values courses (religion, philosophy, etc.)
- 2 literature and fine arts courses

Selected courses from Weinberg College and professional schools across the University may be used to fulfill distribution requirements with the consent of the student's adviser and the SESP assistant dean for student affairs.

Professional Core (11 units)

- SESP 201
- TEACH ED 302, 304, 322 (or 325 for English), 327
- 1 methods and techniques course chosen from TEACH ED 355, 356, 357, 358, 359
- 1 practicum/seminar: TEACH ED 378 or 379
- 1 student teaching seminar (4 units): TEACH ED 388 or 389

Students seeking endorsement to teach art, foreign languages, or in middle schools must also take TEACH ED 328 and 329.

Teaching Subject–Area Requirements (12–19.36 units)

Specific teaching subject–area courses prepare students to meet the requirements of the Illinois State Board of Education. Teaching subject–area requirements may differ from those of a departmental major, and departmental course offerings change frequently. Secondary teaching certification candidates are required to meet regularly with the advising staff in the SESP Office of Student Affairs to ensure that certification requirements are met. In the event that courses listed here are no longer offered by the departments, suitable replacements will be found. Students are also responsible for any prerequisites.

Art (14 units)

- 4 introductory courses chosen from ART 120, 125, 130, 140, 150
- 4 studio courses: ART 210 *or* 310, 222 *or* 225, 231 *or* 232, 240 *or* 250
- 1 additional studio course in painting and drawing, printmaking, sculpture, or photography
- 2 courses chosen from ART HIST 220, 230, 240, 250
- 1 theory/criticism course chosen from ART 270, 272, 372, ART HIST 360-1, 360-2, 365-2, 366
- TEACH ED 328, 329

Biological and Physical Sciences

Biological Sciences (19.36 units)

- 7 core science courses
  - ASTRON 101, 120, or 220
  - BIOL SCI 215
  - CHEM 101/121 or 171/181
  - PHYSICS 130-1,2,3 *or* 135-1,2,3
- 4 additional chemistry courses: 102, 103, 210-1,2 (excluding all labs)
- 8 additional biological sciences courses: 216, 217, 218, 220, 221, 222; 301 or 309; 341, 342, or 391
- 1 additional course chosen from BIOL SCI 312, 313, 316, 335, 346, 347, 349, 350
- *SESP students:* 2 additional 300-level biological sciences courses
  Weinberg College students: additional courses as needed to meet requirements for the major

Chemistry (17.7 units)
- 7 core science courses
  - ASTRON 101, 120, or 220
  - BIOL SCI 164 or 215
  - CHEM 101/121 or 171/181
  - PHYSICS 135-1,2,3
- 11 additional chemistry courses: 102/122, 103/123, 210-1,2,3, 220, 230-2,3, 342-1
- 3 additional 300-level chemistry courses, including at least 1 advanced lab course, chosen from 333, 342-2,3, 350-1,2, 393

Physics (13.34 units)
- 7 core science courses
  - ASTRON 101, 120, or 220
  - BIOL SCI 164 or 215
  - CHEM 101/121 or 171/181
  - PHYSICS 135-1,2,3
- 4 additional physics courses: 330-1, 332, 333-1; 335 or 339-1
- 3 additional physics or astronomy electives, including at least 2 at the 300 level

English (14 units)
- ENGLISH 210-1,2 or 270-1,2; 298
- TEACH ED 324; 325 (taken in lieu of 322)
- 8 literature courses, including at least 5 at the 300 level
  - 2 American literature courses
  - 2 English literature courses
  - 4 additional literature courses, including 1 on non-Western literature
- 1 course chosen from LING 220, 221, 250, 260, 270, 311, 312, 321, 322, 323, 341, 342, ENGLISH 206, a poetry course

Foreign Languages

French (14 units)
- At least 12 French language courses, including at least 5 at the 300 level
  - Up to 5 courses may be chosen from FRENCH 202, 203; 210 or 211; 271, 272, 273.
  - At least 3 must be 300-level French literature courses.
  - At least 2 must be French culture courses.
  - Students whose AP score places them out of FRENCH 202 and 203 choose additional 200- or 300-level courses for a total of at least 12 French courses.
- TEACH ED 328, 329
- Upper-intermediate or higher score on the ACTFL

German (14 units)
- 4 language courses chosen from GERMAN 201, 203-1, 203-2, 207, or 209; 205-1 or 205-2; 303, 305
- GERMAN 207 or 211
- 1 additional history and culture course chosen from GERMAN 307, 321-1, 321-2, 321-3, 327, 337
- 6 German literature courses
  - 3 chosen from 221-1, 221-2, 221-3, 223, 225, 245
  - 3 chosen from 325, 329, 331, 333, 335, 345, 398
- TEACH ED 328, 329
- Upper-intermediate or higher score on the ACTFL

Latin (14 units)
- 3 courses in Latin literature no lower than 201-3
- 6 200- or 300-level Latin, Greek, or classics courses
- At least 4 of the 9 courses above must be at the 300 level.
- CLASSICS 211, 212, 395
- TEACH ED 328, 329

Spanish (15 units)
- Prerequisite: SPANISH 203, 207, or AP placement
- SPANISH 204, 220
- 3 literature courses chosen from SPANISH 250, 251, 260, 261
- 2 Spanish culture and civilization courses, including at least 1 at the 300 level
- 4 300-level literature courses taught in Spanish
- 1 additional Spanish course if the SPANISH 203 or 207 prerequisite was met through AP placement
- TEACH ED 328, 329
- Upper-intermediate or higher score on the ACTFL

Mathematics (12 units)
- 6 calculus/analysis courses: MATH 220, 224, 230, 234, 240, 300
- 1 probability and statistics course chosen from MATH 310-1,2,3, SESP 210, STAT 202, 210, 302
- EECS 110 or 111
- Additional mathematics courses for a total of 12, including at least 5 at the 300 level
- No more than 1 AP credit may be counted toward any of the above requirements.
- Students enrolled in Mathematical Experience for Northwestern Undergraduates courses should consult with their SESP advisers to determine course equivalencies.

Social Sciences

History (15 units)
- HISTORY 201-1,2, 210-1,2
- 8 additional courses, including at least 5 at the 300 level
  - 2 non-Western civilization courses chosen from HISTORY 255-1,2,3, 270, 274, 281, 284-1,2, 355, 356-1,2, 357, 358-1,2, 365, 366, 367, 368-1,2, 369, 370-1,2,3, 381-1,2, 382, 384-1,2, 385, approved history courses on non-Western cultures
  - 2 US history courses
  - 4 additional history courses

- No more than 1 AP credit may be counted toward any of the above requirements.
- 3 courses chosen from the following to meet related core requirements in social sciences: ANTHRO 214, ECON 201, 202, GEOG 313, 341, POLI SCI 220, PSYCH 110, SOCIOL 110

Economics (19 units)

- 8 economics courses: ECON 201, 202, 281, 310-1,2, 311, 323-1,2
- 4 additional economics courses
- *SESP students:* complete a minor in history (7 units) *Weinberg College students:* economics majors complete a minor in history (7 units) or 7 history courses, including 4 in US history (HISTORY 201-1,2 and 210-1,2 recommended)

Political Science (19 units)

- POLI SCI 201, 240, or 250; 220; 221 or 230; 310, 311, or 312; 395
- 7 additional political science courses, including at least 4 at the 300 level
- *SESP students:* complete a minor in history (7 units) *Weinberg College students:* political science majors complete a minor in history (7 units) or take 7 history courses, including 4 in US history (HISTORY 201-1,2 and 210-1,2 recommended)

Sociology (18 units)

- SOCIOL 110, 226, 303, 306, 329
- 6 additional sociology or anthropology courses, including at least 3 at the 300 level
- *SESP students:* complete a minor in history (7 units) *Weinberg College students:* sociology majors complete a minor in history (7 units) or take 7 history courses, including 4 in US history (HISTORY 201-1,2 and 210-1,2 recommended)

Electives (8 units or more)

Additional units of elective coursework must be taken to complete the 45-unit degree requirement. Students are encouraged to discuss their elective plans with the teacher certification manager.

Teacher Preparation Program

Students who wish to be certified as teachers must apply to the SESP Teacher Preparation Program. This program is approved by the Illinois State Teacher Certification Board, and those completing the following requirements qualify for secondary or K–12 certification in Illinois.

The program's requirements parallel courses in the secondary teaching professional core, notably TEACH ED 302, 304, 354–359, 378, 379, 388, and 389. Completion of the courses alone does not result in certification, nor is certification required for completion of the SESP degree.

Application and Admission

Students apply to the Teacher Preparation Program when enrolled in TEACH ED 304 Schooling in Communities or by the fall of the junior year. To be admitted, they must have received a passing score on the Illinois Certification Testing System (ICTS) Test of Academic Proficiency and have a minimum overall GPA of 2.5 and a minimum GPA of 3.0 in teaching subject–area courses. SESP students must be eligible for entrance to the program no later than the end of fall quarter of the junior year. Weinberg College students may start the program later than the fall of the junior year but then may finish later than June of the senior year. Students are required to attend meetings about the certification process.

Clinical Experience

Students in the Teacher Preparation Program complete three clinical experiences: a 30-hour nonschool experience (during winter of the sophomore or junior year as part of TEACH ED 304); a 100-hour school practicum (typically during fall of the senior year); and student teaching (typically during winter of the senior year).

To be eligible for the 100-hour practicum, students must have met the GPA requirements for and been admitted to the Teacher Preparation Program and have taken a minimum of 9 courses in the teaching subject area to be placed. Those meeting these requirements will be placed with a department or teacher mentor at a local school.

Students are encouraged to begin the practicum at the start of the school year at the assigned site. This is typically one to three weeks prior to the start of Northwestern's fall quarter. Clinical experiences gained at the site are central to the discussion of methods and theories in the practicum seminar (TEACH ED 378 or 379) and methodology courses (TEACH ED 354–359).

To be eligible for student teaching, students must have successfully completed the applicable TEACH ED 354–359 course(s) as well as TEACH ED 378 or 379, earned a passing score on the applicable ICTS Content-Area Test, fulfilled minimum GPA requirements for student teaching, and completed 9 teaching subject–area courses. Some school districts also require a criminal background check.

Student teaching involves full-time placement in a local school for the entire quarter; no other courses are taken concurrently. Teacher candidates attend an evening seminar (TEACH ED 388 or 389). The internship and seminar together earn 4 units. Teacher candidates are evaluated by their school mentor, a Northwestern supervisor, and the seminar instructor.

Other Requirements

In addition to successful completion of student teaching, teacher candidates must pass three ICTS professional teaching tests and successfully complete the edTPA tasks.

Foreign language teacher candidates other than those in Latin are required to complete the Oral Proficiency Interview of the American Council on the Teaching of Foreign Languages with a rating of upper-intermediate-high or better.

Recommendation for Certification

Students are recommended for certification when they successfully complete degree requirements and all courses in the Teacher Preparation Program, earn a rating of recommendation for certification for student teaching, pass all outside tests as noted above, and successfully complete the edTPA tasks.

Although legal requirements for certification vary from state to state, the SESP Teacher Preparation Program is flexible enough to permit students who plan carefully to complete provisional requirements for most states. As it is easier to obtain a teaching license in another state through reciprocity than through independent certification, all students who complete the program are encouraged to apply for an Illinois license before leaving the state.

Students should apply for the certificate immediately upon graduation. Teacher Preparation Program graduates who are recommended but do not apply for certification upon graduation may not be eligible for certification at a later date due to changes in state requirements.

The Illinois School Code has provided that school districts may not knowingly employ individuals who have been convicted of certain offenses (principally those related to sex or drugs). All Illinois school districts require applicants to submit to a criminal background check.

Courses

SESP 201-0 Human Development: Childhood and Adolescence Personal, social, and cognitive development, birth through adolescence. Interplay of biological and experiential factors on linguistic and conceptual development, ego, and personality.

TEACH ED 302-0 Social Contexts of Education How social contexts such as families, schools, and the workplace shape individuals; how individuals' intellectual and interpersonal capacities, preferences, and goals are shaped by their social contexts. Societal structures that organize, supply, and channel individual learning experiences and how they provide the formal and informal settings in which social interaction takes place. How participation in these socializing settings molds the development of individuals' capacities and forms their goals.

TEACH ED 304-0 Seminar on Teaching: Introduction to Schooling in Communities Action research methods—including observation/field notes, interviewing, and artifact analysis—as means to understanding how schools work and how theory and practice relate. Includes 30 hours of field experience. *Note:* Students seeking certification must take the ICTS Basic Skills Test before the end of the quarter of enrollment in 304.

TEACH ED 313-0 Problems in the Philosophy of Education Classical and modern philosophies of education. Text interpretation, analysis of ideas, argument construction; relationship of philosophy to educational issues. Students develop their own philosophy of education.

TEACH ED 322-0 Teaching Reading in the Content Area Theory and practical methods of reading methodology to enable teacher candidates to scaffold the literacy skills of English-language learners and students not reading at grade level.

TEACH ED 324-0 Foundations of Reading and Language Acquisition Cognitive foundations of reading comprehension processes and their influences on methods of instruction and assessment. Interrelationships between reading processes and language learning and their implications for instruction and assessment.

TEACH ED 325-0 Foundations of Writing Processes (Secondary) Cognitive and sociocultural foundations of writing processes and their implications for instruction and assessment.

TEACH ED 327-0 Educating Exceptional Children Students with disabilities, including learning disabilities resulting from human development and/or accidents; understanding and application of approved emergency, educational, and rehabilitative activities; interrelationships with medical, health, and educational personnel.

TEACH ED 328-0 Dynamics of Middle School Curriculum Identifying and understanding the effects of middle school dynamics (such as principles, structures, and practices) on classroom learning and instruction. Focuses on the development and social problems of children in grades five through eight. Required for middle school endorsement and enrollment in Type 10 (K-12) programs.

TEACH ED 329-0 Early Adolescent Development and Intervention Focuses on the interaction and interdependence of physical well-being, mental and emotional health, and the surrounding social environment of middle school students; the developmental characteristics of early adolescence; the middle school teacher's role in assessment, coordination, and referral of students to health and social services. Required for middle school endorsement and enrollment in Type 10 (K-12) programs.

TEACH ED 330-0 Cognitive Foundations of Learning Examines disciplinary knowledge from a distance to understand how it is we know what we know and to understand how students think and learn.

TEACH ED 351-0 Special Topics in Teacher Education Advanced work on special topics.

TEACH ED 354-0 Methods and Techniques: Art Analysis of literature, research, and teaching methodologies related to the content area. Focuses on learning experiences, methods, and educational techniques appropriate for middle

and high school students. Concurrent registration in 378 or 379 required.

TEACH ED 355-0 Methods and Techniques: Foreign Languages See description for 354.

TEACH ED 356-0 Methods and Techniques: English See description for 354.

TEACH ED 357-0 Methods and Techniques: Secondary Mathematics See description for 354.

TEACH ED 358-0 Methods and Techniques: Sciences See description for 354.

TEACH ED 359-0 Methods and Techniques: Social Sciences See description for 354.

TEACH ED 378-0 Practicum/Seminar: Humanities Students spend a minimum of 10 hours per week for an entire quarter observing and assisting in a school approved by the SESP director of undergraduate teacher education. Concurrent registration in the applicable methods and techniques course (354–359) required. Prerequisites: 304 and passing score on the ICTS Basic Skills Test.

TEACH ED 379-0 Practicum/Seminar: Mathematics and Science See description for 378.

TEACH ED 388-0 Student Teaching Seminar: Humanities (4 units) Seminar and accompanying internship involving intensive clinical experience and teaching under the supervision of master teachers in teacher-training schools. Students assume increasingly sophisticated teaching responsibilities and, finally, primary responsibility for teaching a group or a class. Prerequisites: 304; 378 or 379; applicable course(s) from 354–359; successful completion of the practicum experience; an approved contract for the internship experience; consent of the program; passing score on the applicable ICTS Content-Area Test.

TEACH ED 389-0 Student Teaching Seminar: Mathematics and Science (4 units) See description for 388.

SESP PROGRAMS FOR ALL NORTHWESTERN STUDENTS

Civic Engagement Certificate

www.sesp.northwestern.edu/ugrad/civic-engagement-program

Open to freshmen, sophomores, and juniors in any school at Northwestern, the Civic Engagement Certificate Program increases students' understanding of community needs and assets and fosters ongoing civic engagement by connecting community service experience with an academic component. Spanning five academic quarters, the two-year program requires a total of 5 units of coursework and 100 hours of community engagement.

Coursework includes SESP 202 Introduction to Community Development, taken in winter quarter of the first year of the program; SESP 195-1,2 Community Engagement, taken in winter and spring of the first year; SESP 295 Theory and Practice of Community Consulting, taken in fall of the second year; and 2 independent study units—SESP 299-1,2 Civic Engagement Capstone Research—taken in winter and spring of the second year and leading to a capstone project completed in collaboration with a sponsoring organization.

During the two years of the program, students complete at least 100 hours of meaningful community engagement.

Summer Field Studies Program

www.sesp.northwestern.edu/ugrad/practicum.html

The SESP Field Studies Program gives students the opportunity to make solid professional contributions to an organization while benefiting from experiential learning. The one-quarter program carries 4 units of credit. Students intern at their sites for 30 hours a week and attend a Friday morning Practicum Analysis Seminar.

In the workplace, students record and analyze events and processes, integrating concepts and theories from their social science courses. The field notes lead to a final paper analyzing some component of the practicum/field study experience.

During Summer Session any Northwestern undergraduate student is able to complete the program in Washington, DC (SESP 384), or San Francisco (SESP 389) in addition to the Chicago area. Program sites expose students to the breadth and depth of issues and activities within a field. They experience new skills and responsibilities through the projects they carry out from start to finish. Their supervising mentors meet with them individually for at least one hour per week.

The prerequisite course—SESP 372 Methods of Observing Human Behavior—teaches students how to take and analyze notes for a field study. Students complete a qualitative field study of their practicum experiences.

Robert R. McCormick School of Engineering and Applied Science

www.mccormick.northwestern.edu

The McCormick School of Engineering and Applied Science is committed to providing leadership for the technological foundation of our society, economy, environment, and culture. The school's mission is twofold: the personal and professional development of its students and faculty and the development and application of new technology, which is increasingly interdisciplinary.

McCormick is dedicated to a high standard of excellence in

- Teaching fundamentals of science and engineering disciplines and stimulating students to become innovative thinkers and leaders able to cope with complex issues in a changing environment
- Preparing undergraduate and graduate students capable of understanding, applying, and contributing to technology in whatever areas or careers they pursue

Undergraduate students in McCormick may follow a curriculum leading to a bachelor of science degree in any of the following fields:

applied mathematics
biomedical engineering
chemical engineering
civil engineering
computer engineering
computer science
electrical engineering
environmental engineering
industrial engineering
manufacturing and design engineering
materials science and engineering
mechanical engineering
medical engineering (Honors Program in Medical Education only)

The programs in biomedical engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, environmental engineering, industrial engineering, manufacturing and design engineering, materials science and engineering, and mechanical engineering are accredited by the Engineering Accreditation Commission of ABET (www.abet.org).

With the proper use and combination of requirements, options, and electives, students may prepare themselves for graduate work in engineering or for postbaccalaureate degrees in medicine, law, business, or other areas. Bachelor of science degrees are also awarded in approved ad hoc integrated engineering studies programs.

Graduate programs of study are available in all of the above fields as well as in theoretical and applied mechanics, biotechnology, analytics, engineering design and innovation, computer information systems, manufacturing management, project management, information technology, product design and development, and engineering management. Programs leading to degrees at the master's and doctoral levels are described completely in publications of the Graduate School and engineering graduate programs.

Excellence in research is a distinguishing characteristic of the engineering faculty. Working at the frontiers of knowledge, faculty members are positioned to maintain currency in courses and curricula and to develop an atmosphere inspiring scholarship, discovery, and originality among students.

McCormick has a student body of approximately 1,500 undergraduates and 1,350 graduate students. It is housed in the Technological Institute complex, which contains nearly 2 million square feet of floor area and provides excellent educational and research facilities.

ACADEMIC POLICIES

Requirements for the Degree of Bachelor of Science

Students must successfully complete all 48 units of the curriculum or have equivalent academic credit. Students who interrupt their programs of study for an extended time during which degree requirements are changed will normally be held to the new requirements. Those who encounter curricular changes during their period of enrollment may choose to follow any curriculum during that period but must meet its requirements completely.

All curricula leading to a bachelor of science degree in engineering or applied science have the same basic components: mathematics, engineering analysis and computer proficiency, basic sciences, design and communications, basic engineering, social sciences/humanities, unrestricted electives, and the major program. Courses qualifying for these components are listed in the departments appearing under Academic Offerings (beginning on page 205). General requirements are as follows:

Core Courses (32 units)

Mathematics (4 units)

Standard for all degree programs:

- MATH 220 Differential Calculus of One-Variable Functions
- MATH 224 Integral Calculus of One-Variable Function
- MATH 230 Differential Calculus of Multivariable Functions
- MATH 234 Multiple Integration and Vector Calculus

Note: ES APPM 252-1,2 may substitute for MATH 230 and 234.

Engineering analysis and computer proficiency (4 units)

Standard for all degree programs: GEN ENG 205-1,2,3,4 Engineering Analysis or 206-1,2,3,4 Honors Engineering Analysis

Basic sciences (4 units)

Eligible courses vary by degree program; 4 courses from at least two of the areas below; no more than 2 from earth and planetary sciences/astronomy; no more than 3 in any other area:

- *Physics*
  - PHYSICS 135-2,3 General Physics
  - PHYSICS 335 Modern Physics for Nonmajors
- *Biological sciences*
  - BIOL SCI 215 Genetics and Molecular Biology
  - BIOL SCI 216 Cell Biology
  - BIOL SCI 217 Physiology
  - CHEM ENG 275 Molecular and Cell Biology for Engineers
- *Chemistry*
  - CHEM 101 General Chemistry
  - CHEM 102 General Inorganic Chemistry
  - CHEM 103 General Physical Chemistry
  - CHEM 171 Accelerated General Inorganic Chemistry
  - CHEM 172 Accelerated General Physical Chemistry
  - CHEM 210-1,2 Organic Chemistry
- *Earth and planetary sciences/astronomy*
  - EARTH 202 Earth's Interior
  - ASTRON 220 Introduction to Astrophysics

Design and communications (3 units)

Standard for all degree programs (except biomedical engineering, which requires BMD ENG 390-2):

- *Writing and design*
  - DSGN 106-1,2 Engineering Design and Communication (.5 units each)
  - ENGLISH 106-1,2 Writing in Special Contexts (.5 units each)
- *Speaking*
  - GEN CMN 102 Public Speaking, GEN CMN 103 Analysis and Performance of Literature, or BMD ENG 390-2 Biomedical Engineering Design

Basic engineering (5 units)

Eligible courses vary by degree program; 5 courses from at least four of the following areas:

- *Computer architecture and numerical methods*
  - EECS 203 Introduction to Computer Engineering
  - EECS 205 Fundamentals of Computer System Software
  - EECS 328 Numerical Methods for Engineers
  - ES APPM 346 Modeling and Computation in Science and Engineering
- *Computer programming*
  - EECS 211 Object-Oriented Programming in C++
  - EECS 317 Data Management and Information Processing
  - EECS 230 Programming for Computer Engineers or 231 Advanced Programming for Computer Engineers
- *Electrical science*
  - EECS 202 Introduction to Electrical Engineering
  - EECS 221 Fundamentals of Circuits
  - EECS 222 Fundamentals of Signals and Systems
  - EECS 223 Fundamentals of Solid-State Engineering
  - EECS 224 Fundamentals of Electromagnetics and Photonics
  - EECS 270 Applications of Electronic Devices
  - MECH ENG 233 Electronics Design
- *Fluids and solids*
  - BMD ENG 270 Fluid Mechanics
  - BMD ENG 271 Introduction to Biomechanics
  - CHEM ENG 321 Fluid Mechanics
  - CIV ENV 216 Mechanics of Materials I
  - MECH ENG 241 Fluid Mechanics I
- *Materials science and engineering*
  - MAT SCI 201 Introduction to Materials or 301 Materials Science Principles
- *Probability, statistics, and quality control*
  - BMD ENG 220 Introduction to Biomedical Statistics
  - CHEM ENG 312 Probability and Statistics for Chemical Engineering
  - CIV ENV 306 Uncertainty Analysis in Civil Engineering
  - EECS 302 Probabilistic Systems and Random Signals
  - IEMS 201 Introduction to Statistics
  - IEMS 303 Statistics
  - MECH ENG 359 Reliability Engineering
- *Systems engineering and analysis*
  - CHEM ENG 210 Analysis of Chemical Process Systems
  - CIV ENV 304 Civil and Environmental Engineering Systems Analysis

- IEMS 310 Operations Research
- IEMS 313 Deterministic Models and Optimization
- IEMS 326 Economics and Finance for Engineers

• *Thermodynamics*
- BMD ENG 250 Thermodynamics
- CHEM 342-1 Thermodynamics
- CHEM ENG 211 Thermodynamics
- MAT SCI 314 Thermodynamics of Materials
- MAT SCI 315 Phase Equilibria and Diffusion in Materials
- MECH ENG 220 Thermodynamics I (may not be taken with CHEM 342-1 or CHEM ENG 211)
- MECH ENG 370 Thermodynamics II

Social sciences/humanities (7 units)
Standard for all degree programs:
• 7 social sciences/humanities courses approved in advance by the McCormick Humanities Panel and chosen according to one of two options:
- *Option A*
  – 3 courses must be thematically related.
  – No more than 3 of the 7 courses may be at the 100 level.
  – At least 2 courses must be chosen from each of the following areas:
  Social and behavioral sciences
  Historical studies and values
  Fine arts, language, and literature
- *Option B:* 5 courses must be thematically related; no more than 5 may come from a single area listed above.

Unrestricted electives (5 units)
Standard for all degree programs: students may take any credit course in the University to explore or extend technical or nontechnical interests.

Major Program (16 units)
Each degree program in the McCormick School finds its depth in the major program's 16 units, all of which must be at the 200 level or higher. Each major curriculum provides considerable elective opportunity for individualization, but coherence in the selection of elective courses is still necessary. In accredited programs, guidance is essential to ensure that certain criteria are met. A plan of study listing intended selections must be submitted for approval to the Office of Undergraduate Engineering by the end of the eighth quarter of study (winter quarter of junior year).

Most curricula offer suggested areas of specialization or options in using electives. Course plans are available in the department or program offices or the McCormick Academic Services Office. Alternately, self-designed plans worked out in consultation with a faculty adviser may be submitted.

Students must meet both the school's and the major program's curricular requirements; the latter are listed in the major curricula sections in this chapter. Some curricula contain specializations or options to guide elective course choices.

Taking courses regarded as duplicates will increase the number of requirements needed to earn a McCormick degree. (Contact the Undergraduate Engineering Office or see the McCormick website for a list.)

For further details about a program's options or specializations, consult its department coordinator, check with McCormick's Academic Services Office, or see the school's website at www.mccormick.northwestern.edu.

Grade Requirements
A grade point average (GPA) of not less than 2.0 is required for all units presented for the degree. Students must have received a grade of C or higher in any course taken elsewhere and used to fulfill a McCormick degree requirement. The GPA in the 16 units in the major program must also be at least 2.0; no more than 2 of these units may carry grades of D.

Every candidate for a degree must file an application for the degree a year in advance of the date of graduation (see Academic Calendar on pages 4–5).

In addition to and independent of the requirements set by McCormick, all students must satisfy the Undergraduate Registration Requirement (see page 17).

Pass/No Credit Option
The following requirements apply to the pass/no credit (P/N) option:
• No more than 8 units taken P/N may be counted toward the 48 units required for the degree.
• Only 1 unit per quarter may be taken P/N during freshman and sophomore years.
• *Core courses:* Only 4 100- or 200-level courses may be taken P/N to satisfy the 7-unit requirement in the social sciences/humanities. No courses may be taken P/N in the required mathematics, engineering analysis and computer proficiency, basic sciences, design and communications, and basic engineering areas.
• *Major program:* Consult the responsible department office or McCormick's Academic Services Office regarding the regulations for use of P/N in each departmental program.
• Credits earned under a P/N grading scheme at another institution may be applied toward McCormick requirements only if the P/N option is permissible for that requirement.

Advanced Placement
Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board (CEEB) Advanced Placement tests (or other appropriate international examinations), special examinations in subject areas, or analysis of high school background. Any placement in approved sequential work (verified by a grade

above C– in a subsequent course) will reduce the requirements for the BS by the number of courses preceding the placement. These stipulations regarding placement, exemption, and degree requirements may differ from those of other schools of the University. Students receiving credit from AP examinations and other such programs must still meet the Undergraduate Registration Requirement.

ACADEMIC OPTIONS

Cooperative Engineering Education Program

The Walter P. Murphy Cooperative Engineering Education Program alternates periods of paid industrial experience with academic studies for full-time students in all departments of engineering and applied science. During 18 months of industrial employment, students apply theory while gaining practical experience and develop an understanding of the responsibilities of their future professional careers.

Freshmen are invited to participate in workshops to prepare for the co-op program. Sophomores in good academic standing begin applying for co-op positions as early as the fall quarter. The co-op coordinator makes every effort to secure interviews for the students so that cooperative work assignments are related to their professional objectives.

Generally, the first work experience for sophomore co-op students occurs the summer before their junior year. Co-op experience for juniors, transfer students, and others may begin as late as the spring of junior year. If necessary, special schedules may be arranged with the help of the academic advisers to enable students to meet individual academic requirements as well as co-op requirements.

Students register for their work quarters, thus remaining enrolled at Northwestern. While no academic credit is given for co-op, special BS/MS programs may use co-op experience as the basis for undergraduate projects and master's theses.

Although emphasis is on the experience gained from cooperative work rather than on the income, students in the co-op program can cover a portion of their educational expenses with their earnings.

The following table shows the college-industry schedule for the five years of undergraduate education:

College-Industry Schedule

	Summer	Fall	Winter	Spring
Freshman		1	2	3
Sophomore	vacation	4	5	6
Junior	work	7	8	work
Presenior	work	9	work	10
Senior	work	work	11	12

Employers of co-op students include government and service institutions as well as industry. Co-op coordinators visit participating employers periodically to discuss students' abilities, attitudes, and progress on the job. At the end of each work period, employers are asked to evaluate student performance and progress.

No tuition or fees are charged during co-op periods. Students who complete the co-op plan receive rebates of tuition increases their final academic quarters and continue to pay the same tuition level as others in their entering class.

In addition to the academic degree, students who successfully complete the schedule of school and work—meeting standards set by the program and the co-op employer—receive recognition as co-op students upon graduation from McCormick.

In some states, co-op experience may be credited for up to one year of the usual four years of engineering experience required for the Professional Engineer's License.

Permanent employment is not an obligation for either employers or co-op students, but most students receive impressive permanent job offers as a result of the co-op experience. Others are admitted to prestigious graduate and professional schools.

Undergraduate Honors Program

Students with good scholastic records may apply to the Undergraduate Honors Program any time during their junior or presenior years. (Students within three quarters of graduation are past this admission point.) At the time of admission to the honors program, they must have a cumulative GPA of 3.5 or better. Courses used to meet the honors requirements must also be used toward requirements for the bachelor's degree.

Honors students participating in the program must

- Complete at least three units of approved advanced study (including courses normally accepted at the graduate level) with an average grade of B or better.
- Complete an extended independent study project (at least two quarters on the same topic) leading to an acceptable report.

Successful completion of the honors program will be noted on the student's transcript. Recognition also will be given in the Commencement program. If his or her performance is not judged to meet the honors standards, the student will still receive course grades and credits as earned.

Undergraduate Research

Opportunities for undergraduate research are made available and encouraged. Each field of study offers independent study courses for research enrollment on an elective basis. Funding of undergraduate research is provided by faculty-directed programs and several McCormick School and University sources.

The Northwestern Student Advisory Board holds an annual competition for the best undergraduate research

project; the winner is recognized with the Harold Benedict Gotaas Award.

Students normally perform undergraduate research projects under the direction of faculty doing research in their department and in laboratories throughout the University, including McCormick research centers. For more on McCormick's research activities, see www.mccormick.northwestern.edu/research.

Integrated Engineering Studies Program

The Integrated Engineering Studies Program provides an alternative for students whose particular interests and goals cannot be satisfied by a regular program in engineering or applied science. To be eligible, students must have a cumulative GPA of 3.25 or above. They may apply as early as the end of freshman year but no later than 3½ quarters before completing the degree. Applicants must prepare a compelling argument for qualifying for this customized degree program. Examples of these ad hoc degrees from recent years include public health, engineering physics, biomedical engineering and molecular biology, analytics, and mechanical design. Additional details are available on the McCormick School web pages. Students who complete this program are awarded a bachelor of science in integrated engineering studies, and their transcripts specify the themes of their courses of study.

Second Field of Specialization

Elective opportunities in McCormick curricula may be used in a departmental program in another school of the University. Satisfactory completion of the requirements for the second program, verified by the appropriate department, will be noted on the student's transcript. Carefully planned electives will normally enable students to obtain a second field of specialization within the 48-unit requirement for the BS degree.

Multiple BS Degrees

Students with wide-ranging interests may work toward two or more bachelor of science degrees in McCormick by satisfying the full requirements for each degree. At least 6 additional units of credit, or the equivalent, must be presented for each additional degree, and the work in multiple areas does not need to be completed at the same time. Each department or program must approve the course plan for its degree no later than two academic quarters before work for the second degree is completed but no earlier than junior year.

Accelerated Master's Program

Qualified McCormick undergraduate students may work simultaneously toward the bachelor of science and master of science degrees in engineering. Integrated planning of coursework makes it possible to take graduate-level courses during the third and fourth years. The requirements remain unchanged for the two degrees. The McCormick requirement for the BS is 48 units, and the requirement for the MS is specified by the individual department (9–12 units). No course used for the MS requirement may be counted toward the BS requirement.

Application for admission to concurrent BS/MS study must be approved by the appropriate department and the Graduate School. A department may require that students do additional work beforehand.

Dual Bachelor's Degree Programs

Dual Engineering and Liberal Arts Degrees

McCormick encourages breadth of interest and to this end supports dual bachelor's degree programs in engineering and liberal arts. A common approach to a dual degree program is a parallel arrangement of studies requiring five years and resulting in a BA with a major in Weinberg College and a BS in a field of engineering. Students must complete the stated requirements of both schools and expected majors. For a description of the program, see page 28 in the Cross-School Options chapter. For information on applying to the program, see page 11.

Dual Engineering and Music Degrees

Highly capable students who have a strong interest in and commitment to both engineering and music may pursue a five-year program leading to bachelor's degrees in both fields. In engineering any field of study may be chosen, resulting in a bachelor of science in the chosen field. In music the bachelor of music or bachelor of arts in music is awarded. For a description of the program, see page 28 in the Cross-School Options chapter. For information on applying to the program, see page 11.

Business Enterprise Certificate

Students who aim to have business careers and want to improve their ability to make a contribution soon after graduation may wish to consider this certificate program. It involves a combination of required business courses and work experience. Those completing the Walter P. Murphy Cooperative Engineering Education Program must take 2 units of credit in addition to those needed for their bachelor's degrees; other students must take 4 extra units. An acceptable report on the work experience and successful completion of a McCormick BS degree are required.

Certificate in Engineering Design

This certificate program, administered by the Segal Design Institute, develops a set of design skills valuable across the entire spectrum of careers available to McCormick graduates. See page 230 for details.

Certificate in Entrepreneurship

Administered by the Farley Center for Entrepreneurship and Innovation, this certificate is intended for undergraduates planning to pursue entrepreneurship at some point in

their careers. Students who plan to join or create startups hone skills to complement their degrees. Those focused on research gain skills relevant when traditional sources of research funding no longer exist and commercialization is the next logical step. The certificate requires completion of 4 courses:

- ENTREP 225 Principles of Entrepreneurship
- ENTREP 325 Engineering Entrepreneurship
- 2 courses chosen from
  - IEMS 399 Independent Study with Farley Center faculty focusing on a student idea or a project from the Northwestern University Innovation and New Ventures Office
  - ENTREP 430 NUvention: Energy
  - ENTREP 473 NUvention: Web
  - ENTREP 495 NUvention: Medical
  - A graduate-level course focused on a technology the student is interested in commercializing
  - A course in economics or business institutions in Weinberg College (requires prior approval from the Farley Center)

Honors Program in Medical Education

The Honors Program in Medical Education (HPME) is designed for unusually gifted high school students who seek careers in medicine or medical science. It provides a plan whereby students entering Northwestern are admitted simultaneously to McCormick, Weinberg College, or the School of Communication and to the Feinberg School of Medicine. HPME students then participate in a challenging program, with the first three or four years in undergraduate study and the last four years in the Feinberg School. Thus, the period of formal training may be reduced by one year.

Students who meet the entrance requirements of McCormick may pursue a program leading to the bachelor of science degree in medical engineering after five years and the doctor of medicine degree after seven years. See page 30 for more information on HPME and page 11 for information on applying to the program.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

STUDENT RESOURCES

Tutorial Program

McCormick conducts a program of guided study and tutorial help for freshmen and sophomores in all the required courses in mathematics, chemistry, physics, and engineering. This program encourages out-of-class work and good study habits and helps provide a full understanding of the early courses that are the foundation for much to follow.

Faculty Advisers

During the first year students are assigned a freshman adviser. At the beginning of the sophomore year most students will have selected a program of study and will be reassigned an adviser in that area. Advisers assist in planning the program of study, but students retain the responsibility of meeting overall graduation requirements. Advice on other subjects may be obtained by emailing mccormick-school@northwestern.edu.

Organizations for Engineering Students

The McCormick Student Advisory Board is composed of representatives from each class in engineering and from approved McCormick organizations. It is the recognized representative body of undergraduate engineering students and as such serves as a link between the students and the faculty and administration. It encourages and coordinates the activities of engineering students and student groups.

The following professional societies have established student branches on the campus:

American Institute of Chemical Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
ASM International
Association for Computing Machinery
Biomedical Engineering Society
Design for America
Engineers for a Sustainable World
InNUvation
Institute of Electrical and Electronics Engineers and its computer and engineering in medicine and biology subchapters
Institute of Industrial Engineers
Materials Research Society
National Society of Black Engineers
Northwestern Organization of Design Engineers
Society of Automotive Engineers
Society of Hispanic Professional Engineers
Society of Women Engineers

The following honorary societies recognize high-achieving McCormick undergraduates:

Eta Kappa Nu: open to upperclass students in electrical engineering who demonstrate superior scholarship and ability
Kappa Theta Epsilon: cooperative engineering education honorary society
Omega Chi Epsilon: for upperclass students in chemical engineering who demonstrate superior scholarship and leadership ability
Phi Eta Sigma: for freshmen who earn a scholastic average equivalent to a grade of A
Phi Lambda Upsilon: open to upperclass students in chemistry and chemical engineering who demonstrate superior scholarship and academic ability

Pi Tau Sigma: for upperclass students in mechanical engineering who demonstrate superior scholarship and leadership ability

Sigma Xi Society: associate membership open to seniors who excel in scholarship in at least two departments

Tau Beta Pi: for upperclass students who have shown superiority in scholarship and ability in engineering work

ACADEMIC OFFERINGS

GENERAL ENGINEERING

Introductory and Related Courses

DSGN 106-1,2 Design Thinking and Communication (.5 unit each) Integrated introduction to the engineering design process and technical communication. Approaches to unstructured and poorly defined problems; conceptual and detailed design; team structure and teamwork; project planning; written, oral, graphical, and interpersonal communications; use of software tools; discussion of societal and business issues. One lecture, two workshops, lab. Registration for both quarters required. Primarily intended for freshmen.

GEN ENG 190-0 Engineering Freshman Seminar Broad engineering or interdisciplinary subjects of current interest.

GEN ENG 191-0 MEOP Complete Seminar Issues unique to minority engineering students. Working in groups, achieving one's full potential, succeeding in class, increasing involvements with faculty and in their research. Primarily intended for freshmen.

GEN ENG 195-1,2,3,4 Engineering Dialog (.34 unit each) Weekly seminar addressing subjects of interest in engineering, design, engineering policy, and entrepreneurial activities. For participants in the invitation-only Murphy Institute Scholars Program. May be repeated.

GEN ENG 205-1,2,3,4 Engineering Analysis 1. Introduction to linear algebra from computational, mathematical, and applications viewpoints. Computational methods using a higher-level software package such as MATLAB. May be taken concurrently with 215-1. **2**. Linear algebra and introduction to vector methods in engineering analysis. Statics and dynamics of rigid bodies and matrix analysis of trusses and networks. Engineering design problems. May be taken concurrently with 215-2. Prerequisites: C– or better in 205-1; MATH 220. **3.** Dynamic behavior of the elements. Modeling of mechanical (both translational and rotational), electrical, thermal, hydraulic, and chemical systems composed of those elements. May be taken concurrently with 215-3. Prerequisite: C– or better in 205-2. **4.** Solution methods for ordinary differential equations, including exact, numerical, and qualitative methods. Applications and modeling principles; solution techniques. May be taken concurrently with 215-4. Prerequisites: C– or better in 205-2; MATH 224.

GEN ENG 206-1,2,3,4 Honors Engineering Analysis Covers topics addressed in 205 at a deeper level. Intended for students with demonstrated strength in mathematics, computer programming, and/or physics. Prerequisite: consent of instructor.

GEN ENG 215-1,2,3,4 Advanced Conceptual Workshop Exercises related to work in 205. Taken concurrently with 205-1,2,3,4.

GEN ENG 220-1,2 Analytic and Computer Graphics (.5 unit each) **1.** Creating in autoCAD software. **2.** 3-D parametric modeling with AutoDesk Inventory.

ENTREP 225-0 Principles of Engineering Entrepreneurship Introduction to the essential elements of building one's own business, including strategy, finance, accounting, marketing, operations, and choosing the ideal management team. History of entrepreneurship and the entrepreneur psyche. Lectures, guest speakers, and case studies. Teams present a business idea at the conclusion. May not be taken after IEMS 325 or ENTREP 325.

GEN ENG 295-0 Introductory Topics in Engineering Intermediate-level topics suggested by students or faculty members and approved by the curriculum committee.

CRDV 301-0 Introduction to Career Development (0 units) Course preparing students for the Walter P. Murphy Cooperative Engineering Education Program, internships, and full-time employment. It includes units on job-search skills, self-assessment, transition to the workplace, workplace-management issues, and transition back to school.

CRDV 310-1,2,3,4,5,6 Cooperative Engineering Education (0 units) Sequence of courses covering the work terms of students in the Walter P. Murphy Cooperative Engineering Education Program. Prerequisite: CRDV 301 or consent of program director.

CRDV 310-7 Engineering Co-op (Half-Time) (0 units) Half-time registration covering half-time enrollment in the Walter P. Murphy Cooperative Engineering Education Program. Prerequisite: CRDV 301 or consent of program director.

CRDV 311-1,2,3 Professional Engineering Internship (0 units) Series of courses designated for students pursuing the Business Enterprise Certificate, seeking University recognition of their internship experience, or participating in an approved internship during the regular academic year. Prerequisite: consent of program director.

CRDV 311-7 Engineering Internship (Half-Time) (0 units) Half-time registration of courses designated for students pursuing the Business Enterprise Certificate, seeking University recognition of a half-time internship experience, or participating in an approved half-time internship during the regular academic year. Prerequisite: CRDV 301 or consent of program director.

CRDV 312-1,2,3 Undergraduate Engineering Projects in Service Learning (0 units) Noncredit course requiring students to engage in an engineering-related, full-time

community service project under the guidance of an appropriate faculty member, agency supervisor, or mentor.

CRDV 312-7 Engineering Projects in Service Learning (Half-Time) (0 units) Noncredit course requiring students to engage in an engineering-related, half-time community service project under the guidance of an appropriate faculty member, agency supervisor, or mentor.

CRDV 313-7 Engineering Research (Half-Time) (0 units) Noncredit course allowing students to maintain half-time enrollment at Northwestern while engaged full-time in a University-based research project under the supervision of a faculty research sponsor. Students are evaluated by ABET criteria, the same as those in the Walter P. Murphy Cooperative Engineering Education Program and the Professional Engineering Internship Program.

ENTREP 325-0 Engineering Entrepreneurship Overview of the entrepreneurial process from an engineering perspective. Idea generation, planning, financing, marketing, protecting, staffing, leading, growing, and harvesting. Business models for startups. Lectures, guest speakers, and case studies. Prerequisite: 1 course in accounting or finance such as IEMS 326 or BUS INST 260.

GEN ENG 355-0 Domestic Study—Affiliated Full-time registration in an academic program in the continental United States that is affiliated with Northwestern. Upon successful completion of the program, registration is replaced with credits transferred from the affiliated institution.

GEN ENG 395-0 Special Topics in Engineering Topics suggested by faculty members and approved by the curriculum committee.

PRDV 395-0 Special Topics in Personal Development (1 unit) Topics suggested by students or faculty and approved by the McCormick Curriculum Committee. Prerequisite: consent of instructor.

PRDV 396-0 Topics in Personal Development (0 units) Topics of limited scope as suggested by faculty or students and approved by the McCormick Office of Personal Development.

PRDV 397-0 Selected Topics in Personal Development (.5 unit) Topics of limited scope as suggested by faculty or students and approved by the McCormick Curriculum Committee.

GEN ENG 399-0 Independent Study Independent study on an engineering subject supervised by a faculty member and concluding with a final report.

APPLIED MATHEMATICS

See Engineering Sciences and Applied Mathematics.

BIOMEDICAL ENGINEERING

www.bme.northwestern.edu

Biomedical engineers solve problems in the life sciences and clinical medicine by applying engineering and mathematical techniques. This approach has been fruitful where a descriptive approach is no longer adequate for studying complex systems involved in the body's transport, regulation, and information processing. Equally important has been the development of devices used inside or outside the body to replace or supplement physiological functions and to enhance the quality of diagnosis and care.

The interplay among the physical sciences, engineering, biology, and the medical sciences takes many forms. The traditional study of complex systems—whether for power transmission, communications, or the operation and control of industrial processes—provided engineers with a number of concepts and techniques that proved valuable in analysis and design. These principles expressed in mathematical form are applicable to a wide range of phenomena, including those in biological processes. Information theory, statistics, and computer technology have opened new areas for exploration of sensory and central nervous activity as well as patient handling and diagnosis. Theories for feedback controls, transport processes, materials science, and mechanics have provided new insight into homeostatic physiological processes. Analysis of heat transfer, fluid flow, and chemical-process control in living organisms requires competence in both engineering and the life sciences. Current studies further understanding of many physiological processes, which in turn leads to improvements in clinical practice, diagnosis, and patient care.

Northwestern was among the first schools to recognize the value of a biomedical engineering background. Today the Department of Biomedical Engineering offers one of the largest and broadest programs in the country at both the undergraduate and graduate levels. Most students interested in the field follow its program, but other engineering departments also offer biomedical options.

The biomedical engineering program provides biomedical training that is quantitative, emphasizes problem solving, and treats phenomena from the molecular to the systems levels. The curriculum prepares students for careers in dentistry, medicine, or research or with healthcare corporations. Required courses in mathematics, engineering, and science establish a strong foundation on which the student builds a self-selected area of specialization.

A minimum of 18 course units in engineering design and engineering science, as well as substantial training in design, are required for a biomedical engineering degree.

Those seeking admission to dental or medical school should be familiar with the entrance requirements of schools to which they intend to apply. Many professional schools require courses in physics, organic, and/or physical chemistry and laboratory biology, in addition to courses required by the biomedical engineering program. These requirements may be satisfied by judicious use of electives.

Tracks

Biological Materials and Molecular Engineering
This track combines biochemistry, materials science, molecular biology, and other research areas to generate devices and interfaces from the nanoscale to the microscale. By integrating fundamental synthesis/fabrication principles with relevant medical needs, students learn to engineer technologies with translational relevance.

Biomechanics and Rehabilitation
In this track solid (e.g., musculoskeletal) and fluid (e.g., cardiovascular, pulmonary) mechanics are applied to human physiology in the design and manufacture of limb prostheses or artificial organs.

Biomedical Signals and Images
Imaging and signal processing have become integral parts of biomedical engineering. Applications include MRI, CT and PET scans, neural signal analysis, and optics. Students in this track obtain a solid foundation in mathematics, physics, and physiology with an emphasis on applications in image and signal analysis. This track is appropriate for students interested in pursuing careers in MRI, medical physics, biomedical optics, or neural engineering.

Electrical Engineering and Computer Engineering
Electronic instruments are widely used in the diagnosis and treatment of disease and in the study of normal physiological function. In this track students learn the fundamentals of electronic and computer instrumentation (hardware and software) with a focus on their applications in biomedicine.

Transport Processes and Tissue Engineering
This track concerns the application of engineering principles to the design, modulation, and/or replacement of cells, tissues, and organs. Students learn concepts of fluid mechanics, mass transfer, and the molecular and cellular biology necessary in the field.

Degree in Biomedical Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses: PHYSICS 135-2,3; CHEM 102 and 103 *or* 171 and 172
- 3 design and communications courses
- 5 basic engineering courses
  - *Fluids and solids:* BMD ENG 270 and 271
  - *Materials science and engineering:* MAT SCI 201 or 301
  - *Probability, statistics, and quality control:* 1 course from BMD ENG 220; IEMS 201, 303; MECH ENG 359
  - *Thermodynamics:* 1 course from BMD ENG 250; CHEM 342-1; MECH ENG 220
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- BMD ENG 101 (noncredit)
- 9 core courses: BIOL SCI 215 or 216; CHEM 210-1; BMD ENG 301, 302, 303, 305, 306, 307, 390-1
- 7 courses in an area of specialization
  - 5 courses selected from one of the following tracks or an alternate set of courses developed with advisers and approved by the Biomedical Engineering Undergraduate Committee:
    - *Biological materials and molecular engineering*
    - *Biomechanics and rehabilitation*
    - *Biomedical signals and images*
    - *Computer engineering*
    - *Electrical engineering*
    - *Transport processes and tissue engineering*
  - 2 technical electives
    - May include BIOL SCI 217; CHEM 101, 210-2; DSGN 245-1,2; EECS 230; and any courses in engineering, science, or mathematics at the 300 level or higher.
    - Students are urged to choose technical electives that emphasize engineering design.
- Courses in the major program must be at the 200 level or higher; none may be taken P/N.

Courses

BMD ENG 101-0 Introduction to Biomedical Engineering (0 units) Faculty, students, and guests present various topics introducing the field of biomedical engineering: different tracks within the program of study, possible career and research opportunities, and ethics.

BMD ENG 220-0 Introduction to Biomedical Statistics Basic statistical concepts presented with emphasis on their relevance to biological and medical investigations.

BMD ENG 250-0 Thermodynamics Physical and chemical principles as applied to biological systems and medical devices. Topics include material balances, thermodynamics, solution chemistry, electrochemistry, surface chemistry, transport, and kinetics. Prerequisites: MATH 230; CHEM 103 or 172.

BMD ENG 270-0 Fluid Mechanics Fundamentals of fluid mechanics and their applications to biological systems. Prerequisites: GEN ENG 205-4; MATH 234.

BMD ENG 271-0 Introduction to Biomechanics Analysis of stresses and deformations in solids. Problems in biomechanics, with emphasis on assumptions appropriate to modeling biological materials including bone, skin, muscle, and cell membranes. Prerequisite: GEN ENG 205-2.

BMD ENG 301-0 Systems Physiology Functional/structural aspects of mammalian nervous system. Neural biophysics.

Laboratory exercises. Prerequisites: PHYSICS 135-2; junior standing.

BMD ENG 302-0 Systems Physiology Cardiovascular and respiratory physiology. Human physiology from a quantitative viewpoint. Anatomy and pathology, where appropriate. Prerequisite: MATH 230.

BMD ENG 303-0 Systems Physiology Cellular mechanisms of and quantitative systems' approach to human renal, digestive, endocrine, and metabolic physiology. Prerequisite: BIOL SCI 215 or 216; junior standing recommended.

BMD ENG 305-0 Introduction to Biomedical Signals and Electrical Circuits Time and frequency domain analysis: convolution representation, Fourier series, Fourier transforms, frequency response, filtering, sampling. Prerequisite: PHYSICS 135-2 or consent of instructor.

BMD ENG 306-0 Biomedical Systems Analysis Introduction to linear systems analysis. Time and frequency domain techniques for analyzing linear systems, emphasizing their applications to biomedical systems. MATLAB-based problem sets and lab illustrate topics covered in class. Prerequisites: 305; 220, or IEMS 202 or 303, or MECH ENG 359; GEN ENG 205-4.

BMD ENG 307-0 Quantitative Experimentation and Design Laboratory and associated lecture concerning quantitative physiology, physiological measurement techniques, instrument design, and statistical design of experiments. Prerequisites: 305, 306; 220 or IEMS 201 or 303, or MECH ENG 359.

BMD ENG 310-0 Molecular and Cellular Aspects of Bioengineering Molecular/cellular structure and function, mechanical influences on biological systems, molecular/cellular experiments. Prerequisites: BIOL SCI 215 or 216; GEN ENG 205-3.

BMD ENG 314-0 Models of Biochemistry and Molecular Biology Mathematical modeling of biochemical and molecular biological problems, such as allosteric enzymes, bacterial transduction, X-ray diffraction, study of DNA. Prerequisite: junior standing recommended.

BMD ENG 315-0 Application of Genetic Engineering to Immunochemistry Recent developments in genetic engineering as applied to the rapidly developing field of immunochemistry for antibodies and related proteins. Prerequisite: junior standing recommended.

BMD ENG 317-0 Biochemical Sensors Theory, design, and applications of chemical sensors used in medical diagnosis and patient monitoring. Electrochemical and optical sensors. Prerequisites: BIOL SCI 215 or 216; CHEM 210-1; PHYSICS 135-2,3.

BMD ENG 323-0 Visual Science Mammalian visual system. Optics of the eye. Visual image representation and interpretation. Visual adaptation. Motion. Color vision. Prerequisite: PHYSICS 135-2.

BMD ENG 325-0 Introduction to Medical Imaging Diagnostic X rays; X-ray film and radiographic image; computed tomography; ultrasound. Prerequisite: PHYSICS 135-3 or equivalent.

BMD ENG 327-0 Magnetic Resonance Imaging Nuclear magnetic resonance; two-dimensional Fourier transform, spin-echo and gradient-echo imaging; gradient and RF hardware. Prerequisite: PHYSICS 135-3.

BMD ENG 333-0 Modern Optical Microscopy and Imaging Rigorous introduction to principles, current trends, emerging technologies, and biomedical applications of modern optical microscopy.

BMD ENG 343-0 Biomaterials and Medical Devices Structure-property relationships for biomaterials. Metal, ceramic, and polymeric implant materials and their implant applications. Interactions of materials with the body. Prerequisites: MAT SCI 201 or 301; senior standing.

BMD ENG 344-0 Biological Performance of Materials Structure-property relationships of materials, physical chemistry of surfaces and interfaces, materials-tissue interactions, applications to the selection and design of materials for medical implants and devices. Prerequisite: MAT SCI 201.

BMD ENG 346-0 Tissue Engineering In vivo molecular, cellular, and organ engineering, with emphasis on the foundations, techniques, experiments, and clinical applications of tissue engineering. Prerequisites: BIOL SCI 215 or 216 or CHEM ENG 375; GEN ENG 205-3.

BMD ENG 349-0 Bioregenerative Engineering Fundamentals, mechanisms, and clinical significance of biological regeneration and application of engineering principles to regenerative medicine. Prerequisite: BIOL SCI 216.

BMD ENG 350-0 Transport Fundamentals Fundamental and biomedical applications of diffusive and convective heat and mass transfer. Prerequisites: 270, MATH 230; 377 recommended.

BMD ENG 359-0 Regenerative Engineering Laboratory Principles and technologies for developing regenerative therapies. Fundamental labs in molecular, cellular, and tissue regenerative engineering. Prerequisites: 349 (may be taken concurrently); BIOL SCI 215 or 216.

BMD ENG 365-0 Control of Human Limbs and Their Artificial Replacements Human movement, biomechanics, skeletal and muscular anatomy, comparative anatomy, muscle physiology, and locomotion. Engineering design of artificial limbs. Prerequisite: senior standing with engineering or physical science background.

BMD ENG 366-0 Biomechanics of Movement Engineering mechanics applied to analyze human movement, including models of muscle and tendon, kinematics of joints, and dynamics of multijoint movement. Applications in sports, rehabilitation, and orthopedics. Prerequisite: 271, MECH ENG 202, or consent of instructor.

BMD ENG 371-0 Mechanics of Biological Tissues Stress and strain for small and large deformations. Nonlinear elastic, viscoelastic, pseudoelastic, and biphasic models. Prerequisites: 271, GEN ENG 205-1,2.

CHEM ENG 371-0 Transport Phenomena in Living Systems See Chemical Engineering.

BMD ENG 377-0 Intermediate Fluid Mechanics Fundamental concepts of fluid dynamics. Kinematics, mass and momentum balances, constitutive relations. Navier-Stokes equations and methods of solution. Sealing techniques. Prerequisite: 270 or consent of instructor.

BMD ENG 383-0 Cardiovascular Instrumentation Theory, design, and application of instrumentation used for diagnosis, monitoring, treatment, and research investigation of cardiac and cardiovascular diseases. Examples from the current literature. Prerequisite: EECS 202, 270, or equivalent or consent of instructor.

BMD ENG 388-0-SA Healthcare Technology in Resource-Poor Environments Introduction to health systems in the context of disease burden, with special emphasis on developing countries and the devices and drugs used to combat diseases there. Restricted to students in Northwestern's Public Health in South Africa study abroad program. Prerequisite: consent of instructor.

BMD ENG 389-0-SA Healthcare Assessment and Planning Introduction to formal concepts and methodologies used in health-technology planning, assessment, and adoption for cost-effective healthcare delivery. Restricted to students in Northwestern's Public Health in South Africa study abroad program. Prerequisite: consent of instructor.

BMD ENG 391-0-SA Healthcare Technology Innovation and Design Principles and practice of medical device design for the developing world. Evaluation of user needs in the environment of underresourced segments of the South African healthcare system. Restricted to students in Northwestern's Public Health in South Africa study abroad program. Prerequisite: consent of instructor.

BMD ENG 390-1,2 Biomedical Engineering Design 1. Open-ended team-designed projects in the medical devices arena. Systems approach requiring design strategy and concepts, including reliability, safety, ethics, economic analysis, marketing, FDA regulations, and patents. Written and oral reports. Prerequisite: 307. **2.** Development of a design project initiated during the previous quarter. Prerequisite: 390-1.

BMD ENG 395-0 Special Topics in Biomedical Engineering

BMD ENG 399-0 Projects Must be taken P/N.

CHEMICAL ENGINEERING

www.chem-biol-eng.northwestern.edu

Chemical engineering is concerned primarily with the principles and processes involved in the conversion of raw materials into products vital to modern civilization. The products of the chemical and process industries range from antibiotics to zirconium, from petroleum to pharmaceuticals, from agricultural chemicals to plastics and synthetic rubber. The rapid introduction of new products gives chemical engineering its characteristic concern with the management and development of innovation. Chemical engineers have always played a pivotal role in the field of energy and more recently have become key players in sustainability and biotechnology.

While clearly rooted in chemistry, chemical engineering is a distinct discipline that makes significant contributions to society. Concerns about efficient utilization of raw materials, cost-effective and safe processing strategies, and environmental impact have shaped the evolution of the field. Chemical engineers are uniquely skilled in understanding molecular transformations; working over a wide range of scales, from molecular to global; analyzing quantitatively; and viewing, synthesizing, and analyzing large, complex systems.

Preparation for careers in the field requires a comprehension of physical, chemical, biological, and engineering principles. The chemical engineering curriculum provides broad fundamental training and prepares graduates for the chemical and process industries or for advanced study. The program aims at developing graduates who can plan, design, and operate new processes, who can contribute to the development of new chemical products, and who have potential for managerial responsibility in highly technical industrial enterprises.

Areas of Specialization

The curriculum permits students to select one of these six areas of specialization or plan an alternate program with an adviser:

- Bioengineering
- Chemical process engineering
- Design
- Environmental engineering and sustainability
- Nanotechnology and molecular engineering
- Polymer science and engineering

Laboratories

The Undergraduate Chemical Engineering Laboratory provides facilities for exploring firsthand the quantitative experimental implications of fundamental laws in their application to practical problems of heat transfer, distillation, reaction engineering, and other basic operations. A computing laboratory is used in a variety of courses.

Degree in Chemical Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses: PHYSICS 135-2,3; CHEM 102 and 103 *or* 171 and 172
- 3 design and communications courses

- 5 basic engineering courses
  - *Fluids and solids:* CHEM ENG 321
  - *Materials science and engineering:* MAT SCI 301
  - *Probability, statistics, and quality control:* CHEM ENG 312 or IEMS 303
  - *Systems engineering and analysis:* CHEM ENG 210
  - *Thermodynamics:* CHEM ENG 211
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)
- 11 required courses
  - CHEM 210-1,2
  - CHEM ENG 212, 275, 307, 322, 323, 341, 342, 351, 352 (BIOL SCI 215 or 216 may substitute for CHEM ENG 275)
- 5 technical electives
  - 2 advanced chemical engineering courses from an approved list available from the department
  - 3 engineering, advanced science, or mathematics courses from approved lists available from the department

Minor in Biotechnology and Biochemical Engineering

This minor provides specific training for McCormick students interested in industries that create and manufacture pharmaceuticals, biomaterials, and agents for gene and cell therapies or for those desiring in-depth preparation for future graduate study in biotech research.

Requirements (10 units)
- 6 courses in biological science and biochemical engineering: BIOL SCI 215 or 216, 218; BIOL SCI 216 or CHEM ENG 275; BIOL SCI 217 or BMD ENG 303; CHEM ENG 375, 377
- 1 quarter of research: CHEM ENG 399 in an approved laboratory, or the set of 0.34-unit laboratories (BIOL SCI 220, 221, 222)
- 3 electives providing opportunity for greater depth in both fundamental biology and engineering applications
  - 1 course from CHEM ENG 371, 379, 475, 478, 479
  - 2 courses from CHEM ENG 371, 379, 399, 475, 478, 479; BIOL SCI 309, 315, 319, 323, 333, 355, 390; BMD ENG 317; CHEM 210-3; CIV ENV 441
- A minimum GPA of 2.0 is required in the courses in the minor.
- A McCormick BS degree must be completed.
- No more than 5 courses may be double-counted to fulfill requirements in the major program.
- Students should discuss how best to satisfy prerequisites for required courses, especially CHEM ENG 375, with the minor coordinator.
- Students must submit a completed Petition to Receive form for the minor to the McCormick Academic Services Office before the beginning of their final quarter as undergraduates.

Courses

CHEM ENG 190-0 Engineering of Chemical and Biological Processes Survey of engineering principles as they are applied to processes involving chemical and biological transformations. Examples from the chemical, pharmaceutical, biotechnology, food processing, electronics, and other industries. Impact of economics, ethics, and other nontechnical constraints.

CHEM ENG 210-0 Analysis of Chemical Process Systems Introduction to process systems. Material balances and stoichiometry. Analysis of process system flow sheets. Introduction to departmental computing facilities. Basic numerical analysis. Prerequisites: CHEM 103; GEN ENG 205-4 (may be taken concurrently).

CHEM ENG 211-0 Thermodynamics The first and second laws of thermodynamics. Entropy and equilibrium. Material and energy balances. Equations of state and properties of fluids. Solutions, phase equilibria, and chemical reactions. Prerequisite: 210.

CHEM ENG 212-0 Phase Equilibrium and Staged Separations Thermodynamic models of mixtures and phase equilibrium. Analysis and design of staged separation processes such as distillation, absorption, stripping, and extraction. Prerequisites: 210, 211.

CHEM ENG 275-0 Molecular and Cell Biology for Engineers Introduction to cell and molecular biology concepts that provide the foundation for modern biotechnology and bioengineering. Prerequisite: CHEM 103.

CHEM ENG 307-0 Kinetics and Reactor Engineering Chemical reaction kinetics with application to the design of chemical reactors. Prerequisites: 210, 211, 321, 322.

CHEM ENG 312-0 Probability and Statistics for Chemical Engineering Introduction to probability theory and statistical methods necessary for analyzing the behavior of processes and experiments. Statistical tests for detecting significant changes in process parameters. Prerequisite: MATH 220, 224, 230, 234, or equivalent.

CHEM ENG 321-0 Fluid Mechanics Derivation and applications of continuity and Navier-Stokes equations. Macroscopic mass, momentum, and energy balance. Dimensional analysis: friction factors in pipes and packed beds; drag coefficients. Prerequisites: completion of mathematics requirements with no grades of D; GEN ENG 205-4 (C– or better).

CHEM ENG 322-0 Heat Transfer The differential equations of energy transport. Solutions for various applications. Prerequisites: completion of mathematics requirements with no grades of D; GEN ENG 205-4 (C– or better); 321 recommended.

CHEM ENG 323-0 Mass Transfer Diffusion and rate concepts; application to distillation, extraction, absorption, humidification, drying. Prerequisites: 321, 322.

CHEM ENG 330-0 Molecular Engineering and Statistical Mechanics Basic statistical mechanics. Applications to thermodynamics, kinetics, and transport of various engineering systems, including frontier areas of chemical and biological engineering. Not open to students who have taken 406, CHEM 342-3, or PHYSICS 332. Prerequisite: 211 or another thermodynamics course; courses in probability and statistics, heat transfer, or other transport recommended.

CHEM ENG 341-0 Dynamics and Control of Chemical and Biological Processes Dynamic behavior of chemical process components. Feedback control principles. Prerequisites: 307; senior standing.

CHEM ENG 342-0 Chemical Engineering Laboratory Operation and control of process equipment for the determination of operating data. Analysis and written presentation of results. Prerequisites: 212, 307, 321, 322, 323.

CHEM ENG 345-0 Process Optimization Modern techniques and application to the design and operation of chemical process systems. Steady-state and dynamic methods. Experimental search for the optimum. Prerequisite: junior standing.

CHEM ENG 351-0 Process Economics, Design, and Evaluation Preliminary design of industrial processes for the production of chemical and allied products by the application of the engineering sciences and economics. Prerequisites: 212, 307, 321, 322, 323.

CHEM ENG 352-0 Chemical Engineering Design Projects Design of chemical and process plants applying the principles of unit operations, thermodynamics, reaction kinetics, and economics. Mechanical design and selection of chemical process equipment. Prerequisite: 351.

CHEM ENG 355-0 Chemical Engineering Product Design Properties and selection of chemicals for products from single-molecule pharmaceuticals to devices to manufactured products such as food and consumer goods. Prerequisite: junior standing.

CHEM ENG 361-0 Introduction to Polymers Polymerization mechanisms and their relation to molecular structure, polymerization processes, and the mechanical properties of polymers, especially flow behavior. Prerequisites: 211 or other thermodynamics course; CHEM 210-1.

CHEM ENG 364-0 Chemical Processing and the Environment Application of chemical engineering fundamentals to environmental problems. Chemistry and mechanisms, chemical reaction and rate, and transport emphasized. Risk assessment and analysis revealed through case studies. Prerequisites: 212, 307.

CHEM ENG 365-0 Sustainability, Technology, and Society Technical discussion of sustainability, sustainable development, global warming, natural and renewal resources and utilization, industrial ecology, ecoefficiency, technology related to sustainability, and risk assessment. Prerequisite: junior standing in science or engineering.

CHEM ENG 371-0 Transport Phenomena in Living Systems Application of transport theory, principally diffusion, to movement of molecules in biological systems, including blood, cornea, microcirculation, and lung. Prerequisites: 275 or BIOL SCI 215 or 216; 321, 323, BMD ENG 270, or equivalent; or consent of instructor.

CHEM ENG 375-0 Biochemical Engineering Modern biochemical engineering. Life sciences: microbiology, biochemistry, and molecular genetics. Metabolic stoichiometry, energetics, growth kinetics, transport phenomena in bioreactors, and product recovery. Prerequisite: 307, 323, or consent of instructor.

CHEM ENG 377-0 Bioseparations Downstream process in biotechnology. Separation and lysis of cells. Recovery of organelles and proteins. Protein separation and purification. Prerequisites: 323 (may be taken concurrently); 275 or BIOL SCI 215 or 216.

CHEM ENG 379-0 Computational Biology: Principles and Applications Introduction to the development and application of data-analytical and theoretical methods, mathematical modeling, and computational simulation techniques to the study of biological systems.

CHEM ENG 390-0 Personal and Organizational Effectiveness Introduction to nontechnical skills required in a business environment, with the goal of increasing personal effectiveness and marketability of seniors and graduate students. Prerequisite: senior standing.

CHEM ENG 395-0 Special Topics in Chemical Engineering Topics suggested by students or faculty and approved by the department.

CHEM ENG 396-0 Focused Topics in Chemical Engineering (.5 unit) Emerging topics suggested by students or faculty and approved by the department.

CHEM ENG 399-0 Projects Supervised investigation of a chemical engineering problem with submission of a final report.

CIVIL AND ENVIRONMENTAL ENGINEERING

www.cee.northwestern.edu

The Department of Civil and Environmental Engineering offers two degree programs for undergraduate students, one in civil engineering and another in environmental engineering, as well as a minor in environmental engineering and an architectural engineering and design certificate.

Civil and environmental engineers play central roles in defining sustainable development approaches to the interactions of humans with earth systems. The curricula of these programs place strong emphasis on design, communication, teamwork, and the development of a systems perspective on the complex problems of today and tomorrow.

Civil Engineering

Civil engineers plan systems such as transportation networks and procedures for water control and supply, and they design structures such as buildings, bridges, dams, and sewage disposal plants. They work with ecologists, sociologists, economists, lawyers, and others to plan how to wisely use the human and natural resources of large areas, such as river basins, and how to redevelop cities. With few exceptions, each planning or design job is one of a kind.

Planning requires much data of all sorts—topography, geology, soils, vegetation, weather and climate, stream flow and lake currents, traffic routes and patterns, pollution, population, preferences, skills, and ambitions. Many civil engineers collect, analyze, and present the data, developing and improving measuring instruments as part of their jobs. Others apply probability and statistical methods to the data to forecast such things as population growth, demand for water and transportation, maximum winds and precipitation, height of floods, and air and water quality.

In addition to the planning forecasts, the design of systems and structures requires accurate data on the mechanical properties of materials such as steel, concrete, soils, rocks, and plastics and on the behavior of structural components made from them. Some civil engineers test materials and physical models to obtain such data. Many more use known physical properties and the laws of mechanics—energy, momentum, and conservation of mass—to design structures, foundations, pavements, pipe networks, and treatment plants that will do the job safely and economically.

Civil engineers who design water and waste treatment facilities or set up programs to reduce air and water pollution need to understand certain chemical reactions and biological processes as well as the usual fluid and solid mechanics. Engineers who help to plan and design a system understand how and why it works and what may go wrong with it. Hence, civil engineers may operate treatment facilities or systems of flood control reservoirs or set up and administer traffic control plans. Civil engineers may become city engineers.

Engineers who design structures and know soil mechanics learn the practical difficulties of providing a foundation and erecting the structure, and some enter the construction business. The administrative and business activities of construction companies require them to also learn something about accounting, personnel management, and contracts.

Areas of Specialization

Since civil engineering students have a wide range of career options, the Department of Civil and Environmental Engineering prescribes only a minimum of required courses and subjects, allowing students to select the remainder freely or from specified broad categories. To make judicious choices that fit their needs, students are encouraged to discuss with faculty any proposed program that meets a well-defined goal. Examples of courses selected in the areas of specialization most often pursued are available on the department website.

Degree in Civil Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses: PHYSICS 135-2; CHEM 101, 102; 1 course in astronomy, biological sciences, or earth and planetary sciences
- 3 design and communications courses
- 5 basic engineering courses
  - *Electrical science:* MECH ENG 233 or EECS 202 or 270
  - *Fluids and solids:* CIV ENV 216; MECH ENG 241
  - *Thermodynamics:* MECH ENG 220, BMD ENG 250, CHEM ENG 211, or CHEM 342-1
  - 1 course from materials science and engineering, systems engineering and analysis, computer architecture and numerical methods, or computer programming
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 7 basic civil engineering courses: CIV ENV 221, 250, 260, 325, 330, 340; 371 or 376
- 2 mathematical techniques and science courses from an approved list, 1 of which must be a calculus-based probability and statistics course
- 5 technical electives at the 300 level or higher in mathematics, science, engineering, or another area supporting the area of specialization; GEN ENG 220 may count toward this requirement
- 2 courses from an approved list of design and synthesis courses; 1 must be CIV ENV 382, which may not be taken P/N
- 10 of the 16 courses in the major program must be civil engineering courses
- Samples of traditional areas of specialization follow, but students are encouraged to work with advisers to design programs that meet their needs.
  - *Mechanics of materials and solids*
  - *Construction*
  - *Environmental engineering*
  - *Geotechnical engineering*
  - *Structural engineering*
  - *Transportation systems*

Environmental Engineering

Environmental engineering is concerned with the interactions of people and environment, the applications of

scientific knowledge to the understanding and analysis of these interactions, and the improvement of the quality of our environment.

Traditionally, environmental engineers have ensured safe drinking water, treated and properly disposed of wastes, maintained air quality, controlled water pollution, and remediated sites contaminated by hazardous substances. They continue to do so with the realization that anthropogenic activities at the earth's surface are modifying the natural environment more quickly. As a result, the emphasis in environmental engineering is shifting from managing wastes to designing sustainable practices that foster recovery, recycling, and reuse of resources. Because environmental engineers understand how complex environmental systems work, they develop, for example, molecular tools and new technologies to track and remove contaminates present at very low levels, and they use genomic approaches to characterize microbial communities. They are a vital link between scientific discovery, technological development, and the societal need for protecting the health of humans and ecological systems.

The environmental engineering curriculum provides a broad fundamental training and prepares graduates for highly interdisciplinary work. The first two years are devoted to mathematics, physics, chemistry, basic engineering, and gateway courses that provide an overall view of earth systems. Subsequently, the fundamentals of environmental engineering and their application to the atmosphere, land, and the hydrosphere are emphasized.

This program provides an engineering and scientific basis for understanding contemporary environmental problems and approaches to solutions, understanding the natural systems with which human activities must be compatible, and developing the engineering analysis and design tools to plan and design environmental control systems. Completion of the undergraduate degree prepares students to practice engineering at the entry level or to continue their education at the graduate level. It serves as preparation for the Fundamentals of Engineering (FE) examination and, with adequate experience, the Professional Engineer (PE) examination.

Degree in Environmental Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses: PHYSICS 135-2; CHEM 101, 102, 103
- 3 design and communications courses
- 5 basic engineering courses
  - *Systems engineering and analysis:* CIV ENV 304 or IEMS 326
  - *Thermodynamics:* 1 course from BMD ENG 250; CHEM ENG 211; MAT SCI 314
  - *Fluids and solids:* MECH ENG 241
  - *Probability, statistics, and quality control:* 1 course from BMD ENG 220; CHEM ENG 312; CIV ENV 306 (recommended); EECS 302; IEMS 303; MECH ENG 359
  - 1 course from EECS 328; MAT SCI 201, 301
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 12 core courses: CHEM 210-1; CIV ENV 201, 202, 203, 260, 340, 361, 363, 364, 365, 367, 382
- 4 technical electives from an approved list in engineering, mathematics, or science
  - 3 must be engineering courses.
  - May include only 1 quarter of CIV ENV 399.
  - No course may be taken P/N.

Minor in Environmental Engineering

Requirements (8 units)

Core courses (6 units)

- CIV ENV 201, 202, 203, 260, 363, 364

Electives (2 units)

- 2 courses from CIV ENV 340, 361-1,2, 367, 368, 398-1,2, 399, or a 400-level course by permission; only 1 CIV ENV 399 unit may be counted toward the minor.
- No more than 4 courses may be used to fulfill requirements in the major program.
- A grade of at least C– is required in each course for the minor.
- Students should discuss with the minor coordinator how best to satisfy prerequisites for required courses.
- A completed Petition to Receive form for the minor must be submitted to the McCormick Academic Services Office before the beginning of the final undergraduate quarter.

Certificate in Architectural Engineering and Design

The Architectural Engineering and Design Certificate Program requires a mixture of design imagination, knowledge of materials and systems, and a variety of analytic and management tools. Architects, who traditionally have led the design effort, are best known for the aesthetic element of their products. It is the integration of architecture and engineering perspectives that leads to buildings that are pathbreaking in functionality, aesthetics, economy, and sustainability. This certificate prepares students for further pursuit of architecture-related careers.

Certificate Requirements (8 units)

- CIV ENV 385-1 Design Studio I: Fundamentals
- CIV ENV 385-2 Design Studio II: Intermediate
- CIV ENV 385-3 Design Studio III: Advanced

- GEN ENG 220-1,2 (.5 unit each) Analytic and Computer Graphics
- CIV ENV 323 Structural Steel Design or 352 Foundation Engineering
- ART HIST 232 Introduction to the History of Architecture and Design
- CIV ENV 221 Theory of Structures I
- CIV ENV 325 Reinforced Concrete

Courses

CIV ENV 201-0 Earth: A Habitable Planet Overview of the physical processes governing environmental systems, from lithosphere to hydrosphere to atmosphere. Physical science perspectives on current debates, such as those over water resources, energy, and climate change. Prerequisites: MATH 224 or equivalent; CHEM 103, 172, or equivalent.

CIV ENV 202-0 The Health of the Biosphere Population processes in nature; role of human population growth; interactions between populations; major impacts of human populations on the environment. Taught with ENVR SCI 202; students may not earn credit for both courses. Prerequisite: MATH 224 or equivalent.

CIV ENV 203-0 Energy and the Environment Introduction to the mitigation of environmental impacts and the science and engineering behind sustainable energy production. Taught with ENVR SCI 203; students may not earn credit for both courses. Prerequisites: MATH 224 or equivalent; CHEM 103, 172, or equivalent.

CIV ENV 216-0 Mechanics of Materials I Analytical and experimental study of stresses and deformations and their application to the design of machine and structural elements subjected to static, dynamic, and repeated loads. Prerequisite: 212 or GEN ENG 205-2.

GEN ENG 220-1,2 Analytical and Computer Graphics (.5 unit each) See General Engineering Courses.

CIV ENV 221-0 Theory of Structures I Deflections of structures, energy concepts, idealization of structures, truss analysis, column stability, and influence lines. Introduction to indeterminate truss and frame analyses, slope-deflection analysis, and moment distribution. Portal method. Prerequisite: 216.

MECH ENG 241-0 Fluid Mechanics I See Mechanical Engineering.

CIV ENV 250-0 Introductory Soil Mechanics Fundamental properties and behavior of soils as engineering materials. Origin of soils through the properties of soil components to the strength, permeability, and deformation of soil masses. Prerequisite: 216.

CIV ENV 260-0 Fundamentals of Environmental Engineering Mass and energy concepts applied to major issues facing environmental engineers: safe drinking water, surface water quality, ambient air quality, global atmosphere, managing solid and hazardous wastes. Prerequisites: CHEM 101; MATH 224 (may be taken concurrently).

CIV ENV 301-1,2 Professional Development Seminar (0 units) Preparation for the Fundamentals of Engineering exam, case study of engineering ethics, and discussion of topics associated with professional development and lifelong learning. Prerequisite: senior standing.

CIV ENV 302-0 Engineering Law The American legal system from an engineer's perspective. Socratic-method analysis of statutory and case law. Contract, patent, corporation, antitrust, property, and environmental law. Torts, product liability, and arbitration. Prerequisite: junior standing.

CIV ENV 303-0 Environmental Law and Policy An introduction to important aspects of environmental law and policy. Covers a wide range of environmental topics, with a focus on major federal environmental statutes. Prerequisite: junior or senior standing.

CIV ENV 304-0 Civil and Environmental Engineering Systems Analysis Quantitative techniques to develop descriptive and prescriptive models that support efficient planning and management of civil and environmental engineering systems. Prerequisite: MATH 224 or equivalent.

CIV ENV 306-0 Uncertainty Analysis in Civil Engineering Probability, statistics, and decision theory. Discrete and continuous random variables, marginal and conditional distributions, moments, statistical model selection and significance tests, hypothesis testing, and elementary Bayesian decision theory. Application to problems in soil mechanics, water resources, transportation, and structures.

CIV ENV 314-0 Organic Geochemistry The sources and fates of organic matter in the natural environment; global cycling of organic carbon; applications to the study of modern and ancient environments. Taught with EARTH 314; students may not earn credit for both courses. Prerequisites: 1 course in earth and planetary sciences or environmental sciences; 1 course in chemistry.

CIV ENV 317-0 Biogeochemistry Cycling of biogenic elements (C, N, S, Fe, Mn) in surficial environments. Emphasis on microbial processes and isotopic signatures. Prerequisites: 1 quarter of chemistry; 1 quarter of geoscience, environmental sciences, or biological sciences.

CIV ENV 319-0 Theory of Structures II Shear center, nonprismatic members, nonlinear materials, influence lines, Mueller-Breslau principle, approximate methods of analysis, energy methods, stiffness matrix, and computer methods of analysis. Prerequisite: 221.

CIV ENV 320-0 Structural Analysis—Dynamics Single and multiple degree-of-freedom systems subjected to periodic, seismic, and general loadings. Time-history analysis of linear and nonlinear systems. Design methods for earthquakes. Prerequisite: 221.

CIV ENV 321-0 Properties of Concrete Concrete as a composite material; relationship between constitutive laws and microstructure; failure theories; fracture; fatigue; strain rate effects; destructive and nondestructive testing; creep and shrinkage; chemistry of cement hydration; admixtures; aggregates; proportioning; new materials.

CIV ENV 322-0 Structural Design Design criteria; planning and design aspects of structural systems for gravity and lateral loads. A total design project involving the analysis and design of a structure. Prerequisite: 222 or equivalent.

CIV ENV 323-0 Structural Steel Design Rational basis of structural design. Design approach for structural-steel components of a building system. Prerequisites: 216; 221 or equivalent.

CIV ENV 325-0 Reinforced Concrete Fundamentals of reinforced concrete theory and design. Analysis and design of beams, slabs, and columns. Concurrent familiarization with current building codes, specifications, and practices. Prerequisite: 221.

CIV ENV 327-0 Finite Element Methods in Mechanics Development of finite elements from variational principles and application to static stress analysis. Introduction to techniques for transient and generalized field problems. Computer implementation of finite element techniques.

CIV ENV 330-0 Construction Management Techniques for coordinating decisions and actions of various parties in the design and construction of civil and environmental engineering projects. Delivery systems, preconstruction services, project planning, cost control and value engineering, bidding. Prerequisite: consent of instructor.

CIV ENV 332-0 Building Construction Estimating Estimation of cost at different stages of design; conceptual estimating and quantity takeoff of various elements, such as materials, labor, and equipment. Prerequisites: 330 and consent of instructor.

CIV ENV 336-0 Project Scheduling Project planning, scheduling, and control using CPM arrow and precedence networks; basic resource allocation and leveling; earned-value analysis; linear scheduling; PERT charts; hands-on experience in using computer tools. Prerequisite: 330 or consent of instructor.

CIV ENV 340-0 Fluid Mechanics II Civil engineering applications of fluid mechanics. Turbulent flow in pipes, pipe networks, and open channels. Prerequisite: CHEM ENG 321, MECH ENG 241, or consent of instructor.

CIV ENV 346-0 Meteorology and Hydrology Mechanics of the atmosphere. Precipitation, runoff, groundwater flow. Methods of analyzing rainfall and stream-flow records for power generation, flood control, and water supply. Prerequisite: MECH ENG 241.

CIV ENV 349-0 Environmental Management The roles and responsibilities of project managers who deal with environmental issues. How managers deal with previously created environmental problems, respond to current requirements, and anticipate future needs. Prerequisites: a technical background and senior standing.

CIV ENV 352-0 Foundation Engineering Application of soil mechanics to analysis and design of foundations and embankments. Settlement of structures, bearing capacities of shallow and deep foundations, earth pressures on retaining structures, and slope stability. Prerequisite: 250.

CIV ENV 355-0 Engineering Aspects of Groundwater Flow Applied aspects of groundwater flow and seepage, including Darcy's law, parameter determination, aquifer test analysis, flow-net construction and application, modeling techniques, slope stability analysis, drainage, and filter design. Prerequisite: fluid mechanics.

CIV ENV 358-0 Airphoto Interpretation Principles and practice of using aerial photographs to obtain information about natural features of the earth's surface, with emphasis on earth materials. Landforms, geological processes, rocks, and soils. Stereoscopic photographs, elements of photogrammetry. Prerequisite: junior standing or consent of instructor.

CIV ENV 361-1 Environmental Microbiology Basic principles and practical applications of microbiology to environmental issues, such as microbial contamination, degradation of organic contaminants, production of alternative fuels, and global climate change.

CIV ENV 361-2 Public and Environmental Health Current problems in public and environmental health, such as the worldwide burden of major infectious diseases, emergence of new pathogens, and environmental reservoirs of infectious organisms. Prerequisite: 361-1 or consent of instructor.

CIV ENV 363-0 Environmental Engineering Applications I: Air and Land Nature and control of community air pollution. Sources, physical and chemical properties, and effects of major air pollutants; analytical measurements and monitoring of air pollutants; engineering and legislative control. Prerequisites: junior standing and 260.

CIV ENV 364-0 Environmental Engineering Applications II: Water Engineering elements of water supply and water pollution abatement. Water quality standards, water and wastewater treatment processes, and the management of receiving waters to control pollution. Prerequisites: 260, MECH ENG 241; 340 recommended.

CIV ENV 365-0 Environmental Laboratory Chemical and microbiological aspects of environmental engineering and science are explored through an integrated laboratory course.

CIV ENV 367-0 Aquatic Chemistry Terrestrial, freshwater, marine, and estuarine chemical equilibria in natural waters. Development of theoretical basis for the investigation of chemical behavior of aquatic systems emphasizing a problem-solving approach. Prerequisite: BMD ENG 250.

CIV ENV 368-0 Sustainability: Issues and Action, Near and Far Exploration of the issues that motivate the design and engineering of sustainable resource use and development.

CIV ENV 371-0 Introduction to Transportation Planning and Analysis Analysis and design of solutions to transportation problems; introduction to selected operations research and statistical analysis techniques; use of case studies in urban transportation, intercity passenger transport, and freight movements. Prerequisite: junior standing or consent of instructor.

CIV ENV 376-0 Transportation System Operations Traffic-flow theory; vehicle and human factors, capacity analysis, intersection performance and control; management and control of arterial streets and networks; neighborhood traffic restraint, urban transit operations. Operations concepts and theories applied to actual problems through laboratory practice. Prerequisite: basic understanding of calculus and statistics; knowledge of MATLAB is desirable but not required.

CIV ENV 382-0 Capstone Design Culminating team-based design experience in civil and environmental engineering, with an overview of the function, design, and operation of modern infrastructure systems. Prerequisite: senior standing in civil or environmental engineering or consent of instructor.

CIV ENV 385-1,2,3 Architectural Engineering and Design Architectural engineering and design studios: architectural history, case studies in design, construction and management of buildings, and drawing and model building. **1.** Fundamental studio: basic architectural and structural design of a simple building project. Prerequisite: junior standing in engineering or consent of instructor. **2.** Intermediate studio: architectural and structural design of a building project with multiple requirements. Prerequisites: junior standing in engineering; 385-1 or consent of instructor. **3.** Advanced studio: architectural and structural design of a large, complex building project. Prerequisites: junior standing in engineering; 385-2 or consent of instructor.

CIV ENV 395-0 Special Topics in Civil Engineering Topics suggested by students or faculty and approved by the department.

CIV ENV 398-1,2 Community-Based Design Yearlong participation in two- or three-person team projects involving research, analysis, and/or design in the solution of environmental problems affecting primarily lower-income communities. Grade assigned only on completion of both units. Prerequisite: consent of instructor.

CIV ENV 399-0 Projects Special studies under faculty direction. Credit to be arranged.

COMPUTER ENGINEERING

See Electrical Engineering and Computer Science.

COMPUTER SCIENCE

See Electrical Engineering and Computer Science.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

DESIGN ENGINEERING

See Manufacturing and Design Engineering for the certificate in design engineering.

ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

www.eecs.northwestern.edu

The Department of Electrical Engineering and Computer Science offers three programs for undergraduate students leading to the bachelor of science degree: electrical engineering, computer engineering, and computer science. It also offers graduate programs leading to the MS and PhD degrees in those three areas. The department boasts an internationally renowned faculty, state-of-the-art research equipment, and the considerable resources offered by a great university. It combine these advantages with an uncommon commitment to students.

The department offers several interdisciplinary options, including premedical/biomedical studies and cognitive science. It collaborates with Weinberg College to offer that school's major in computer science (see page 80).

Electrical Engineering

Electrical engineering involves the development and application of electronic and optical technologies for generating, communicating, and processing information. The electrical engineering curriculum includes courses in electronic circuits, solid-state electronics, electromagnetics, optics, lasers, controls, digital signal processing, communications and networks. Students may specialize in any of the following areas.

Circuits and Electronics

This area of study is concerned with the analysis and design of circuits that employ electronic devices, such as integrated circuits, transistors, diodes, light-emitting diodes, data-storage elements, and image-forming devices. Important applications include AM and FM radio, television, digital computers, and electronic control instrumentation systems.

Communications Systems

A communication system involves the generation of an electrical signal representing information to be transmitted, its encoding in some form for efficient transmission, its actual transmission, its decoding at the receiving end of the system, and its reconversion into something intelligible to the user. The thorough study of communications systems theory requires knowledge of a broad range of mathematical methods and of the capabilities and limitations of electronic circuits. This subject also covers the design and analysis of communication networks for the transmission of audio, video, and data among many users.

Control Systems

The study of control systems deals with the analysis and design of automatic regulators, guidance systems, numerical control of machines, robotics, and computer control of industrial processes. Students are concerned with identifying these systems and with such topics as system stability,

system performance criteria, and optimization. These concepts find application in other fields of engineering and in the development of better understanding of biological, energy, economic, and social systems.

Digital Signal Processing
Study in this area focuses on the digital representation and algorithmic manipulation of speech, audio, image, and video signals. Specific topics within this general area include image and video processing, recovery and compression, multimedia signal processing, filter design and rank-order operators, image and video transmission, medical and biomedical signal processing, medical imaging, and algorithms for medical instrumentation.

Electromagnetics and Photonics
Study in the area of photonic systems and technology focuses on microcavity lasers, nanostructures, quantum and nonlinear optics, integrated optics, fiber-optic and infrared waveguide devices, fiber-optic communications, computational electromagnetics, and imaging through turbulence. Special emphases include applications of novel quantum amplifiers in optical communications, imaging, and cryptography; devices for terabit second WDM and TDM optical networks; and applications of computational techniques in integrated and nonlinear optics.

Solid-State Engineering
This area is concerned with the design, physical principles, and applications of solid-state devices both as discrete units and integrated circuit systems. In addition to the various diode, transistor, and FET devices fabricated from silicon technology, devices developed from compound semiconductor materials are reviewed. Both analog and digital circuit applications are stressed. Another important topic is the behavior of conductors in the superconducting state, with a stress on applications.

Degree in Electrical Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses
  - PHYSICS 135-2,3
  - 2 courses from
    - *Physics:* PHYSICS 335
    - *Biological sciences:* BIOL SCI 215, 216, 217; CHEM ENG 275
    - *Chemistry:* CHEM 101, 102, 103, 171, 172, 210-1,2
    - *Earth and planetary sciences/astronomy:* EARTH 201, 202; ASTRON 220
- 3 design and communications courses
- 5 basic engineering courses
  - EECS 202, 203, 302 (grade of C– or better in 202 and 203 required for graduation)
  - EECS 211 *or* 230
  - 1 course from BMD ENG 250, 270, 271; CHEM 342-1; CHEM ENG 210, 211, 321; CIV ENV 216, 219, 304; IEMS 310, 313, 326; MECH ENG 220, 241, 370; MAT SCI 201, 203, 301, 314, 315
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 5 required courses: EECS 221, 222, 223, 224, 225
- 10 technical electives
  - At least 6 courses from the following six tracks:
    - *Biomedical engineering track:* BMD ENG 317, 325, 327, 333, 383
    - *Circuits and electronics track:* EECS 303, 346, 353, 355, 391, 393
    - *Communications systems track:* EECS 307, 333, 378, 380
    - *Control systems track:* EECS 360 *or* MECH ENG 391; EECS 374, 390; MECH ENG 333
    - *Digital signal processing track:* EECS 332, 359, 363
    - *Electromagnetics and optics track:* EECS 308, 379, 382, 383, 386
    - *Solid-state engineering track:* MECH ENG 381; EECS 250, 381, 384, 385, 388
  - 2 courses from 300-level EECS technical electives (which may include 205 and the courses above)
  - 2 courses may be chosen from BIOL SCI 215, 216, 217; CHEM 210-1,2,3; or 300-level technical courses in science, mathematics, computer science, or engineering or the courses above.
  - No more than 2 units of 399 will be counted as technical electives. Additional units of 399 may be taken but will be counted as unrestricted electives.
- 1 required design course from EECS 347-1, 392, 398, 399 (when 399 is a design project and the student has senior standing)

Computer Engineering

Computer engineering deals with digital design, computer hardware and architecture, robotics, microprocessors, software and programming, and the interrelationships between hardware and software. The computer engineering curriculum involves courses in digital logic, electronic circuits, computer architecture, robotics, VLSI design, VLSI CAD, software programming, operating systems, microprocessor systems, and parallel computing. The computer engineering curriculum allows students to develop a particular specialization in the following areas.

Embedded Systems
This area focuses on the use of digital hardware to monitor and control physical systems. Topics include discrete dynamics systems, digital controllers, analog-to-digital converters, microprocessor-based design, and the economic trade-offs of different software and hardware systems.

High-Performance Computing
This area introduces students to the field of state-of-the-art high-performance computing. In particular, it deals with aspects of computing involving multiple processors working together on a common problem, including issues of computer architecture, parallel programming and algorithms, numerical computing, and computer networking.

Software
This area exposes students to concepts and skills necessary to implement and understand computer software. Students are taught how to design and analyze efficient algorithms, how to develop operating systems and compilers, and how to write programs using efficient data structures and software engineering practices.

VLSI and Computer-Aided Design
This area focuses on systematic approaches to designing high-performance integrated circuits consisting of millions of transistors. This specialization includes topics such as low-power, high-speed, and reliable circuit design, hardware-software codesign, design verification, design of field-programmable gate array (FPGA), and computer-aided design (CAD) techniques.

Degree in Computer Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses
  - PHYSICS 135-2,3
  - 2 courses from ASTRON 220; BIOL SCI 215, 216, 217; CHEM 101, 102, 103, 171, 172, 210-1,2; CHEM ENG 275; EARTH 201, 202; PHYSICS 335
- 3 design and communications courses
- 5 basic engineering courses
  - *Computer architecture and numerical methods:* EECS 203 (grade of C– or better required for graduation)
  - *Computer programming:* EECS 211
  - *Electrical science:* EECS 202 (grade of C– or better required for graduation)
  - *Probability, statistics, and quality control:* EECS 302
  - 1 course from BMD ENG 250, 270, 271; CHEM 342-1; CHEM ENG 210, 211, 321; CIV ENV 216, 219, 304; IEMS 310, 313, 326; MAT SCI 201, 203, 301, 314, 315; MECH ENG 220, 241, 370
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 5 required courses: EECS 205, 214, 221, 303, 361
- 10 technical electives
  - At least 2 courses from EECS 213, 222, 223, 224, 225
  - 5 courses from the following four tracks:
    - *Embedded systems track:* EECS 332, 346, 347-1, -2, 390; BMD ENG 384
    - *High-performance computing track:* EECS 328, 333, 339, 350, 354, 358, 362, 368, 452, 453, 468
    - *Software track:* EECS 212, 322, 336, 339, 343, 394, 395 (by petition)
    - *VLSI and CAD track:* EECS 353, 355, 357, 391, 392, 393, 492, 459
  - 3 electives from BIOL 215, 216, 217; CHEM 210-1,2,3; or 300-level technical courses in science, mathematics, computer science, or engineering
  - No more than 2 units of 399 will be counted as technical electives. Additional units of 399 may be taken but will be counted as unrestricted electives.
- 1 required design course from EECS 347-1, 362, 392

Computer Science

Computer science involves the understanding, use, and extension of computational ideas and their implementation. A Northwestern computer science graduate will

- Comprehend the breadth of computer science, its key intellectual divisions and questions, and its past and likely future influence on engineering, science, medicine, business, and law
- Approach problems from the algorithmic perspective, understanding the nature and broad reach of computation and how to apply it abstractly
- Approach problems from the systems perspective, understanding the evolving layers of the software/hardware stack and how to create, use, and extend them
- Approach problems from the perspective of artificial intelligence, understanding how to make progress in solving seemingly intractable problems
- Design and implement complex software systems, individually and as a team member
- Design and implement effective human-machine interfaces

Courses and undergraduate research opportunities focus on software, ranging from theoretical models to practical applications. They establish a common breadth of knowledge in computer science, allowing students flexibility in areas in which they choose to specialize, such as

- *Artificial intelligence*, including mobile robots with perceptual systems, models of memory and reasoning, knowledge representation, natural-language comprehension, planning, and problem solving

- *Computer systems*, including parallel, distributed, and real-time systems, performance evaluation, prediction, and scheduling
- *Networked systems*, including peer-to-peer computing, large-scale data storage, network security, and pervasive computing environments
- *Programming languages and compilers*, including semantics, optimization, and software
- *Human-computer interaction*, including interface design, task modeling, intelligent interfaces, and authoring tools
- *Distributed interactive systems*, including client-server and web-based applications such as heterogeneous databases and multimedia learning environments
- *Theoretical computer science*, focusing on algorithm design and analysis of algorithms' worst- and average-case behavior
- *Intelligent information systems*, including "frictionless" proactive systems and context- and task-sensitive retrieval systems
- *Computer graphics and human-computer interfaces* for spatial applications, visualization, and computer entertainment

Degree in Computer Science

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses: MATH 220, 224, 230; EECS 212
- 4 engineering analysis and computer proficiency courses: GEN ENG 205-1,2,3 or 206-1,2,3; EECS 111
- 4 basic science courses from at least two of the areas below; no more than 2 from earth and planetary sciences/astronomy; no more than 3 in any other area; PHYSICS 135-2,3, 335; BIOL SCI 215; and CHEM ENG 275 are recommended but not required
  - *Physics:* PHYSICS 135-2,3, 335
  - *Biological sciences:* BIOL SCI 215, 216, 217; CHEM ENG 275
  - *Chemistry:* CHEM 101, 102, 103, 171, 172, 210-1,2
  - *Earth and planetary sciences/astronomy:* EARTH 201, 202; ASTRON 220
- 3 design and communications courses: DSGN 106-1,2; ENGLISH 106-1,2; GEN CMN 102
- 5 basic engineering courses
  - *Computer programming:* EECS 211
  - *Probability, statistics, and quality control:* IEMS 201, 303, or EECS 302
  - 3 courses from at least two of the remaining basic engineering areas: computer architecture and numerical methods, electrical science, fluids and solids, materials science and engineering, systems engineering and analysis, and thermodynamics
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 3 required courses: EECS 101, 213, 214
- 5 breadth courses, 1 from each of the following areas (see department website for changes to this list):
  - *Artificial intelligence:* EECS 325, 337, 344, 348, 349, 360
  - *Interfaces:* EECS 321, 330, 332, 351, 352, 370
  - *Software development:* EECS 338, 394
  - *Systems:* EECS 303, 322, 339, 340, 343, 345, 346, 350, 358, 361, 440, 441, 443, 450, 464
  - *Theory:* EECS 328, 335, 336, 356
- 6 depth courses
  - 3 each from two of the following areas (see department website for changes to this list), chosen in consultation with advisers:
    - *Artificial intelligence:* EECS 325, 337, 344, 348, 349, 360
    - *Interfaces:* EECS 330, 332, 351, 352, 370
    - *Security:* EECS 322, 339, 340, 343, 345, 350, 440, 441, 443, 450
    - *Systems:* EECS 322, 339, 340, 343, 345, 350, 358, 361, 440, 441, 442, 443, 450, 464
    - *Theory:* EECS 328, 336, 355, 356, 357, 457, 459; MATH 308
  - May be a single 6-course depth area with approval.
  - 321 may satisfy both breadth and depth requirements for the major.
- 2 project courses: 2 units of 399 or others from the department's list of project courses
- Sections of 395 and 399 may be used for breadth and depth requirements if appropriate; consult program advisers for information.
- Courses at the 400 level are primarily for graduate students but may be open to advanced undergraduate students with the consent of the instructor.
- EECS 110 may be used as an unrestricted elective if taken before EECS 111.

Minor in Computer Science

The department offers a minor in computer science for students who wish to develop stronger competence in computer science while pursuing a degree in another field.

Requirements (15 units)

Prerequisites (6 units)

- MATH 220, 224, 230
- 3 units of engineering analysis: GEN ENG 205-1,2,3 or 206-1,2,3

Minor requirements (9 units)

Core courses (6 units)

- 6 units of computer science: EECS 101, 111, 211, 212, 213, 214; students without prior programming experience may wish to take 110 before 111

Breadth courses (3 units)

- 3 courses from the list of breadth courses (available from the department); each course must be in a different breadth area

Students must submit a completed Petition to Receive form for the minor to the McCormick Academic Services Office before the beginning of their final quarter as undergraduates.

Facilities

Students have access to state-of-the-art research and teaching facilities, ranging from laboratories for electronic devices to parallel computers and worldwide distributed testbeds.

Electrical engineering facilities include laboratories for electronic circuits, digital circuits, solid-state electronics, fabrication of solid-state lasers and other quantum electronic/photonic devices, thin-film device development, biomedical electronics, microwave techniques, holography and coherent light optics, biological and other control systems, and signal, image, and speech processing.

Computer engineering facilities include laboratories in digital systems design, microprocessor systems, microprogramming, robotics, computer-aided design, and computer networking. The department has major research facilities for work in parallel and distributed computing systems, database systems, computer vision, VLSI design, CAD, robotics, solid-state devices, fiber optics, lasers, computational electromagnetics, electronic materials, and biomedical engineering.

Computer science students benefit from access to computing laboratories that provide Linux, Windows, Solaris, and PocketPC machines, a private network, sensor networks, and the worldwide PlanetLab distributed systems testbed. Students taking courses in experimental computer systems also have access to a special cluster on which they can instantiate their own collections of virtual machines. The department is part of the Microsoft Developer Network Academic Alliance, which provides free or inexpensive access to Microsoft products widely used in desktop computing.

Courses

EECS 100-0 Electrons, Photons, and Bits: Adventures in Electrical and Computer Engineering Introduction to contemporary topics in electrical and computer engineering via lectures, demonstrations, lab tours, and invited speakers from industry and government. Weekly reading and writing assignments.

EECS 101-0 An Introduction to Computer Science for Everyone General introduction to historical and current intellectual questions in computer science. Theory, systems, artificial intelligence, interfaces, software development, and interactions with business, politics, law, medicine, engineering, and other sciences.

EECS 110-0 Introduction to Computer Programming Introduction to programming practice using a modern programming language. Analysis and formulation of problems for computer solution. Systematic design, construction, and testing of programs. Substantial programming assignments. Not to be taken for credit with or after EECS 111.

EECS 111-0 Fundamentals of Computer Programming Introduction to principles of programming and procedural thinking. Procedural abstraction, data abstraction, modularity, object-oriented programming. Use of the Scheme programming language and computer facilities. Substantial programming assignments, including numerical and symbolic programs. Required for the computer science degree.

EECS 130-0 Tools and Technology of the World Wide Web Introduction to the theory and practice of developing sites on and technology for the web. Basics of HTML, JavaScript, ASP, and CGI programming.

EECS 195-0 Introductory Topics in Electrical Engineering and Computer Science Topics suggested by students or faculty and approved by the department.

EECS 202-0 Introduction to Electrical Engineering Concepts and applications of electrical engineering. Quantization, binary representation, performance. Power spectral density, digital filtering, fundamental limitations. Control systems, feedback systems. Properties of lasers, amplifiers, passive circuit elements, active circuit elements. Electronic devices and materials.

EECS 203-0 Introduction to Computer Engineering Overview of computer engineering design. Number systems and Boolean algebra. Logic gates. Design of combinational circuits and simplification. Decoders, multiplexers, adders. Sequential logic and flip flops. Introduction to assembly language. Application of concepts to a computer engineering design project.

EECS 205-0 Fundamentals of Computer System Software Basics of assembly language programming. Macros. System stack and procedure calls. Techniques for writing assembly language programs. Features of INTEL 8086/88-based PC. Interfaces between C and assembly codes. Prerequisites: GEN ENG 205-1,2,3,4 or EECS 110; EECS 203 recommended.

EECS 211-0 Object-Oriented Programming in C++ Continuation of 111. Key concepts in software design and systems programming. Object-oriented programming in C++, design of interpreters and compilers, and register machines. Required for the computer science degree. Not to be taken for credit with or after 230 or 231. Prerequisite: 110 or 111 or knowledge of any programming language.

EECS 212-0 Numerical Foundations of Computer Science Basic concepts of finite and structural mathematics. Sets, axiomatic systems, the propositional and predicate calculi, and graph theory. Application to computer science:

sequential machines, formal grammars, and software design. Prerequisite: MATH 230.

EECS 213-0 Introduction to Computer Systems The hierarchy of abstractions and implementations that make up a modern computer system; demystifying the machine and the tools used to program it; systems programming in C in the UNIX environment. Preparation for upper-level systems courses. Prerequisite: 211 or 230.

EECS 214-0 Data Structures and Data Management Design, implementation, and analysis of abstract data types; data structures and their algorithms. Topics include data and procedural abstraction, linked lists, stacks, queues, binary trees, searching, and sorting. Required for the computer science degree. Prerequisite: 211 or 230.

EECS 221-0 Fundamentals of Circuits Circuit analysis and network theorems; linearity and superposition; series/parallel combinations of R, L, and C circuits; sinusoidal forcing; complex frequency and Bode plots; mutual inductance and transformers; two-port networks; Fourier analysis; response of circuits to periodic nonsinusoidal sources. Prerequisite: 202.

EECS 222-0 Fundamentals of Signals and Systems Comprehensive introduction to analysis of continuous and discrete-time signals and systems. Linear time-invariant systems, convolution. Fourier series representations of periodic signals. Continuous- and discrete-time Fourier transforms. Laplace transform; z-transform. Prerequisite: 202.

EECS 223-0 Fundamentals of Solid-State Engineering Crystalline state of matter; quantum phenomena and quantum mechanics; electrons in atoms, atoms in crystals, electrons in crystals; semiconductors; thermal properties of crystals, electrical properties of crystals and semiconductors; p-n junction. Prerequisites: 202; PHYSICS 135-3; MATH 234.

EECS 224-0 Fundamentals of Electromagnetics and Photonics Concepts of flux, potential, gradient, divergence, curl, and field intensity. Boundary conditions and solutions to Laplace and Poisson equations. Capacitance and inductance calculations. Conductors, insulators, and magnetic materials. Prerequisites: 202, 221; PHYSICS 135-2; MATH 234; or consent of instructor.

EECS 225-0 Fundamentals of Electronics Diode, BJT, and FET circuits; design using ideal operational amplifiers; feedback; frequency response; biasing; current sources and mirrors; small-signal analysis; design of operational amplifiers. Prerequisites: 221, 223.

EECS 230-0 Programming for Computer Engineers Introduction to computer programming in an object-oriented language. Emphasis on applications to computer systems, computer simulation, and discrete optimization. Basic principles of software engineering. Not to be taken for credit with or after 211 or 231. Prerequisites: GEN ENG 205-1,2.

EECS 231-0 Advanced Programming for Computer Engineers Object-oriented programming, classes and data hiding, dynamic object construction and destruction, derived classes and inheritance, virtual functions; file processing; introduction to UNIX; testing and test generation. Not to be taken for credit with or after 211 or 230. Prerequisite: 110 or knowledge of a programming language.

EECS 250-0 Physical Electronics and Devices The physical basis of electronic and optoelectronic devices and their application in analog and digital systems. Diodes, transistors, LEDs, photodetectors, and lasers are described, and their properties explored. Prerequisites: 221; PHYSICS 135-2.

EECS 270-0 Applications of Electronic Devices DC and AC networks, rectifiers, transistor amplifiers, feedback and operational amplifiers, digital electronics, and microprocessors. Not open to electrical engineering degree candidates. Prerequisites: MATH 224; PHYSICS 135-2; or equivalent.

EECS 295-0 Intermediate Topics in Electrical Engineering and Computer Science Topics suggested by students or faculty and approved by the department.

EECS 302-0 Probabilistic Systems and Random Signals Basic concepts of probability theory and statistics, random variables, moments; multiple random variables, conditional distributions, correlation; random signals; applications to engineering systems. Prerequisite: MATH 234.

EECS 303-0 Advanced Digital Logic Design Overview of digital logic design. Technology review. Delays, timing in combinational and sequential circuits, CAD tools, arithmetic units such as ALUs and multipliers. Introduction to VHDL. Prerequisite: 203.

EECS 307-0 Communications Systems Analysis of analog and digital communications systems, including modulation, transmission, and demodulation of AM, FM, and TV systems. Design issues, channel distortion and loss, bandwidth limitations, additive noise. Prerequisites: 222, 302.

EECS 308-0 Advanced Electromagnetics and Photonics Electromagnetic waves, transmission lines; impedance transformation; transients on lines; electrostatics, conductors, and capacitors; magnetostatics and inductors; wave reflection and transmission; electromagnetic motor, Maxwell's equations; metallic waveguides and wave transmission; antenna and diffraction, antenna arrays, communication, and radar. Prerequisite: 224.

EECS 313-0 Telecommunication Networks for Multimedia Signals and bandwidth concepts, spectra, basics of electronics, information and coding, modulation, multiplexing, transmission systems, transmission media, analog versus digital communications, computer networks, and switching techniques. Not for electrical engineering or computer engineering degree candidates.

EECS 317-0 Data Management and Information Processing Data representation, file and record organization, linear and linked lists, and scatter storage techniques. Sorting

and searching algorithms. Solving problems involving large databases. Not for computer science degree candidates. Prerequisite: 110, 111, or programming experience.

EECS 321-0 Programming Languages Introduction to key parts of programming languages: syntax, semantics, and pragmatics. Implementation of a series of interpreters that show how various aspects of programming languages behave. Prerequisites: 111, 214.

EECS 322-0 Compiler Construction Overview of compilers and context-free languages, top-down parsing, LL(1) parser construction, translation grammars, implementation of lexical analyzer, parser and translator, compiler optimization, error handling, and recovery. Prerequisite: 214.

EECS 325-1,2 Artificial Intelligence Programming Introduction to LISP and programming knowledge-based systems and interfaces. Strong emphasis on writing maintainable, extensible systems. Topics include semantic networks, frames, pattern matching, deductive inference rules, case-based reasoning, and discrimination trees. Project-driven. Substantial programming assignments. Prerequisite: 110, 111, or programming experience.

EECS 328-0 Numerical Methods for Engineers Introduction to numerical methods; numerical differentiation, numerical integration, solution of ordinary and partial differential equations. Writing programs in FORTRAN, C, or Pascal using methods presented in class. Prerequisites: GEN ENG 205-1,2,3; MATH 220, 224, 230.

EECS 330-0 Human-Computer Interaction Introduction to human-computer interaction and design of systems that work for people and their organizations. Understanding the manner in which humans interact with and use computers for productive work. Prerequisite: programming experience.

EECS 332-0 Digital Image Analysis Introduction to computer and biological vision systems, image formation, edge detection, image segmentation, texture, representation and analysis of two-dimensional geometric structures and of three-dimensional structures. Prerequisites: 214; IEMS 202; MATH 240.

EECS 333-0 Introduction to Communication Networks Data communication basics. Telephone, cellular, cable, and computer networks. Layered network architectures, models, and protocols. Switching, routing, flow control, and congestion control. Medium access control, ARQ, and local area networks. Queuing models and network performance analysis. Prerequisite: 302; IEMS 202; MATH 320-1,2,3; or equivalent basic probability theory.

EECS 334-0 Introduction to Computer Vision Introduction to computer and biological vision systems, image formation, edge detection, image segmentation, texture, and representation and analysis of two- and three-dimensional structures. Prerequisites: 214; IEMS 201.

EECS 335-0 Introduction to the Theory of Computation Mathematical foundations of computation, including computability, relationships of time and space, and the P vs. NP problem. Prerequisite: 212 or consent of instructor.

EECS 336-0 Design and Analysis of Algorithms Analysis techniques: solving recurrence equations. Algorithm design techniques: divide and conquer, the greedy method, backtracking, branch-and-bound, and dynamic programming. Sorting and selection algorithms, order statistics, heaps, and priority queues. Prerequisite: 212, 214, or consent of instructor.

EECS 337-0 Natural Language Processing Semantics-oriented introduction to natural language processing, broadly construed. Representation of meaning and knowledge inference in story understanding, script/frame theory, plans and plan recognition, counterplanning, and thematic structures. Prerequisite: 348 or consent of instructor.

EECS 338-0 Practicum in Intelligent Information Systems A practical excursion into building intelligent information systems. Students develop a working program in information access, management, capture, or retrieval. Project definition, data collection, technology selection, implementation, and project management.

EECS 339-0 Introduction to Database Systems Data models and database design. Modeling the real world: structures, constraints, and operations. The entity relationship to data modeling (including network hierarchical and object-oriented), emphasis on the relational model. Use of existing database systems for the implementation of information systems. Prerequisite: 214.

EECS 340-0 Introduction to Networking A top-down exploration of networking using the five-layer model and the TCP/IP stack, covering each layer in depth. Students build web clients, servers, and a TCP implementation and implement routing algorithms. Prerequisite: 214.

EECS 343-1,2 Operating Systems Fundamental overview of operating systems. **1.** Operating system structures, processes, process synchronization, deadlocks, CPU scheduling, and memory management. **2.** File systems, secondary storage management, issues in distributed systems, case studies, and special topics. Requires substantial programming projects. Prerequisites: 214; 213 or 205; 231.

EECS 344-0 Design of Computer Problem Solvers Principles and practice of organizing and building artificial intelligence reasoning systems. Pattern-directed rule systems, truth-maintenance systems, and constraint languages. Prerequisites: 348 and 325-1 or equivalent LISP experience.

EECS 345-0 Distributed Systems Basic principles behind distributed systems (collections of independent components that appear to users as a single coherent system) and main paradigms used to organize them. Prerequisites: 340, 343.

EECS 346-0 Microprocessor System Design Structure and timing of typical microprocessors. Sample microprocessor families. Memories, UARTS, timer/counters, serial devices, and related devices. MUX and related control structures

for building systems. Sample single-board computers. Standard bus structures. Interrupt programming. Hardware/software design tradeoffs. Prerequisites: 203, 205.

EECS 347-1 Microprocessor System Projects I Programmable logic devices such as PAL and FPGA. Design, prototype, and test individual projects involving microprocessors and programmable logic devices. Prerequisite: 346.

EECS 347-2 Microprocessor System Projects II Designing, prototyping, and testing individual projects involving microprocessors and related devices, such as PAL/FPGA and special-purpose ICs. Embedded-system tools such as special-purpose compilers and ICE (in-circuit emulation). Manufacturing issues such as PCB layout. Survey of microprocessor platforms. Prerequisite: 347-1.

EECS 348-0 Introduction to Artificial Intelligence Core techniques and applications of AI. Representing, retrieving, and applying knowledge for problem solving. Hypothesis exploration. Theorem proving. Vision and neural networks. Prerequisite: 325-1 or LISP programming experience.

EECS 349-0 Machine Learning Study of algorithms that improve through experience. Topics typically include Bayesian learning, decision trees, genetic algorithms, neural networks, Markov models, and reinforcement learning. Assignments include programming projects and written work. Prerequisite: 348.

EECS 350-0 Introduction to Computer Security Basic principles and practices of computer and information security. Software, operating system, and network security techniques, with detailed analysis of real-world examples. Topics include cryptography, authentication, software and operating system security (e.g., buffer overflow), Internet vulnerability (DoS attacks, viruses/worms, etc.), intrusion detection systems, firewalls, VPN, and web and wireless security. Prerequisite: 213 or equivalent or consent of instructor; 340 highly recommended.

EECS 351-0 Introduction to Computer Graphics Mathematical software and hardware requirement for computer graphics systems. Data structures and program ming languages. Random displays. Graphic applications. Prerequisite: 214.

EECS 352-0 Machine Perception of Music and Audio Machine extraction of musical structure in audio and MIDI and score files, covering areas such as source separation and perceptual mapping of audio to machine-quantifiable measures. Prerequisite: GEN ENG 205-2, EECS 211, EECS 231, or prior programming experience in MATLAB.

EECS 353-0 Digital Microelectronics Logic families, comparators, A/D and D/A converters, combinational systems, sequential systems, solid-state memory, large-scale integrated circuits, and design of electronic systems. Prerequisites: 203, 225.

EECS 354-0 Network Penetration and Security Practical tools for vulnerability assessment and defense of computer and communication systems. Prerequisites: 213 or 205; 231; 333 or 340.

EECS 355-0 Introduction to FPGA Design Overview of computer-aided design tool flow for ASIC and FPGA design. Synthesis from hardware description languages and creation of finite-state machines. Differences between FPGA and ASIC design flows. Exploration of concepts in several projects. Prerequisite: 303.

EECS 356-0 Introduction to Formal Specification and Verification Introduction to formal techniques used for system specifications and verifications: temporal logic, set theory, proofs, and model checking. TLA+ (Temporal Logic of Actions) specifications. Safety and liveness properties. Real-time specs and verifications.

EECS 357-0 Introduction to VLSI CAD VLSI physical design, including logic design, architectural design, and packaging. Development of CAD tools for VLSI physical design. Prerequisites: 214, 303.

EECS 358-0 Introduction to Parallel Computing Introduction to parallel computing for scientists and engineers. Shared-memory parallel architectures and programming, distributed memory, message-passing data-parallel architectures, and programming. Prerequisites: 361; 211 or 230.

EECS 359-0 Digital Signal Processing Discrete-time signals and systems. Discrete-time Fourier transform, z-transform, discrete Fourier transform, digital filters. Prerequisite: 222.

EECS 360-0 Introduction to Feedback Systems Linear feedback control systems, their physical behavior, dynamical analysis, and stability. Laplace transform, frequency spectrum, and root locus methods. System design and compensation using PID and lead-lag controllers. Digital implementations of analog controllers. Not to be taken for credit with or after MECH ENG 391. Prerequisite: 222.

EECS 361-0 Computer Architecture Design and understanding of the computer system as a whole unit. Performance evaluation and its role in computer system design; instruction set architecture design, datapath design and optimizations (e.g., ALU); control design; single cycle, multiple cycle, and pipeline implementations of processor. Hazard detection and forwarding; memory hierarchy design; cache memories, virtual memory, peripheral devices, and I/O. Prerequisites: 205, 303.

EECS 362-0 Computer Architecture Project Quarter-long team project designing a processor for a complete instruction set. Involves ISA design, design of components, datapath, and control for a pipelined processor to implement the ISA. Use of industrial-strength design tools and VHDL as the design specification language. Designs are evaluated using benchmark programs for correctness and performance. Prerequisite: 361.

EECS 363-0 Digital Filtering Recursive and nonrecursive digital filters, decimation and interpolation, A/D and D/A conversion as digital filtering problems. Implementation of

nonrecursive filters via FFT, quantization problems (e.g., companding and limit cycles). Prerequisite: 359.

EECS 368-0 Programming Massively Parallel Processors with CUDA GPU architecture, CUDA programming model, parallel programming optimizations for 1000+ cores, performance analysis, OpenCL. Requires two-week mini-project on optimized histogramming on GPUs. Students may not earn credit for both 368 and 468. Prerequisites: 213; 211, 230, or intermediate C programming experience; or consent of instructor.

EECS 369-0 Introduction to Sensor Networks Basic hardware and software platforms for sensor networks. Various algorithmic techniques for data routing, query processing, and tracking. Prerequisite: 343 or 340.

EECS 370-0 Computer Game Design Plot, narrative, and character simulation for creating game worlds; artificial intelligence for synthetic characters; tuning gameplay. Substantial programming and project work. Prerequisites: 214; 1 unit of 322, 343, 348, or 351.

EECS 371-0 Knowledge Representation and Reasoning Principles and practices of knowledge representation, including logics, ontologies, common-sense knowledge, and semantic web technologies. Prerequisite: 348, 325, or equivalent experience with artificial intelligence.

EECS 372-0 Designing and Constructing Models with Multiagent Languages Exploration and analysis of multi-agent models, which simulate "emergent" scientific phenomena in a wide variety of content domains.

EECS 374-0 Introduction to Digital Control Discrete dynamics systems; discrete models of continuous systems feedback and digital controllers; analog-digital conversion; digital control design including PID, lead/lag, deadbeat, and model-matching controllers. Prerequisite: 360.

EECS 378-0 Digital Communications Sampling and time-division multiplexing, baseband digital signals and systems. Coded pulse modulation, error control coding, digital modulation systems, information measure and source encoding, and introduction to spread spectrum communications. Prerequisites: 302, 307.

EECS 379-0 Lasers and Coherent Optics Optical resonators; fundamental operation of lasers; mode-locking and Q-switching; optical propagation and diffraction; Gaussian beams; thin-lens imaging; optical signal processing. Prerequisites: 222, 224.

EECS 380-0 Wireless Communications Overview of existing and emerging wireless communications systems; interference, blocking, and spectral efficiency; radio propagation and fading models; performance of digital modulation in the presence of fading; diversity techniques; code-division multiple access. Prerequisite: 378.

EECS 381-0 Electronic Properties of Materials Fundamental properties of electrons in materials. Classical and quantum mechanical descriptions of free and bound electrons. Optical, electrical, thermal, and magnetic properties of materials. Microelectronic, optoelectronic, magnetic recording, superconductivity. Prerequisites: 223 and 224 or consent of instructor.

EECS 382-0 Photonic Information Processing Introduction to photonic information processing; coherent and incoherent light; electro-optic and acousto-optic modulation; optical signal processing; holography; optical storage. Prerequisites: 222 and 224 or consent of instructor.

EECS 383-0 Fiber-Optic Communications Semiconductor diode lasers, internal modulation, electro-optic modulation, coherent and incoherent detection, optical fibers and their properties, optical amplifiers, communication systems, optical networks. Prerequisites: 223, 224.

EECS 384-0 Solid-State Electronic Devices Energy-band model for semiconductors; carrier statistics and transport; diodes, bipolar and field-effect transistors; integrated circuits, optoelectronic and heterojunction devices. Prerequisite: 381 or consent of instructor.

EECS 385-0 Optoelectronics Introduction to solid-state optoelectronic devices; display devices, laser diodes, photodetectors, and light modulators; optical waveguides and fibers; system application of optoelectronic devices. Prerequisite: 381 or consent of instructor.

EECS 386-0 Computational Electromagnetics and Photonics Introduction to the finite-difference time-domain (FDTD) method in numerical modeling of electromagnetic and optical wave interactions with engineering structures. Finite differences; Maxwell's equations; numerical dispersion and stability; free-space and waveguide field sources; absorbing boundary conditions; material dispersions and nonlinearities; modeling examples in modern electromagnetic and optical engineering. Prerequisite: 308.

EECS 388-0 Nanotechnology Physics and fabrication of photonic and electronic devices. Physics of semiconductors: crystal structures, reciprocal lattice, elements of quantum mechanics, heterojunctions, quantum wells, and superlattices. Bulk crystal, thin-film, and epitaxial growth technologies. Device processing technologies: diffusion oxidation, ion implantation, annealing, etching, and photolithography. Prerequisite: 223 or consent of instructor.

EECS 389-0 Superconductivity and Its Applications Properties of materials in the superconducting state; charge flow dynamics of type II superconductors; high-Tc superconductors; applications for computers and high-frequency devices. Prerequisite: 381 or consent of instructor.

EECS 390-0 Introduction to Robotics Homogeneous vectors and planes; homogeneous transformation, position and orientation transformations, kinematics and inverse kinematic solutions of robot manipulators; Jacobian and inverse Jacobian relation; robot trajectory and task planning; dynamic formulation and computation of robot manipulators; robot programming and control systems. Prerequisite: 230.

EECS 391-0 VLSI Systems Design Design of CMOS digital integrated circuits, concentrating on architectural and

topological issues. Tradeoffs in custom design, standard cells, gate arrays. Use of VLSI design tools on a small project. Prerequisite: 303.

EECS 392-0 VLSI Systems Design Projects Design of a cutting-edge VLSI chip. Teams of 5 to 10 students undertake a large circuit design problem, going from specification to VLSI implementation while optimizing for speed, area, and/or power. Group collaboration and engineering design. Prerequisite: 391.

EECS 393-0 VLSI Design and Analysis of High-Speed Integrated Circuits Issues that arise in the design and analysis of VLSI circuits at high speeds, such as buffer sizing, repeater insertion, noise, electromigration, Elmore decay, scaling trends, and power consumption. Prerequisite: 391.

EECS 394-0 Software Project Management and Development Software development methodologies. Object-oriented analysis and design, CASE tools, software life cycle. Project management tools, programming teams. Executable specifications, automatic test generation. Prerequisite: 343 or equivalent programming experience.

EECS 395-0 Special Topics in Electrical Engineering and Computer Science Topics suggested by students or faculty and approved by the department.

EECS 398-0 Electrical Engineering Design Design of electrical and electronic devices, circuits, and systems by the application of the engineering sciences, economics, and Institute of Electrical and Electronics Engineers or other national standards. Prerequisite: senior standing.

EECS 399-0 Projects Seminar and projects for advanced undergraduates on subjects of current interest in electrical and computer engineering.

ENGINEERING DESIGN

See Manufacturing and Design Engineering for the certificate in engineering design.

ENGINEERING SCIENCES AND APPLIED MATHEMATICS

www.esam.northwestern.edu

The Department of Engineering Sciences and Applied Mathematics offers coursework in applied mathematics and administers an undergraduate program leading to a BS in applied mathematics and a graduate program in applied mathematics.

The applied mathematics program is intended to provide the knowledge necessary for applying mathematical ideas and techniques to the problems that arise in engineering or science. It is expected that a student receiving a BS in applied mathematics would have the background for suitable employment in industry or for graduate study in either mathematics (pure or applied) or an engineering field, including computer science and operations research. To achieve these goals, the applied mathematics program is designed to be flexible and allow the student to concentrate a substantial part of the coursework either in mathematics or one or more areas of application.

Degree in Applied Mathematics

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses
  - PHYSICS 135-2,3
  - 2 courses from the following list:
    - *Biological sciences:* BIOL SCI 210-1,2,3; CHEM ENG 275
    - *Chemistry:* CHEM 101, 102, 103, 171, 172, 210-1,2
    - *Earth and planetary sciences/astronomy:* EARTH 201, 202; ASTRON 220
- 3 design and communications courses
- 5 basic engineering courses
  - EECS 230 or 231
  - 4 courses from at least three of the following areas:
    - *Computer architecture and numerical methods:* EECS 203, 205, 328
    - *Electrical science:* EECS 202, 221, 222, 223, 224, 270; MECH ENG 233
    - *Fluids and solids:* BMD ENG 270, 271; CHEM ENG 321; CIV ENV 216, 219; MECH ENG 241
    - *Materials science and engineering:* MAT SCI 201, 203, *or* 301
    - *Systems engineering and analysis:* CHEM ENG 210; CIV ENV 304; IEMS 310, 313, 326
    - *Thermodynamics:* BMD ENG 250; CHEM 342-1; CHEM ENG 211; MAT SCI 314, 315; MECH ENG 220, 370 (MECH ENG 220 may not be taken with CHEM 342-1 or CHEM ENG 211)
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 5 engineering sciences and applied mathematics courses: ES APPM 311-1,2, 322, 346, 421-1
- ES APPM 311-3 or MATH 325
- MATH 334
- 2 courses chosen from EECS 302; IEMS 202, 303; IEMS 310 or 313; MATH 330-1,2,3
- 1 course chosen from ES APPM 339, 421-2, 3, 495 (subject to department approval)
- 4 courses in engineering or the sciences at the 300-level or higher leading to an approved concentration in one of the following areas:
  - *Engineering*
  - *Mathematical social sciences (e.g., economics)*
  - *Mathematics (e.g., discrete mathematics or analysis)*
  - *Numerics*
  - *The sciences*

- 2 technical electives at the 300 level or higher in engineering, science, or mathematics

Courses

ES APPM 252-1,2 Honors Calculus for Engineers Alternative to standard calculus sequence. Covers more material at a deeper level with more applications. Satisfies same requirements as MATH 230 and 234. Prerequisite: invitation or consent of instructor.

ES APPM 311-1,2 Methods of Applied Mathematics Ordinary differential equations; Sturm-Liouville theory, properties of special functions, solution methods including Laplace transforms. Fourier series: eigenvalue problems and expansions in orthogonal functions. Partial differential equations: classification, separation of variables, solution by series and transform methods. Prerequisite: GEN ENG 205-4, 206-4, or MATH 250.

ES APPM 311-3 Methods of Applied Mathematics: Complex Variables Imaginary numbers and complex variables, analytic functions, calculus of complex functions, contour integration with application to transform inversion, conformal mapping. May be taken independently of 311-1,2. Prerequisite: GEN ENG 205-4, 206-4, or MATH 250.

ES APPM 321-0 Modeling Soft Matter: Networks, Membranes, Fluctuations Fundamental mathematical tools (e.g., differential geometry, variational calculus) are applied to modern concepts of soft-matter structure and mechanics in various fields (e.g., biological membranes, polymers). Prerequisites: 311-1,2 or consent of instructor.

ES APPM 322-0 Applied Dynamical Systems Example-oriented survey of nonlinear dynamical systems, including chaos. Combines numerical exploration of differential equations describing physical problems with analytic methods and geometric concepts. Applications to mechanical, fluid dynamical, electrical, chemical, and biological systems. Prerequisites: 311-1,2 or equivalent or consent of instructor.

ES APPM 346-0 Modeling and Computation in Science and Engineering Advanced techniques for initial value problems, differential algebraic systems, bifurcations, chaos, and partial differential equations. Applications drawn from different physical areas. Prerequisites: MATH 234, 240; MATH 250 or GEN ENG 205-4; PHYSICS 135-1,2 or equivalent; familiarity with a programming language; or consent of instructor.

ES APPM 370-1 Introduction to Computational Neuroscience From neurons to networks. Ion channels, Hodgkin-Huxley framework, simplified models, cable equation, synapses, spike-triggered average, and optimal stimulus. Feed-forward and recurrent firing-rate networks. Statistical approach, Bayesian modeling. Brief introduction to numerical methods.

ES APPM 399-0 Projects Special studies to be carried out under faculty direction. Credit to be arranged.

ENVIRONMENTAL ENGINEERING

See Civil and Environmental Engineering.

INDUSTRIAL ENGINEERING AND MANAGEMENT SCIENCES

www.iems.northwestern.edu

Northwestern's industrial engineering students graduate with the skills needed to create, design, analyze, and improve the operation of complex organizational systems, e.g., financial systems, information systems, production systems, logistics, and transportation. All students acquire an understanding of statistics, economics, optimization, computing, and simulation techniques. Elective opportunities include courses in business management, advanced economics and mathematics, quality control and reliability, communications and information systems, and production and supply-chain management. Realistic (i.e., open-ended and ill-defined) problems are used to help students refine the application of these principles as well as their ability to work in teams and to communicate their results effectively. These are the experiences that employers find most valuable in our graduates regardless of the field they enter.

Students may pursue an optional concentration using technical electives and other courses from one or more of the following areas: economics and finance, general business management, industrial behavioral sciences, mathematical sciences/graduate research, production and logistics, and statistics and quality control.

Many industrial engineering graduates eventually assume management positions. In preparation for such careers, students take full advantage of the additional academic, business, and leadership programs available at Northwestern: a major or minor in economics, the business enterprise certificate for engineers, the Undergraduate Leadership Program, the Business Institutions Program, study abroad, and the co-op program. The two-quarter senior design project allows students to integrate all of these experiences.

Degree in Industrial Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses
  - Chosen from at least two of the following areas:
    - *Physics:* PHYSICS 135-2,3, 335
    - *Biological sciences:* BIOL SCI 210-1,2,3; CHEM ENG 275
    - *Chemistry:* CHEM 101, 102, 103, 171, 172, 210-1,2
    - *Earth and planetary sciences/astronomy:* EARTH 201, 202; ASTRON 220
  - No more than 2 courses from earth and planetary sciences/astronomy

- No more than 3 courses in any other area
- PHYSICS 135-2 and 1 unit of chemistry recommended

- 3 design and communications courses
- 5 basic engineering courses from four different areas
  - EECS 230, 317
  - IEMS 326
    - May not be taken concurrently with or after KELLG FE 310.
    - 1 of the courses on the following list may substitute for 326, as long as the 5 basic courses are from four different areas.
  - 2 courses from two different areas from the following list or by petition (provided the 18-course ABET requirement is met)
    - Computer architecture and numerical methods
      EECS 205
    - Electrical science
      EECS 202, 270
      MECH ENG 233
    - Fluids and solids
      BMD ENG 270, 271
      CHEM ENG 321
      CIV ENV 216
      MECH ENG 241
    - Materials science and engineering
      MAT SCI 201, 301 (may not be taken concurrently)
    - Probability, statistics, and quality control
      BMD ENG 220
      CHEM ENG 312
      MECH ENG 359
    - Thermodynamics
      BMD ENG 250
      CHEM ENG 211
      MAT SCI 314, 315
      MECH ENG 220 (may not be taken with CHEM ENG 211 or CHEM 342-1), 370
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 2 probability and statistics courses: IEMS 202, 303
- 3 operations research courses: IEMS 313, 315, 317
- 1 applied behavioral science course: IEMS 340 or 342
- 1 production and logistics course chosen from IEMS 381, 382, 383, 385
- 2 senior design project courses
  - IEMS 393-1,2
- 7 electives
  - 3 industrial engineering/operations courses from IEMS 304, 305, 306, 307, 373, 381, 382, 383, 385, 391
  - 1 management science course from IEMS 325, 340, 341, 342, 390, 392
  - 3 engineering courses at the 200 level or higher or any course from the general technical elective group (available from the department)
    - No more than 2 units of 399 are allowed.
    - No more than 2 courses in this group may be taken P/N; no other electives may be taken P/N.
- Concentration (optional): at least 4 courses from an approved list
  - Students may pursue more than one concentration.
  - Concentrations may be created from courses that satisfy other requirements or concentrations.
  - A list of available concentration areas may be found on the department website.

Courses

IEMS 201-0 Introduction to Statistics Collecting data; summarizing and displaying data; drawing conclusions from data; probability background, confidence intervals, hypotheses tests, regression, correlation. Not open to industrial engineering degree candidates. Not to be taken for credit with or after STAT 210.

IEMS 202-0 Probability Introduction to probability theory and its applications. Random variables and distributions, including binomial, Poisson, exponential, and normal. Monte Carlo simulation. Examples in reliability, inventory, finance, and statistics. Homework, labs, and exams. Not to be taken for credit with or after MATH 310-1. Prerequisite: concurrent enrollment in MATH 234.

IEMS 210-0 Methods, Standards, and Work Design Introduction to traditional topics in industrial engineering, including time study, work measurement, standards, and design. Enables industrial engineering students to understand and assume traditional industrial engineering roles upon graduation. Prerequisite: knowledge of probability and statistics.

IEMS 225-0 Principles of Entrepreneurship Introduction to essential elements of building one's own business, from brainstorming ideas and assessing opportunities to pitching a business idea. History of entrepreneurship and the entrepreneurial psyche. Business plan fundamentals, including strategy, finance, accounting, marketing, operations, and choosing the ideal management team. May not be taken after 325.

IEMS 295-0 Introductory Topics in Industrial Engineering Topics suggested by students or faculty members and approved by the department; taught at an intermediate level.

IEMS 303-0 Statistics Statistical methods for data analysis. Descriptive plots and statistics; observational studies and experiments; confidence interval estimation; hypothesis testing; regression and correlation. Homework, labs, and project. Not to be taken for credit with or after STAT 320-1. Prerequisite: 202 or equivalent.

IEMS 304-0 Statistical Methods for Data Mining Advanced statistical methods. Multiple regression; analysis of

variance; design and analysis of single-factor and multifactor experiments; categorical data; nonparametric methods. Homework and project. Prerequisite: 303 or equivalent.

IEMS 305-0 Statistical Methods for Quality Improvement Methods for controlling and improving industrial processes. Control charts; process capability; gage repeatability and reproducibility. Multifactor experiments; screening experiments; robust design. Homework, labs, and project. Prerequisite: 303 or equivalent.

IEMS 306-0 Decision Analysis Theory and practice of analyzing decisions in the public and private sectors. Multiple objectives; influence diagrams; decision trees; sensitivity analysis; probability assessment; utility; human biases. Problems, cases, and projects. Prerequisite: 202 or equivalent.

IEMS 307-0 Quality Improvement by Experimental Design Methods for designing and analyzing industrial experiments. Blocking; randomization; multiple regression; factorial and fractional factorial experiments; response surface methodology; Taguchi's robust design; split plot experimentation. Homework, labs, and project. Prerequisite: 303 or equivalent.

IEMS 310-0 Operations Research Survey of operations research techniques. Linear programming, decision theory, stochastic processes, game theory. Not open to industrial engineering degree candidates. May not be taken with 313 or 315.

IEMS 313-0 Deterministic Models and Optimization Formulation and solution of applicable optimization models, including linear, integer, nonlinear, and network problems. Efficient algorithmic methods and use of computer modeling languages and systems. Homework, exams, and project. Prerequisites: GEN ENG 205-1; MATH 230; sophomore standing.

IEMS 315-0 Stochastic Models and Simulation Modeling and analysis of dynamic systems subject to uncertainty. Integrated approach to stochastic analysis and simulation. Rough-cut analysis of queuing systems. Homework, exams, computer labs, and project. Prerequisites: 202, 303; GEN ENG 205-1.

IEMS 317-0 Discrete-Event Systems Simulation Computer simulation of discrete-change systems subject to uncertainty. Choice of input distributions; development of models; design and analysis of simulation experiments. Miniprojects, exams, and computer labs. Prerequisites: 303; 310 or 315.

IEMS 325-0 Engineering Entrepreneurship Overview of the entrepreneurial process from an engineering perspective. Idea generation, planning, financing, marketing, protecting, staffing, leading, growing, and harvesting. Students write startup business plans. Lectures, guest speakers, and case studies. Prerequisite: 1 course in accounting or finance such as 326 or BUS INST 260.

IEMS 326-0 Economics and Finance for Engineers Principles of corporate finance; financial decisions of firms; value; risk and return; investment and capital budgeting decisions under certainty and uncertainty; performance evaluation. Homework and exams. Students may not receive credit for 326 after taking KELLG FE 310. Prerequisites: MATH 220; basic understanding of probability and economics recommended.

IEMS 340-0 Field Project Methods Use of field research methods to solve management problems. Assignments focus on individual student projects. Students define projects, design field studies and pilot tests of data collection instruments, and present results. Prerequisite: consent of instructor for students who are not degree candidates.

IEMS 341-0 Social Network Analysis The use of social network analysis to understand the growing connectivity and complexity in the world around us on different scales, ranging from small groups to the World Wide Web. How we create social, economic, and technological networks, and how they enable and constrain attitudes and behaviors.

IEMS 342-0 Organizational Behavior Manager's view of tools available to recruit, develop, appraise, compensate, organize, and lead a team going through change. Application of psychological principles relating to human dynamics, motivation, teams, power, and organizational culture. Lectures, guest speakers, and exams. Work experience recommended.

IEMS 343-0 Project Management for Engineers A case study–based exploration of the body of project management knowledge. Key topics include project scheduling, risk management, project leadership, small-group dynamics, project methodologies, lifecycle concepts, and project controls. A Socratic approach is taken to exploring various case studies in the context of established and leading-edge project-management concepts. Prerequisites: 303 and 342 recommended.

IEMS 345-0 Negotiations and Conflict Resolution for Engineers Highly interactive case-study-based exploration of the field of negotiation and dispute resolution. Simulated negotiations and disputes ranging in complexity from single-party/single-issue to multiparty/multi-issue cases that illustrate integrative negotiation techniques. Also, dispute resolution techniques in the context of typical industrial situations. Prerequisites: 303 and 342 recommended.

IEMS 373-0 Introduction to Financial Engineering Financial markets, derivative securities, risk management, mathematical models in finance. Foreign exchange, debt, equity, commodity markets. Investing, trading, hedging, arbitrage. Forwards, futures, options, swaps, exotic derivatives. Models of price dynamics, binomial model, introduction to Black-Scholes theory and Monte Carlo simulation. Homework, projects, and guest speakers. Prerequisites: 315, 326, MATH 234, EECS 230, or equivalent or consent of instructor.

IEMS 381-0 Supply-Chain Modeling and Analysis Application and development of mathematical modeling tools for the analysis of strategic, tactical, and operational supply-chain

problems, including facility location, customer assignment, vehicle routing, and inventory management. Related topics including the role of information and decision support systems in supply chains. Homework, exams, and project. Prerequisite: 313.

IEMS 382-0 Production Planning and Scheduling Applications of operations research methods to practical problems of production planning and inventory control. Forecasting; aggregate planning; deterministic and stochastic inventory models; MRP; JIT; variability; scheduling in production and service systems. Case studies, homework, and exams. Prerequisites: 202; 310 or 313.

IEMS 383-0 Service Operations Management Exploration of service industries: cost-reduction and service-enhancement models, location planning, workforce scheduling, yield management, queuing analysis, and call-center management. Prerequisites: 313, 315.

IEMS 385-0 Introduction to Health Systems Management Health systems, lean concepts, patient-flow analysis, inference, and data-driven knowledge generation, decisions, and change. Forecasting, operations, and optimization of health resources. Prerequisites: 303, 313.

IEMS 390-0 Systems Management Introduction to systems problems and methods. Small-group development of potential classwide projects to be carried out the following quarter. Identifying projects, team skills, presenting plans and proposals.

IEMS 392-0 Systems Project Management Project management methods applied to analysis and design of a complex real-world system. Selection and implementation of a single classwide project. Planning, organizing, staffing, directing, and controlling; working with clients and stakeholders. Prerequisite: senior standing.

IEMS 393-1,2 Industrial Engineering Design Project 1. Case studies and small-scale projects involving application of operations research techniques to complex-decisions problems. Mathematical modeling, optimization, and policy analysis in public- and private-sector systems. Written and oral presentations of analyses. Prerequisites: 313, 315. **2.** Large-scale, open-ended team projects from selected fields of industrial engineering. Systems approach requiring establishment of objectives and criteria, analysis and synthesis of alternatives, feasibility, tradeoffs, testing, and evaluation. Written and oral reports. Prerequisite: 393-1.

IEMS 395-0 Special Topics in Industrial Engineering Topics suggested by students or faculty members and approved by the department.

IEMS 399-0 Independent Study Independent study on an industrial engineering topic supervised by a faculty member.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

MANUFACTURING AND DESIGN ENGINEERING

www.segal.northwestern.edu

The Segal Design Institute is the unit of the McCormick School that promotes the importance of design throughout the undergraduate curriculum and is dedicated to fostering innovation among engineering students and faculty.

Through the institute students gain design experience using state-of-the-art tools by participating in projects on topics that range from blast-resistant structures to HIV monitoring in the developing world. They also develop portfolios to showcase their design work.

Degree in Manufacturing and Design Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses: PHYSICS 135-2,3; 2 courses from CHEM 101, 102, 103, 171, 172, 210-1,2
- 3 design and communications courses
- 5 basic engineering courses
  - *Electrical science:* MECH ENG 233
  - *Fluids and solids:* CIV ENV 216
  - *Materials science and engineering:* MAT SCI 201
  - *Systems engineering and analysis:* IEMS 326
  - 1 additional course from BMD ENG 220, 250, 270, 271; CHEM 342-1; CHEM ENG 210, 211, 312, 321; CIV ENV 219, 304, 306; EECS 205, 211, 221, 222, 223, 224, 230, 231, 270, 302 317, 328; ES APPM 346; IEMS 303, 310, 313; MAT SCI 203, 301, 314, 315; MECH ENG 220, 233, 241, 359, 370
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 10 core courses: DSGN 308, 386; IEMS 201 or 303, 305 or 307, 310, 382; MAT SCI 318; MECH ENG 240, 340-1, 340-2 or -3
- 3 project courses from DSGN 384-1,2, MECH ENG 398, IEMS 393-1,2. At least 1 of these must be taken in the final 3 quarters before graduation.
- 3 technical electives: 2 courses from an approved list; 1 300-level engineering course

Segal Design Certificate

This certificate program, administered by the Segal Design Institute, develops a set of design and problem-solving skills that prove valuable in careers across the entire spectrum available to McCormick graduates. The program focuses on user-centered design in team-based, cross-disciplinary settings that address real-world problems.

Certificate Requirements (6 units)

- 1 2-quarter design sequence: 384-1,2 or 380-1,2
- 1 portfolio course: 370
- 3 elective courses from an approved list
  - 1 must be a DSGN course.
  - 2 must be at the 300-level.
- A design portfolio demonstrating accomplishments in design tools such as prototyping and implementation, modern software tools, design analysis, writing, project management, and effective graphical communication
- Successful completion of a Northwestern baccalaureate degree

Courses

DSGN 106-1,2 Design Thinking and Communication (.5 unit each) See General Engineering Courses.

DSGN 220-0 Introduction to Design Sketching (.5 unit) Design sketching to increase one's skills as a basic but essential form of communication. It is the medium for preliminary ideation. Basic rules and skills in a design studio setting.

DSGN 221-0 Design Sketching (.5 unit) Advanced sketching techniques. Further development of skills for the design studio setting. Prerequisite: DSGN 220 or consent of instructor.

DSGN 240-0 Introduction to Solid Modeling: SolidWorks (.5 unit) Solid modeling by creating three-dimensional shapes through two-dimensional sketches. Assemblies of individual parts. CAD modeling theory; modeling objects using different approaches for creating identical features. Lecture balanced with hands-on use of SolidWorks.

DSGN 245-0 Introduction to Computer-Aided Design: NX (.5 unit) Introduction to CAD software. Students develop solid models, detailed drawings, and product assemblies.

DSGN 246-0 Computer-Aided Design: NX (.5 unit) Building more complex shapes such as splines and other developed curves, building sheets through one or more sets of curves, and applying specially shaped transitions between faces. Sequence may not be repeated for credit.

DSGN 253-0 Managing Student-Run Projects Program management, structure, and control for complex, multiyear efforts such as the vehicle teams, a startup business, and other student-run activities. Developing a team vision, designing strategy, and preparing a multiyear business plan using a combination of casework and a team project.

DSGN 295-0 Introductory Topics in Design Topics suggested by students or faculty members and approved by the institute; taught at an intermediate level.

DSGN 297-0 Intermediate Topics in Engineering Design (.5 unit) Topics suggested by students and faculty and approved by the institute.

DSGN 305-0 Human-Centered Service Design Design of new or improved services that tap deeply into people's needs for connectedness, belonging, and autonomy. Project outcomes may include organizational structures, service designs, and designed products.

DSGN 308-0 Human-Centered Product Design Project-based course focusing on user needs: observational methods, brainstorming, prototyping, business models, and the social and engineering concerns for product design. Prerequisite: sophomore standing or 106-1,2.

DSGN 320-0 Introduction to Industrial Design Methods Process of product development from an industrial design perspective.

DSGN 325-0 Rendering: SolidWorks Focus on how to use surfacing, multibody solids, sweep and loft features, and the photorealistic rendering capabilities of SolidWorks for conceptual development and presentations. Prerequisite: DSGN 240 (or CAD equivalent) or consent of instructor; Adobe Photoshop basics helpful but not required.

DSGN 345-0 Computer-Aided Manufacturing: NX (.5 unit) CAM using the NX manufacturing environment to program machining operations for CNC milling. Operations, tool generation, and proper manufacturing geometries. Final project involving design and manufacture, g-code generation, and CNC, with emphasis on design for manufacturing considerations. Prerequisite: 245-1.

DSGN 346-0 Design for Fabrication: NX Part design from manufacturing setup and g-code generation to proper machine operation and manufacturing. Final project involving design and CNC manufacturing of a part outside of class time. Prerequisite: 345.

DSGN 348-0 Rapid Prototyping (.5 unit) The landscape of additive manufacturing processes and the operation of modern RP and reverse engineering equipment. Prerequisites: 245-1,2 or consent of instructor.

DSGN 350-0 Intellectual Property and Innovation The critical role of engineers in the invention/creative process and of technologists in wealth creation. Prerequisite: senior standing or consent of instructor.

DSGN 360-0 Design Competition Undergraduate teams compete in McCormick's annual autonomous robot contest. Work begins winter quarter; teams must pass a qualifying milestone to register for credit in spring quarter. Students may register for this course no more than twice.

DSGN 370-0 Engineering Design Portfolio and Presentation Creation of design projects that showcase engineering work and further career goals. The portfolio physically presents a story that embodies its creator's goals.

DSGN 371-0 Communicating Complex Data (.5 unit) Best practices in creating graphs, tables, and diagrams to communicate complex technical data clearly and powerfully. Emphasis on display of complex data as evidence in support of effective arguments.

DSGN 380-1,2 Industrial Design Projects I, II Design thinking; user-centric principles of design and DFM. Industrial design project for personal portfolio development. Concept ideation and sketching; use of discovery research and data visualization; problem framing and prototyping;

design for manufacturing, Keyshot rendering, rapid prototyping.

DSGN 384-1,2 Interdisciplinary Design Projects I, II Open-ended, team-based product or system design projects in real-world settings. Sequence must be taken in consecutive quarters. **1.** Project research, concept development, professional communication, advanced topics in design. Prerequisite: 106-1. **2.** Implementation, evaluation, communication, documentation. Prerequisite: 384-1.

DSGN 386-0 Manufacturing Engineering Design Hands-on design project addressing manufacturing engineering design topics, such as automation, quality control, process planning, tooling design, concurrent engineering, and continuous improvement. FactoryCAD, FactoryFLOW, and FactoryVIEW. Prerequisite: MECH ENG 340-1 or consent of instructor.

DSGN 395-0 Special Topics in Design Engineering Topics relevant to design engineering and approved by the institute. Prerequisite: consent of instructor.

DSGN 397-0 Topics in Engineering Design (.5 unit) Topics suggested by students and faculty and approved by the institute.

DSGN 399-0 Independent Study Independent study on a manufacturing engineering topic supervised by a faculty member. Prerequisite: consent of instructor.

MATERIALS SCIENCE AND ENGINEERING

www.matsci.northwestern.edu

The discipline of materials science and engineering has expanded rapidly in response to growing demand for materials that make improved use of existing resources or are needed for new technologies. The program at Northwestern is broad based, offering educational and research opportunities in polymer science, ceramics, metallurgy, surface science, biomaterials, nanomaterials, and electronic materials. Engineers, scientists, and technologists who work on these different materials all basically apply the same scientific principles governing the interrelation of processing, structure, properties, and material performance. A key theme of the Northwestern program is the integration of these principles in the systematic design of new materials.

The department offers an undergraduate program leading to the BS degree and participates in the co-op and BS/MS programs. The curriculum centers on basic engineering and materials coursework but also provides the flexibility to focus on different areas of concentration as described below. The student's educational experience is broadened by courses in the humanities, arts, sciences, and other areas of engineering. The undergraduate program culminates in the senior project, in which the student carries out a research/development project with a faculty member and his or her research group.

Students who complete the BS program will be well prepared for professional work or graduate study in the application, production, processing, or research and development of materials. Graduates find opportunities in many areas, since materials expertise is important in various engineering fields as well as in medicine, physics, and chemistry.

Areas of Concentration

The undergraduate program at Northwestern offers a close relationship between students and faculty. Every effort is made to tailor specific programs to needs and interests. Several broad areas of concentration are described below. Students are encouraged to create other areas that fit particular interests.

Biomaterials

The growth of biotechnology has stimulated interest in the interface of the life sciences and materials science. The field of biomaterials spans three broad areas: biomedical implant materials to replace natural structures; biomimetic materials applying biological concepts to the design of new engineering materials; and application of materials science principles to the understanding of structure and function in biological systems.

Design and Manufacturing

This concentration is especially appropriate for those planning a career in industry, where engineers typically work in teams on projects requiring experience with design and manufacturing. It builds on the design content in the materials science curriculum and provides additional interdisciplinary design experience. The concentration also develops industrially relevant strengths in the areas of materials selection, computational tools, materials processing, and failure analysis.

Electronic Materials

As microelectronics enters the era of ultralarge-scale integration, materials scientists face new challenges in developing materials and processes for integrated circuits with components of nanometer dimensions. New scientific principles, materials fabrication techniques, and improved instrumentation will be needed to exploit electronic-level structure/property relations in devices and their components. New electronic materials must be developed to meet requirements in a growing range of application areas, such as spintronics, optical computing, and fuel cells.

Metals and Ceramics

The ability to design increasingly higher-strength alloys allows for lighter structures, and higher-temperature materials provide energy efficiency. Heat-treatable and toughened ceramics exploit advanced knowledge of solid-state phase transformations and reactions. Exciting developments are taking place in high-performance composite

combinations of these and other materials for structural and electronic applications.

Nanomaterials

The area of nanomaterials, focusing on materials with sizes in the range of 1 to 100 nanometers, is an increasingly important research topic as nanotechnology industries develop. Examples of nanomaterials include ultrahigh-strength materials with nanometer-range structural features and structures designed and self-assembled atom by atom or molecule by molecule. Machines smaller than the tip of a pin can be built using either semiconductor materials processing or biologically inspired processing technology. This specialization is designed to give students the knowledge needed to work at the nanoscale, including design and synthesis, characterization, and theory/modeling/simulation of nanomaterials.

Polymeric Materials

Synthetic polymers offer the engineering community an ever-expanding array of materials having properties tailored by chemical and physical processing. New developments are opening up applications for polymers as high-strength, low-weight materials; optoelectronic components; and key materials in other revolutionary areas. The basic understanding of engineering properties in terms of multilevel microstructure is essential for the full utilization of polymers.

Surface Science

A solid communicates with the outside world through its surface. Wear, corrosion, and passivation are well-known surface processes. Chemical, electronic, and mechanical properties of materials depend on composition at surfaces and grain boundaries (internal surfaces), surface treatments, and the environment. The surface scientist must be able to not only determine the properties of surfaces and interfaces but also to control them.

Laboratories and Facilities

Materials science and engineering demands sophisticated experimental techniques for the preparation and characterization of advanced materials. The undergraduate program makes heavy use of state-of-the-art laboratory facilities in core courses, technical electives, and senior projects.

Materials preparation and processing equipment is available for all classes of materials, including an advanced crystal growth facility in a clean-room environment for preparing single crystals of metals, oxides, alkali halides, and semiconductors. Investigation of complex microstructures employs a wide array of microscopy, diffraction, and microanalysis techniques. A unique combination of instruments (cold field–emission transmission electron microscope, atom-probe field-ion microscopes, scanning tunneling microscopes) provides atomic resolution imaging and chemical analysis. These are complemented by an extensive surface analytical laboratory. Characterization of material properties employs an advanced mechanical testing facility featuring static and dynamic loading under controlled temperature and environment. Specialized facilities measure electrical, spectroscopic, magnetic, and photonic properties. Computer laboratories and a design studio address thermodynamic modeling and simulation of microstructural evolution, with application in materials design.

Degree in Materials Science and Engineering Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses
  - PHYSICS 135-2,3
  - CHEM 101 and 103 *or* CHEM 171 and 172
- 3 design and communications courses
- 5 basic engineering courses
  - *Fluids and solids:* CIV ENV 216
  - *Materials science and engineering:* MAT SCI 301
  - *Thermodynamics:* MAT SCI 314, 315
  - 1 course from BMD ENG 220; CHEM ENG 210, 312; CIV ENV 304, 306; EECS 202, 203, 205, 211, 221, 222, 223, 224, 230, 231, 270, 302, 328, 317; ES APPM 346; IEMS 201, 303, 310, 313, 326; MECH ENG 233, 359
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 11 required courses: MAT SCI 316-1,2, 331, 332, 351-1,2, 361, 390, 391, 396-1,2
- 5 technical electives in engineering, natural sciences (usually chemistry or physics), and mathematics chosen to fulfill an area of concentration
  - No more than 2 of the 5 units may be 200-level courses.
  - At least 2 of the 5 must be 300-level materials science and engineering courses.
  - Examples of programs for concentrations in biomaterials, design and manufacturing, electronic materials, metals and ceramics, nanomaterials, polymeric materials, and surface science are described in a departmental manual for degree candidates.
  - No more than 1 unit of 399 may be counted.

Courses

MAT SCI 101-0 Modern Materials and Society Introduction to materials—how they function, how they are made, the devices they enable, and their impact on society. Role of materials developments in technological innovation and global competitiveness. Prerequisites: high school

mathematics and science background. Fulfills Weinberg College distribution requirements; not intended for engineering students.

MAT SCI 190-0 Materials Science and Engineering Freshman Projects Laboratory-oriented, with research projects emphasizing use of the scanning electron microscope and other modern apparatus; correlation of structure with other properties of materials. Lectures, laboratory.

MAT SCI 201-0 Introduction to Materials Introduction to atomic and molecular organization in solids, with emphasis on structure-property relations in ceramics, electronic materials, metals, and polymers. Not to be taken for credit with or after 203 or 301. Prerequisite: CHEM 102.

MAT SCI 301-0 Materials Science Principles Equilibrium and nonequilibrium development of microstructures. Mechanical behavior of metals, ceramics, and polymers. Corrosion and stability of engineering materials. Materials processing. Not to be taken for credit with or after 201. Prerequisite: CHEM 102.

MAT SCI 314-0 Thermodynamics of Materials Classical and statistical thermodynamics; entropy and energy functions in liquid and solid solutions, and their applications to phase equilibria. Lectures, problem solving. Materials science and engineering degree candidates may not take this course for credit with or after CHEM 342-1.

MAT SCI 315-0 Phase Equilibria and Diffusion in Materials Application of thermodynamics to ternary phase equilibria. Defects and diffusion in solids. Interdiffusion. Short-circuit diffusion. Defects and transport in ionic solids. Lectures, problem solving. Prerequisite: 314 or equivalent.

MAT SCI 316-1,2 Microstructural Dynamics Principles underlying development of microstructures. Defects, diffusion, phase transformations, nucleation and growth, thermal and mechanical treatment of materials. Lectures, laboratory. Prerequisite: 315 or equivalent.

MAT SCI 318-0 Materials Selection Methods of specifying materials and the processes for making them in the context of a given application. Service performance of materials based on their physical and chemical properties. Case studies and use of high-level databases. Prerequisite: 201.

MAT SCI 331-0 Soft Materials Different kinds of polymeric materials. Relationships between structure and physical properties; rubber elasticity, the glassy state, crystallinity in polymers. Lectures, laboratory. Prerequisites: 301 or equivalent; 314 or CHEM 342-1.

MAT SCI 332-0 Mechanical Behavior of Solids Plastic deformation and fracture of metals, ceramics, and polymeric materials; structure/property relations. Role of imperfections, state of stress, temperatures, strain rate. Lectures, laboratory. Prerequisites: 316-1; 316-2 (may be taken concurrently).

MAT SCI 333-0 Composite Materials Introduction to ceramic-, metal-, polymer-matrix composites for structural applications. Emphasis on structure (reinforcements, architecture), properties (elasticity, strength, toughness, creep), processing, role of interface. Prerequisites: 316-1,2, 332.

MAT SCI 336-0 Chemical Synthesis of Materials The design of materials targeting important properties through processes that break and form primary chemical bonds. Fundamental principles and main methodologies, including polymerization, biosynthesis, self-assembly, sol-gel reactions, synthesis of nanomaterials, vapor-phase synthesis, and composite synthesis. Prerequisite: junior standing in materials science and engineering or consent of instructor.

MAT SCI 337-0 Conducting Polymers Fundamentals and applications of conducting polymers. Hands-on experience in synthesizing conducting polymer nanostructures.

MAT SCI 340-0 Ceramic Processing Steps in production of fired ceramic articles. Powder preparation and characterization, compact formation, slip casting, extrusion and injection molding; firing, liquid-phase and solid-state sintering. Lectures, laboratory. Prerequisite: 316-1 or equivalent.

MAT SCI 341-0 Introduction to Modern Ceramics Applications of ceramic materials, with emphasis on structure (bond, crystal, glass, defect, micro-); properties (thermal, electrical, optical, magnetic, mechanical); and processing (powders, forming, densification). Prerequisites: 316-1,2 or consent of instructor.

MAT SCI 351-1,2 Introductory Physics of Materials Quantum mechanics; applications to materials and engineering. Band structures and cohesive energy; thermal behavior; electrical conduction; semiconductors; amorphous semiconductors; magnetic behavior of materials; liquid crystals. Lectures, laboratory, problem solving. Prerequisites: GEN ENG 205-4 or equivalent; PHYSICS 135-2,3.

MAT SCI 355-0 Electronic Materials Principles, models, and characterization of semiconductor materials. Crystal growth and doping. Diffusion, epitaxy, and monolithic processes. Current transport, nonequilibrium processes, thin films, low-mobility materials, and interfaces. Prerequisite: 316-1 or consent of instructor.

MAT SCI 360-0 Introduction to Electron Microscopy Theories and practice involved in application of scanning electron microscopy and transmission electron microscopy. Lectures, laboratory. Primarily for undergraduates and for graduate students in other departments. Prerequisites: 301; PHYSICS 135-2,3 or equivalent.

MAT SCI 361-0 Crystallography and Diffraction Elementary crystallography. Basic diffraction theory; reciprocal space. Applications to structure analysis, preferred orientation. Film and counter techniques. Lectures, laboratory. Prerequisites: GEN ENG 205-4; PHYSICS 135-2,3.

MAT SCI 362-0 Point, Line, and Planar Imperfections Introduction to point defects, dislocations, and internal interfaces in crystalline solids. Interactions among point,

line, and planar imperfections. Metals, ionic solids, semiconductors. Prerequisite: 315.

MAT SCI 370-0 Biomaterials Introduction to biomaterials from a materials science perspective, focusing on synthesis, structure, and properties. Materials used for human repair (permanent implants, devices, materials for drug delivery, tissue-engineering scaffolds); naturally occurring and engineered materials synthesized through biotechnology; biomimetic materials that copy microstructures from nature.

MAT SCI 371-0 Biominerals: Hierarchical Architecture and Function How biologically based processing of mineral-organic composites used by living organisms inspires new approaches to materials synthesis in many critical applications—locomotion (bones), defense (shells), and sensing (light, acceleration, magnetic fields).

MAT SCI 372-0 Engineering Strategies in Tissue Engineering and Regenerative Medicine Introduction to the fundamental concepts involved in tissue engineering and regenerative medicine. Different molecular, cellular, and biomaterials engineering approaches used to regenerate tissue or treat disease. Prerequisite: 201, 301, or consent of instructor.

MAT SCI 376-0 Nanomaterials Introduction to structure-property relationships of materials processed at the nanometer scale. Highly interdisciplinary course appropriate for undergraduate and graduate students in other departments. Prerequisite: 351-1 or consent of instructor.

MAT SCI 380-0 Introduction to Surface Science and Spectroscopy Surface spectroscopy, including Auger spectroscopy, photoemission, and LEED. Surface dynamics and thermodynamics. Electronic properties of surfaces and interfaces. Gas-surface interactions. Prerequisite: 351-1 or equivalent.

MAT SCI 381-0 Materials for Energy-Efficient Technology A materials-science approach to the challenges of energy-efficient technology: energy content of materials; advanced materials for energy harvesting, transmission, storage, and conversion; materials for energy-efficient transportation and housing. Term paper and oral presentation. Prerequisite: 201, 301, or consent of instructor.

MAT SCI 390-0 Materials Design Analysis and control of microstructures. Quantitative process/structure/property/performance relations, with case studies. Computer lab for modeling multicomponent thermodynamics and transformation kinetics. Prerequisites: 315, 316-1,2, or consent of instructor.

MAT SCI 391-0 Process Design Processing of materials. Design and analysis of experiments to identify and optimize key parameters to control properties and performance. Resolving conflicting requirements. Statistical process control.

MAT SCI 394-0 Honors Project in Materials Science Independent study and/or research linked to 396. Comprehensive report on a specific area of modern materials science and engineering. Prerequisite: registration in department honors program.

MAT SCI 395-0 Special Topics in Materials Science and Engineering Topics suggested by students or faculty and approved by the department.

MAT SCI 396-1,2 Senior Project in Materials Science and Engineering To be taken in two consecutive quarters. Independent basic or applied research project, conceived and performed under the direction of a department faculty member. Prerequisite: senior standing in materials science program.

MAT SCI 398-0 Introduction to Plasma Science and Processing Technology Plasma production, plasma properties (microscopic and macroscopic); plasma characterization, transport phenomena, plasma processing of powders and advanced materials.

MAT SCI 399-0 Special Problems in Materials Science Individual problems, including library and design work; comprehensive report on a specific phase of modern materials science. Credit to be arranged.

MECHANICAL ENGINEERING

www.mech.northwestern.edu

The Department of Mechanical Engineering offers a broad range of programs leading to the bachelor of science degree in mechanical engineering.

Mechanical engineering has always meant engines and machinery, but the character of modern engines and machinery has changed enormously because of the ever-increasing demands of performance, compactness, reliability, and productivity. The early devices were built by ingenious mechanics who possessed the know-how to reduce ideas to practice. In an increasingly competitive world, traditional know-how and creative ability are as necessary as ever but no longer sufficient. It is also necessary to know why things occur and thus be able to guide the earliest stages of planning. With finite resources and increasing awareness of the environment, mechanical engineers must cope with the undesirable effects of pollution as well as the traditional concerns of efficiency and safety. The tools they need must be more sophisticated.

Mechanical engineering plays a dominant role in a wide spectrum of industries, among them transportation (automotive, rail, air, and marine), heavy machinery (machines producing other machines), the power industry, the environmental industry (heating, ventilation, and air-conditioning), robotics, light precision-machine enterprises (optical, prosthetic devices, mechanical instruments, and the like), and numerous commercial-product industries.

Preparation for a career in mechanical engineering requires a basic understanding of the mathematical, physical, and engineering principles essential to planning, designing, and manufacturing new equipment. The curriculum provides a broad fundamental preparation for direct entry into industry as well as for further professional study. The first part of the curriculum is devoted to mathematics, physics, and chemistry. With this background, fundamental

mechanical engineering subjects, such as dynamics, solid mechanics, fluid mechanics, and thermodynamics, are studied, followed by specialized subjects, such as manufacturing, heat transfer, and automatic control. During the final two years design courses, laboratory courses, and project courses allow students to acquire a taste for the complex task of designing, analyzing, and building a piece of "hardware." In particular, students become aware of the relationships among conceptual design, subsequent analysis (mathematical modeling), manufacturing, systematic experimentation, and final testing. Supporting courses in allied fields of science and engineering broaden technical proficiency, while the elective courses in social sciences, fine arts, history, and philosophy enlarge the background in the problems of humanity.

Elective Concentrations

The program in mechanical engineering is designed to appeal to students with a wide variety of interests and professional goals. By choosing the 5 required elective courses wisely, students can develop a highly personalized curriculum. Some areas of concentration are computer-aided design and manufacturing, fluid mechanics, robotics, systems and control, and tribology. In addition, there are concentrations: biomedical engineering, design, energy, intelligent mechanical systems, manufacturing, nanotechnology/MEMS, and solid mechanics.

The biomedical engineering concentration is open to students interested in the biological and medical applications of mechanical engineering procedures. Students in this concentration can also satisfy the entrance requirements of medical schools.

The design concentration focuses on product design with related conceptual and manufacturing processes.

The energy concentration emphasizes the mechanical aspects of energy conversion and management.

The intelligent mechanical systems concentration focuses on the design of devices featuring mechanical hardware interfaces with electronic hardware and software.

The manufacturing concentration is directed toward planning and selecting manufacturing methods, design for manufacture, computer-aided flexible automation and robotics, and increased efficiency and productivity of current and emerging manufacturing technologies.

The nanotechnology/microelectromechanical systems concentration focuses on engineering at nanometer- and micrometer-length scales, including properties of materials and design and fabrication of devices.

The solid mechanics concentration focuses on the study of stress and strain in solid bodies, along with the application of computational methods for stress analysis.

A listing of courses that satisfy the elective requirements may be found in the department office.

Facilities

A detailed description of facilities in the reconstructed mechanical engineering laboratories is available in the department office.

Degree in Mechanical Engineering

Requirements (48 units)

Core courses (32 units)

See general requirements on page 201 for details.

- 4 mathematics courses
- 4 engineering analysis and computer proficiency courses
- 4 basic science courses
  - PHYSICS 135-2,3
  - 2 courses from CHEM 101, 102, 103, 171, 172, 210-1,2
- 3 design and communications courses
- 5 basic engineering courses
  - *Electrical science:* MECH ENG 233 (students planning to take advanced EECS courses may petition to substitute EECS 221)
  - *Fluids and solids:* CIV ENV 216; MECH ENG 241
  - *Materials science and engineering:* MAT SCI 201
  - *Thermodynamics:* MECH ENG 220 (may not be taken with CHEM 342-1 or CHEM ENG 211)
- 7 social sciences/humanities courses
- 5 unrestricted electives

Major program (16 units)

- 7 required courses: MECH ENG 202, 224, 240, 315, 340-1, 377, 390
- 4 advanced study courses, at least 1 course from each group:
  - *Design:* MECH ENG 340-2, 398, 433 (taken senior year)
  - *Dynamics/controls:* MECH ENG 314, 363, 391; EECS 360
  - *Mechanics:* MECH ENG 362, 365; CIV ENV 327
  - *Thermofluid science:* MECH ENG 370, 373
- 5 electives
  - 2 300-level mechanical engineering courses
  - 1 200- or 300-level technical elective
  - 2 300-level technical electives
  - At least 1 unit must be in mathematics or basic sciences: it may be chosen from IEMS 201 or 202; 200- or 300-level courses in biological sciences, chemistry, earth and planetary sciences, or physics and astronomy; or 300-level courses in mathematics, applied mathematics, or statistics (except BIOL SCI 307, CHEM 393, PHYSICS 301).
  - No more than 2 units of 399 are allowed.
  - Students are encouraged to concentrate electives in areas of interest. A list of seven areas of concentration, including appropriate courses and descriptions, is available from the department office.

Courses

MECH ENG 201-0 Mechanics I Equivalent force systems. Equilibrium of rigid bodies. Distributed forces and centers of gravity. Kinematics of rigid bodies in planar motion. Prerequisites: PHYSICS 135-1; concurrent registration in MATH 234.

MECH ENG 202-0 Mechanics II Dry friction. Kinetics of rigid bodies in planar motion. Kinetics of particles. Moments of inertia of rigid bodies. Prerequisite: GEN ENG 205-4.

MECH ENG 220-0 Thermodynamics I Basic definitions; Zeroth law and the meaning of temperature; the First Law applied to flow and nonflow processes; the Second Law and its applications; properties of pure substances; equations of state, the Third Law of Thermodynamics, and introduction to cycles. Prerequisites: GEN ENG 205-3; concurrent registration in MATH 234.

MECH ENG 224-0 Experimental Engineering I Modern electronics; analog and digital circuit construction and conversion. Modern data acquisition involving temperature measurements, control of stepper motors, transient heat transfer, fluid mechanics, deformation of beams. Prerequisites: 220, 241; 233 or EECS 270; 262 or CIV ENV 216.

MECH ENG 233-0 Electronics Design Design and prototyping of analog and digital electronic circuits using semiconductor devices: diodes, transistors, op amps, logic chips, etc. Optical and other sensors, power electronics, filters, and feedback control. Extensive hands-on construction and debugging. Intended for engineers in all disciplines.

MECH ENG 240-0 Introduction to Mechanical Design and Manufacturing Introduction to strategy and methods of designing, manufacturing, and testing of mechanical products. Material properties and selection methodology, engineering drawing and CAD, and simple manufacturing processes. Prerequisite: MAT SCI 201; CIV ENV 216.

MECH ENG 241-0 Fluid Mechanics I Fundamentals of fluid mechanics. Properties and statics of fluids. Kinematics and dynamics of fluid motion—continuity, momentum, and energy equations. Dimensional analysis, flow in closed conduits. Prerequisites: GEN ENG 205-4.

MECH ENG 260-0 Mechanics of Sports Applications of mechanics and mathematical modeling to sports: baseball, basketball, golf, soccer, swimming, running, and others. Introduction to the biomechanics of sports. Prerequisites: GEN ENG 205-2; MATH 230; or high school physics and consent of instructor.

MECH ENG 262-0 Stress Analysis and Finite Elements I Analytical and numerical methods for study of strains, stresses, and deformations in solids, with applications to design of mechanical components subjected to static and repeated loads. Prerequisite: GEN ENG 205-3.

MECH ENG 314-0 Theory of Machines—Dynamics Three-dimensional kinematics: rotation axes and mechanism analysis, rotation matrices and Euler's angles for rigid bodies. Three-dimensional kinetics: dynamics of particles, central force problems, dynamics of rigid bodies, rotational inertia matrices and principal axes, dynamics of mechanisms, the gyroscope and other torque-free problems. Prerequisite: 202.

MECH ENG 315-0 Theory of Machines—Design of Elements Factors influencing the proportioning of machine elements—stresses, deformations, and failure criteria—as applied to shafts, springs, belts, bearings, gears. Lectures, laboratory. Prerequisites: MAT SCI 201; CIV ENV 216.

MECH ENG 316-0 Mechanical Systems Design Design of mechanical systems such as cams, multibar linkages, and precision machines. Design principles and best practices. Case studies and team-based projects. Prerequisite: 315.

MECH ENG 317-0 Molecular Modeling and the Interface to Micromechanics Introduction to modern computational methods for calculating thermodynamic, transport, and structural properties of materials. Computational chemistry, molecular simulation, and mesoscopic methods, with emphasis on tribology applications.

MECH ENG 318-0 Multiscale Simulations Introduction to multiscale modeling and simulation methods for studying material interactions in micro- and nanomechanical systems, as well as in electronic packaging. Hands-on exercises using equipment to characterize nanoscale properties and parallel computer codes.

MECH ENG 319-0 Applications of Surface Science to Nanomechanics and Nanotribology Overview of the composition, structure, chemical, and mechanical properties of surfaces and how they affect surfaces mechanically and tribologically.

MECH ENG 320-0 Micro- and Nanomechanical Properties of Surfaces Micro- and nanomechanical interactions between surfaces, fractal nature of surfaces, interfacial forces, principles of micromechanics, characterization of surfaces using atomic-force microscopy, optical interferometry, and nanoindentation.

CIV ENV 327-0 Finite Element Methods in Mechanics See Civil Engineering.

MECH ENG 333-0 Introduction to Mechatronics Introduction to microprocessor-controlled electromechanical systems. Interfacing sensors and actuators to computers, electrical and mechanical prototyping, dissection of a commercial product. Final team project. Prerequisite: 233, EECS 221, or consent of instructor.

MECH ENG 340-1,2,3 Computer-Integrated Manufacturing Use of computers to improve productivity and reduce costs in the manufacture of discrete parts and assemblies. **1.** Manufacturing processes: Analysis and evaluation of process usage in the contemporary manufacturing environment. Prerequisite: 240 or consent of instructor. **2.** CAD/CAM: Geometric modeling, dimensioning systems, tolerances, design for manufacture, programming of machine tools. Prerequisites: 340-1; 262 or CIV ENV 216; or consent of instructor. **3.** Manufacturing automation: sensors, actuators, and computers for automation; principles of

computer control; programmable logic controllers; robotic devices; assembly automation. Prerequisite: 340-2 or consent of instructor.

MECH ENG 341-0 Computational Methods for Engineering Design Introduction to a wide range of computational techniques for engineering design. Modeling, simulation, optimization, design software, examples, and projects with emphasis on computational techniques for design- and manufacturing-related applications. Prerequisite: senior standing or consent of instructor.

MECH ENG 342-0 Mechanics of Cutting and Forming Introduction to plasticity theory applications to simple cutting and forming processes. Process analysis and design: force estimation, friction and redundant work effects, temperature-generated defects, and process and equipment limitations. Prerequisites: 262 or CIV ENV 216; senior standing.

MECH ENG 346-0 Introduction to Tribology Fundamentals of surface contact: surface topography, asperity contact, interfacial phenomena. Friction theories and wear mechanisms. Temperatures in sliding contacts. Hydrodynamic, hydrostatic, elastohydrodynamic, and boundary lubrication.

MECH ENG 358-0 Experimental Engineering II Optical metrology. Stress analysis, fluid flows, combustion, dynamics, and control. Use of optical interferometry, anemometers and pitot tubes, accelerometers, and other advanced measurement devices.

MECH ENG 359-0 Reliability Engineering Probability concepts and random variables. Failure rates and reliability testing. Wear-in, wear-out, random failures. Probabilistic treatment of loads, capacity, safety factors. Reliability of redundant and maintained systems. Fault tree analysis. Prerequisite: GEN ENG 205-4.

MECH ENG 362-0 Stress Analysis Theory of elasticity: elastic stability, principle of minimum potential energy, Rayleigh-Ritz methods. Introduction to finite element methods of stress analysis: computer implementation and use of commercial codes. Structural analysis of rods, beams, columns, and plates. Prerequisite: 262 or CIV ENV 216.

MECH ENG 363-0 Mechanical Vibrations Analysis of vibrations in single- and multidegree-of-freedom systems. Free and forced vibrations with various types of damping. Response to steady-state and transient excitations. Prerequisites: 202; GEN ENG 205-4.

MECH ENG 366-0 Finite Elements for Design and Optimization Numerical methods for interaction and optimal CAD. Fully stressed design; design sensitivity analysis and descent methods; optimality criteria to automated design. Prerequisites: senior standing; 365 or consent of instructor.

MECH ENG 367-0 Finite Elements for Stress Analysis Introduction to the finite-element method for stress analysis, with emphasis on linear elasticity. Computer implementation of finite-element techniques: finite-element code development and modification; use of commercial codes. Prerequisite: 262, MATH 234, or CIV ENV 216.

MECH ENG 370-0 Advanced Thermodynamics with Applications to Energy Systems Elementary classical thermodynamics, application of first and second laws of thermodynamics to power and refrigeration cycles, mixtures and solution, thermodynamic relations, chemical reactions, phase and chemical equilibrium. Prerequisite: 220.

MECH ENG 373-0 Engineering Fluid Mechanics Laminar and turbulent duct flows. Boundary layers and potential flows. Lift and drag forces. Thermodynamics and mechanics of compressible flow. Nozzle flows and choking. Wave motion and shock waves. Applications to fluid machinery. Prerequisite: 220, 241, or equivalent.

MECH ENG 377-0 Heat Transfer Fundamentals of heat transfer by conduction, convection, and radiation. Steady and transient heat conduction in solids. Forced and free convection in fluids. Properties of thermal radiation. Radiation heat transfer between solids. Solar radiation. Prerequisite: 241.

MECH ENG 379-0 Elements of Combustion Engineering Introduction to combustion processes, providing an understanding of flame processes as they relate to efficiency and pollution due to propulsion and power-generating systems. Diffusion and premixed flames, problems of ignition, quenching, flammability limits, and detonation. Prerequisite: senior standing in mechanical engineering or consent of instructor.

MECH ENG 381-0 Introduction to Microelectromechanical Systems Introduction to MEMS devices, with an emphasis on their manufacturing and mechanical behavior. Materials properties, microfabrication technology, mechanical behavior of microstructures, design, and packaging. Case studies on sensors, wireless communications, fluidic systems, microengines, and biological devices. Prerequisites: CIV ENV 216 or consent of instructor.

MECH ENG 382-0 Experiments in Micro- and Nanoscience and Engineering Interdisciplinary topics spanning the physical and biological sciences and engineering. Seven integrated labs in which students acquire hands-on experience in various aspects of micro- and nanoscience and engineering: clean-room microfabrication, flow visualization in microchannels, nanomechanics, AFM and dip-pen nanolithography, multiphysics computational tools, and experimental techniques to evaluate micro- and nanoscale devices. Prerequisites: 381 or consent of instructor.

MECH ENG 385-0 Nanotechnology Manipulation of matter at the nanometer-length scale to produce useful devices and materials. Scientific and engineering properties of nanoscale systems. Emphasis on development of new techniques.

MECH ENG 389-0 Molecular Machines in Biology
Introduction to engineering principles that govern cellular activities at the molecular level. Emphasis on the dynamics and kinematics of proteins, especially those that are locomotory or force generating. Lectures, team projects, and presentations. Prerequisite: MATH 230 or consent of instructor.

MECH ENG 390-0 Introduction to Dynamic Systems
Modeling the dynamic behavior of physical systems. Concepts of causality, dependent and independent storages, and state. Introduction to bond graphs. Generation of state equations; analytical and computer simulation of system behavior. Application to problems of engineering interest. Prerequisite: GEN ENG 205-4.

MECH ENG 391-0 Fundamentals of Control Systems
Mathematical modeling of automatic control systems. Open-loop and closed-loop control. Laplace transform techniques and transfer functions. Stability. Root locus technique, Bode plots, Nyquist criterion. Approaches to control system design, including PID and lead-lag compensation. Not to be taken for credit with or after EECS 360. Prerequisite: 390 or consent of instructor.

MECH ENG 395-0 Special Topics in Mechanical Engineering
Topics suggested by students or faculty members and approved by the department.

MECH ENG 398-0 Engineering Design Product or system design projects carried out by small student groups. Project definition, conceptual and detailed design, evaluation, and documentation. Prerequisite: senior standing.

MECH ENG 399-0 Projects Special studies to be done under faculty direction. Credit to be arranged.

Medill School of Journalism, Media, Integrated Marketing Communications

www.medill.northwestern.edu

Medill has pioneered advances in journalism and marketing communications education for almost nine decades. Today Medill's undergraduate program leads the way in preparing multimedia journalists to navigate and help shape a media landscape of unprecedented change.

A Medill education ensures the development of skills not only in writing, reporting, editing, production, and critical thinking but also in using multiple platforms (print, online, broadcast, and wireless) to create compelling, high-impact journalism for increasingly interactive audiences. Building on these strengths, the Medill curriculum emphasizes journalism excellence, multimedia storytelling, ethics and professional behavior, audience understanding, research, quantitative and visual literacy, and creativity.

The bachelor of science in journalism (BSJ) degree program develops well-rounded students who are broadly educated in the liberal arts and sciences, knowledgeable about diverse cultures and the world beyond the United States' borders, and ready for careers in both traditional and nontraditional media and communications.

Core journalism courses make up 30 percent of the BSJ curriculum, and there are opportunities to take up to 4 journalism electives to develop specialized skills and knowledge. Real-world training and immersion experiences extend Medill's learn-by-doing philosophy. For instance, a sophomore-year course that is a cornerstone of the curriculum sends students into diverse Chicago neighborhoods to report from storefront newsrooms. They discover issues important to particular audiences and sharpen reporting and writing skills as they produce relevant, engaging multimedia stories.

During their junior or senior year students get real-world experience and networking opportunities within a media company through the Journalism Residency, a for-credit academic internship. They work alongside professional mentors in one of more than 100 newspapers, magazines, broadcast stations, public relations and marketing firms, and online news operations across the United States and selected locations abroad, including South Africa, Latin America, and the Persian Gulf.

Medill also offers an Integrated Marketing Communications Certificate Program focusing on effective IMC strategies for an increasingly digital media environment. Students learn how to conduct research and analyze data on consumer behavior, media usage, and marketing communications effectiveness. They learn about message creation and delivery through a wide variety of media channels. (See page 245 for more information on the IMC certificate.)

In 2008 Northwestern opened a campus in Qatar offering programs in journalism and communication. Evanston-campus journalism students are eligible to spend a term at Northwestern University in Qatar and other universities in the Qatar Foundation's Education City in Doha. (For more on Northwestern University in Qatar, see page 9.)

Many Medill students find jobs directly after graduation in print, broadcast, or online journalism, public relations, or related fields. Some pursue graduate programs in medicine, law, and other areas, including the graduate programs at Medill.

Medill offers two graduate programs. The master of science in journalism (MSJ) program provides advanced study in specialized subject reporting (such as business, sports, social justice, or science) and techniques (such as magazine writing and editing, interactive media, and videography). The master of science in IMC program has five specialized concentrations: brand advertising, direct and interactive marketing, corporate communications, marketing analytics, and media management.

Medill's 685 undergraduates and 250 graduate students, representing nearly every one of the United States and many countries, take pride in the school's ranking as one of the nation's preeminent schools. They distinguish Medill during their school years, winning national awards such as the Hearst Foundation's Journalism Awards, and go on to become leaders in the journalism and IMC professions.

ACADEMIC POLICIES

Requirements for the Degree of Bachelor of Science in Journalism

All Medill undergraduates pursue the bachelor of science in journalism degree. They must complete a minimum of 45 units to earn the BSJ. In addition to their studies in journalism, they acquire a strong background in the arts and sciences. The following policies apply:

- Students must take the final 23 units at Northwestern and must complete the last three quarters of work while enrolled at Medill. (Students who are enrolled in a study abroad program approved in advance by Northwestern's Study Abroad Office and by Medill are exempt from this requirement.) Credit for summer study at other colleges and universities may be counted as part of the final 23

units if approved in advance by Medill's senior director of undergraduate education and teaching excellence.
- In addition to and independent of the requirements set by Medill, all students must satisfy the Undergraduate Registration Requirement. (See page 17.)
- Of the 45 units, at least 31 must be earned in courses outside of Medill and at least 12 in Medill courses.
- Students complete 12–14 journalism courses, including a three-credit Journalism Residency with a focus on newspaper/online journalism, magazine journalism, broadcast journalism, or marketing communications.
- Students with more than 45 units may take additional journalism units.
- No course may be counted in more than one requirement category, with one exception: Medill students completing a double major in Weinberg College may apply courses used to meet Medill's distribution requirements toward the second major. However, courses used for Medill's 3-unit social science concentration may not be applied to a Weinberg College major (except those requiring related courses) or minor.
- Exceptions to any degree requirements must be approved by Medill's senior director of undergraduate education and teaching excellence. Petitions and rules for filing them are available on the Medill website.

Grade Requirements

Students must achieve a minimum GPA of 2.0 (C) in all nonjournalism courses taken for a letter grade and a minimum GPA of 2.25 (C+) in journalism courses. In addition, all journalism students are subject to the following grade requirements:
- The journalism GPA is an average of the grades (including F's) in all journalism courses attempted.
- Students who earn a grade of D or worse in a journalism course must retake the course until they have earned a C– or better.
- When journalism courses are repeated, both grades are computed in the GPA; one course does not substitute for another.
- Before starting the Journalism Residency, students must
  - Earn a grade of C or better in JOUR 301 and in the presentation and storytelling courses taken before the residency.
  - Have a minimum GPA of 2.25 (C+) in those three courses plus JOUR 201-1 and JOUR 201-2.
- Students may earn grades of C– or worse in no more than one-fifth of the courses taken at Northwestern and offered for graduation.
- All Y and X grades, unless made up satisfactorily by the end of the subsequent quarter, are counted as F's.
- Students who do not meet the minimum GPA requirements are placed on academic probation. Continued poor performance will result in further academic disciplinary action, including academic probation, suspension, or dismissal.
- Medill undergraduates are required to take the following courses for letter grades (A, A–, B+, B, B–, C+, C, C–, D, F):
  - All distribution requirements
  - All courses in the social science concentration
  - All journalism courses except the Journalism Residency
- Other courses may be taken pass/no credit (P/N) if that option is available. No more than 3 courses taken P/N may be counted toward the 45 units required for graduation (excluding the Journalism Residency). Only 1 course per quarter may be taken P/N.

Academic Warning, Probation, and Dismissal

The University's policies about academic probation and dismissal are given on page 22 of the Undergraduate Education chapter. Medill adheres to these policies with the following exceptions and additions:
- A warning letter is sent by email when the student
  - Has a GPA below C (2.0) for one quarter but a cumulative GPA above 2.5.
  - Receives one grade of X or Y.
  - Merits probation for any reason during his or her first two quarters at Northwestern.
- Academic probation occurs when, in addition to the circumstances stated on page 22, the student
  - Fails to maintain a C+ average (2.25) in journalism classes.
  - Receives a D or an F in a journalism class.
  - Fails to fulfill the journalism curriculum requirements.
  - Receives more than one grade of X or Y in any one quarter.
  - Has earned consistently low grades over multiple quarters.
- Students receiving academic warning or probation must meet with their advisers and/or the senior director of undergraduate education and teaching excellence to develop a plan for improvement.

Early Graduation

Students who plan to graduate early must meet with Medill's Office of Student Life at least three quarters before the expected date of graduation. These students also should check with the Office of the Registrar to make sure they have fulfilled the Undergraduate Registration Requirement. (See page 17.)

Medill Integrity Code

All Medill students are required to uphold the Medill Integrity Code, which, among others things, requires adherence to principles of honesty, fairness, and integrity in academic efforts and related professional media, journalism, and marketing communications work, whether

students are in school, on an internship or a job, or acting as volunteers in a professional or academic activity.

ACADEMIC OPTIONS

Accelerated Master's Program

Students who exhibit exceptional ability in undergraduate work may apply for early admission to the graduate journalism program. This program allows them to earn both BSJ and MSJ degrees in less than five years. Candidates apply during their junior year and are admitted after the Journalism Residency on the basis of academic excellence and promise of success in journalism. Interested students are encouraged to begin planning for this option early in their undergraduate careers. Information and admission materials are available from the Medill Office of Graduate Admissions and Financial Aid.

Dual Bachelor's Degree Program

Northwestern offers extremely talented students the opportunity to earn in five years both a BSJ from Medill and a BMus or BAMus degree from the Bienen School of Music. This dual bachelor's–degree program prepares exceptional students for journalism careers emphasizing music and arts reporting. Prospective students typically apply to this joint program when they apply for undergraduate admission to Northwestern (see page 11). For a detailed description of the dual-degree program, see page 28 in the Cross-School Options chapter.

Integrated Marketing Communications Certificate Program

The Integrated Marketing Communications Certificate Program focuses on effective marketing communications strategies, tactics, and tools for an increasingly consumer-controlled environment. It prepares students for entry-level marketing communications positions in such fields as advertising, public relations, corporate communications, and direct, database, e-commerce, and interactive marketing. All students are eligible to apply to the certificate program, but qualified BSJ students in Medill receive priority. Those who complete the certificate are eligible to complete the graduate IMC program in four quarters instead of five. See page 245 and the Medill website for more information.

Medill Undergraduate Program in Washington, DC

A select group of Medill students may study for one quarter in Medill's Washington, DC, news bureau. These students take 2 intensive journalism courses (a two-day reporting experience covering Capitol Hill as mobile journalists, producing up-to-the-minute political stories for Medill's Washington, DC, website, and a one-day political reporting seminar) and a political science course approved by Weinberg College.

This interdisciplinary program exposes students to the challenging dynamics of Capitol Hill, public policy, political organizations, think tanks, and federal agencies. It is best suited to students interested in learning more about the political process and covering important national and global issues from the nation's capital in a rigorous, web-driven reporting environment.

Internships, Field Studies, and Special Programs

Internship employment by newspapers, magazines, radio and television stations, online media, government agencies, and advertising and public relations agencies may be available to Medill students, particularly during the summer. Many employers look to Medill for talented young journalists who can be introduced to their organizations through internships. The school encourages these opportunities as a means of enriching students' education but gives academic credit only for the Journalism Residency.

Medill students also may seek internship or field study credit through other schools at Northwestern. If these experiences involve work in journalism (newspaper, magazine, radio, television), mass communications, public relations, advertising, and/or direct marketing, students must receive approval from Medill's senior director of undergraduate education and teaching excellence before applying internship or field study credit to the 45 units required for the BSJ degree.

Other Undergraduate Programs

Students in Medill also may enroll in courses offered by the Center for the Writing Arts (see page 33), the Undergraduate Leadership Program (see page 31), and the adjunct majors in international studies (see page 111) and legal studies (see page 116), among other areas.

ROTC Course Credits

ROTC course credits may be used as part of the 45 units required for graduation. They are considered elective courses.

STUDENT RESOURCES

Advising

Each entering student is assigned a faculty adviser. The adviser offers support and guidance and is a valuable source of information regarding courses and career goals. First-year students are required to meet with their advisers three times and to spend one quarter in an adviser-led discussion section of JOUR 202. Sophomores, juniors, and seniors are encouraged to maintain regular contact with their faculty advisers.

Staff members in Medill's Office of Student Life help students make the most of their time at the University.

They assist students with a variety of issues, including course planning, degree requirements, registration, study abroad, interschool transfers, petitions to graduate, and resources within and outside Medill.

Medill Career Services helps students through career advising and employment services. It works with academic departments and individual faculty members, student services, employers, alumni, and other constituencies to enhance student and alumni career development. Career Services staff members provide information on careers, jobs, and internships through emails, an interactive website, presentations, various campus media, and outreach and orientation programs.

Activities

Through student publications, student broadcast media, and professional organizations, Medill students have many journalism-related opportunities outside the classroom.

Students write, edit, and manage the *Daily Northwestern*, *North by Northwestern*, and a variety of other print and online campus publications during the academic year as well as during Summer Session, when they publish the *Summer Northwestern*, a weekly newspaper. Although the University awards no academic credit for work on student-run publications because they have no formal connection with Medill, these publications do provide valuable real-world experience to complement course work, Journalism Residencies, and summer internships.

Radio station WNUR-FM provides another outlet for student reporters, sportscasters, editors, and commentators, as do the student-produced news programs *Northwestern News Network* and the Spanish-language *Noticiero*, which air on Evanston and Chicago public access and cable television channels and online. Writing skills are helpful in other extracurricular activities such as student government, the Waa-Mu Show, student-planned colloquia, and various literary publications.

Professional organizations that promote high standards among journalists maintain chapters on campus, including the Society of Professional Journalists, the National Association of Black Journalists, the National Association of Hispanic Journalists, and the National Lesbian and Gay Journalists Association. Other organizations for students interested in journalism include *Blackboard* magazine and the Communications Residential College. Top scholars in the senior and graduate classes are initiated into Kappa Tau Alpha, the national journalism honorary society.

ACADEMIC OFFERINGS

JOURNALISM

Major in Journalism (45 units)

All Medill students pursue a major in journalism.

Arts and sciences requirements (23 units)

- 23 courses in the arts and sciences
  - 14 distribution requirements
  - A 3-course social science concentration
  - A 6-course elective concentration
- See the *Medill Undergraduate Handbook* for a complete list of courses that fulfill requirements.
- Students concentrating in astronomy, biological sciences, chemistry, geological sciences, mathematics, physics, or a foreign language and students completing a minor, a second major, or an adjunct major in Weinberg College are exempt from the arts and sciences requirements. Permission to pursue a minor or a second or adjunct major must be secured from the appropriate Weinberg College department.
- Students should check with an adviser about whether the courses they have chosen also meet the global and diverse cultures requirement. (See page 243.)

Distribution requirements (14 units)

- 1 art or art history course
- 1 economics course
- 3 history courses, including at least 1 course in US history and at least 1 in non–US history
- 3 literature courses chosen from any department in the University dealing with literature, either in English or in a foreign language
- 2 political science courses: 1 course in American government and 1 in international relations or international studies
- 1 religion or philosophy course (not including courses in logic)
- 3 science, mathematics, or logic courses
  - 1 course in statistics chosen from ANTHRO 362; BME 220; IEMS 201; MATH 202, 285; POLI SCI 310, 311, 312, 315; PSYCH 201; SESP 210; SOCIOL 226, 303, 329
  - 2 courses in astronomy, biological sciences, chemistry, electrical engineering and computer science, geological sciences, mathematics, or physics or from the list above; or chosen from ANTHRO 213, 306, 310, 312, 313, 314, 315, 317; CIV ENV 206; COG SCI 210, 211; GEOG 210, 211, 235, 313, 341; MAT SCI 101; PHIL 150, 250, 350, 351, 352; PSYCH 212, 337

Social science concentration (3 units)

- 3 courses in one of the following: anthropology, economics, gender studies, history, political science, psychology, or sociology
  - No more than 1 unit may be at the 100 level.
  - At least 1 unit must be at the 300 level.
  - No more than 1 unit of field study or independent study credit and no AP credits may be applied toward the social science concentration.
- Students may not double-count courses toward both the distribution requirements and the social science concentration.

- Students should check with an adviser about whether the social science courses they have chosen also meet the global and diverse cultures requirement.
- INTL ST 201-1,2 may be counted toward the social science concentration in political science.
- SESP 201 may be counted toward the social science concentration in psychology.

Elective concentration (6 units)

- 6 courses in any Weinberg College department outside the area selected for the 3-unit social science concentration
  - No more than 1 unit may be at the 100 level.
  - At least 2 units must be at the 300 level.
  - No more than 1 unit of field study or independent study credit and no AP credits may be applied toward the elective concentration.

Elective requirement (8–10 units)

Students take 8 to 10 non-Medill credits to explore or extend their interests.

Global and diverse cultures requirement

The Medill faculty believes that all students should understand and appreciate diverse cultures and the world beyond the United States and thus has established the global and diverse cultures requirement:

- 11 of the courses chosen to meet the arts and sciences and elective requirements must relate to the study of global and diverse cultures.
  - 3 courses must be in a foreign language, unless students can demonstrate proficiency as defined by Weinberg College.
  - 8 courses must focus on one or more of the following themes: gender, race, age, class, ethnicity, religion, or disability.
- Students choose from a Medill-approved list of courses offered throughout the University but may appeal to Medill's senior director of undergraduate education and teaching excellence if they believe other courses qualify; JOUR 301, 372, and 379 also count toward this requirement.

Major requirements (12–14 units)

Core courses (5 units)

- *Freshman year:* JOUR 201-1,2; 202
- *Sophomore year:* JOUR 301
- *Junior year:* JOUR 370 (required before Journalism Residency courses 345, 346, 355, 356, 365, 366, 385, and 386)

Journalism Residency (5–6 units)

- *Newspaper/online*
  - Prerequisites: JOUR 310; 320, 321, or 322
  - Journalism Residency: a total of 3 units of 345 and 346
- *Magazine*
  - Prerequisites: JOUR 311; 320, 321, or 322
  - Journalism Residency: a total of 3 units of 345 and 346
- *Broadcast*
  - Prerequisites: JOUR 312; 320, 321, or 322
  - Journalism Residency: a total of 3 units of 345 and 346
- *Marketing communications*
  - Prerequisites: JOUR 310; 320, 321, or 322; IMC 300, 301, 305, or 306
  - Journalism Residency: a total of 3 units of 385 and 386

Electives (2–4 units)

Students must take at least 2 journalism electives. Electives may be taken as early as sophomore year—particularly for students taking 4 electives—and may be chosen regardless of a student's Journalism Residency program. For example, a student pursuing a Journalism Residency in broadcast may take courses in magazine writing, newspaper reporting, investigative journalism, IMC, audio and video, or a combination. JOUR 390 courses may be counted as electives.

Courses

JOUR 201-1 Reporting and Writing Introduction to the fundamentals of journalism for any platform or storytelling format. Includes news and information gathering; constructing a story; using numbers and data to tell a story and assess information; editing and presentation; ethical issues of covering stories; and visual literacy.

JOUR 201-2 Multimedia Storytelling Introduction to using multimedia skills to create effective web-based journalism. Still photography, photo editing, audio recording and editing, audio slideshows, video shooting and editing, video storytelling, web page creation and design, and exposure to Flash. Prerequisite: 201-1.

JOUR 202-0 Introduction to 21st-Century Media Exposure to the range of journalism genres and the media in which they are practiced. How and why journalism practices and industries have evolved and continue to evolve in the digital age. How people access, use, and participate in news and information. Ethical decision making, professional behavior, and the history of journalism.

JOUR 301-0 Enterprise Reporting in Diverse Communities Advanced course on in-depth multimedia reporting and storytelling, with emphasis on reporting for and about diverse audiences. Getting to know a specific audience within a Chicago neighborhood and experimenting with a variety of storytelling techniques, students produce cross-platform content for print, broadcast, and the web. Prerequisites: 201-1,2 and sophomore standing.

JOUR 310-0 Media Presentation: Newspaper/Online Essentials of newspaper editing and online production, including headlines, page layout and design, photo editing, information graphics, and appropriate electronic tools. Prerequisite: 301.

JOUR 311-0 Media Presentation: Magazine Fundamentals of editing magazine copy and graphics, with emphasis on precision, style, and structure for print and online products. Provides an overview of the magazine industry—both

traditional and interactive—and the role of magazines in society. Prerequisite: 301.

JOUR 312-0 Media Presentation: Producing for Broadcast and the Web Writing and producing broadcasts for television, the web, and alternative digital platforms, using the appropriate computer and editing equipment, news wires, and video feeds. Emphasis on the editorial decision-making process. Prerequisite: 301.

JOUR 320-0 Storytelling: Interactive News The craft of digital storytelling, with emphasis on creating compelling packages for the web and other digital platforms, using a variety of narrative formats, interactive tools (such as Flash), and other digital content, including blogs, RSS feeds, and citizen journalism. Prerequisite: 301.

JOUR 321-0 Storytelling: Magazine and Feature Writing The craft of magazine and feature writing, with emphasis on character, scene and theme development, story architecture, voice, alternative story forms, in-depth reporting, public service journalism, and marketing ideas for articles. Prerequisite: 301.

JOUR 322-0 Storytelling: Video Reporting, Shooting, and Editing The craft of audio-video storytelling for television and the web, including practice in field reporting and producing packages ranging from one- to three-minute television news pieces to longer alternative audio-video formats for the web and other digital platforms. Prerequisite: 301.

JOUR 340-0 Innovation in Journalism and Technology Students interested in journalism or computer science work together to conceive and build new kinds of tools and technology for distributing and consuming news and information.

JOUR 341-0 Journalism in a Networked World Network science behind today's media workings. How people find and share content on the web. Practical skills in using web analytics tools, search-engine optimization techniques, and social media strategies.

JOUR 342-0 Advanced Online Storytelling Students work in groups throughout the quarter on a single reporting project that incorporates video, audio, interactivity, and photography. The class discusses and critiques existing work from media professionals. Prerequisite: 320.

JOUR 345-0 Journalism Residency in Newspaper/Online: Reporting (1 or 2 units) Reporting and newswriting skills are honed in a newsroom through practical assignments, including multimedia opportunities whenever possible, under deadline pressure and close editorial supervision. Prerequisites: 310; 320, 321, or 322; 370. Taken with 346.

JOUR 346-0 Journalism Residency in Newspaper/Online: Presentation (1 or 2 units) Skills in news editing, headline writing, page layout/design, and graphics for print and the web are honed in a newsroom environment through practical assignments under deadline pressure and close editorial supervision. Prerequisites: 310; 320, 321, or 322; 370. Taken with 345.

JOUR 351-0 Civil Liberties and National Security National Security Journalism Initiative–sponsored seminar on civil liberties in the post-9/11 world. Government access to personal information; balance between privacy and national security.

JOUR 355-0 Journalism Residency in Magazine: Writing (1 or 2 units) Exploration of aspects of magazine writing and reporting. Practical assignments, including print and web content whenever possible, in a magazine office with deadline pressure and close professional supervision. Prerequisites: 311; 320, 321, or 322; 370. Taken with 356.

JOUR 356-0 Journalism Residency in Magazine: Presentation (1 or 2 units) Exploration of aspects of magazine editing, graphics, and publishing for print and/or online products. Practical assignments in a magazine office with deadline pressure and close professional supervision. Prerequisites: 311; 320, 321, or 322; 370. Taken with 355.

JOUR 365-0 Journalism Residency in Broadcast: Reporting (1 or 2 units) Gathering television news in the field; writing scripts, readers, voice-overs, vosots, packages, and on-camera news for reporters and anchors. Practical assignments in a broadcast newsroom under close professional supervision. Prerequisites: 312; 320, 321, or 322; 370. Taken with 366.

JOUR 366-0 Journalism Residency in Broadcast: Production (1 or 2 units) The television production process: working with the assignment desk; editing voice-overs, sound bites, and packages; possibly producing entire shows. Practical assignments in a broadcast newsroom under close professional supervision. Prerequisites: 312; 320, 321, or 322; 370. Taken with 365.

JOUR 368-0 Video Documentary A comprehensive overview of HD video production geared to short documentaries that tell human stories, with emphasis on character, conflict, drama, and surprise. Different documentary styles. How narrative structures are implemented.

JOUR 369-0 Audio Documentary Different forms of audio documentary production for radio and web-based multimedia distribution. Emphasis on radio reporting techniques, including interviewing, writing to tape, compelling storytelling, and integration of sound and music. Teams produce 7- to 10-minute audio documentaries to be broadcast, quality permitting, on WBEZ-FM.

JOUR 370-0 Media Law and Ethics The legal and ethical framework defining media freedoms and constraints in the United States, including copyright and trademark issues. Historical context and focus on the evolution of constitutional, statutory, judicial, and ethical standards. Prerequisite: sophomore standing.

JOUR 371-0 Journalism of Empathy Exploration of writing and reporting about people and places neglected and misunderstood by mainstream America. Prerequisite: 301.

JOUR 372-0 International Journalism: South Africa An introduction to South Africa, with a focus on the country's newspapers, magazines, and broadcast outlets. Students compare and contrast various aspects of South African and US life—especially the history of the HIV/AIDS pandemic—and explore historical, political, and cultural connections between the two countries. Required for South Africa Journalism Residency. Prerequisites: 301 and junior standing for Medill students; consent of instructor for others.

JOUR 373-0 Investigative Journalism Students enrolled in this class, supported by the Medill Justice Project, investigate and report on cases of prisoners who may have been wrongfully convicted. Prerequisites: junior or senior standing and consent of instructor.

JOUR 374-0 Investigative Reporting Examines the methods and techniques of investigative reporting through hands-on practice—brainstorming, framing the reporting, digging through documents, analyzing numbers, tracking down sources, writing, and rewriting. Prerequisite: 301.

JOUR 375-0 Literary Journalism A survey of the work of several print and broadcast journalists to explore the intersection of journalism and literature; analysis of the relationships between form and content within the historical contexts in which pieces were produced. Prerequisite: 301.

JOUR 376-0 Media Design Advanced tools of layout, typographic contrast, and color theory, including creating infographics, with a focus on current approaches to newspaper, magazine, web, and newsletter design. Prerequisite: 301.

JOUR 378-0 Photojournalism Advanced skills and practice in telling stories with photographs, photo slide shows, photo galleries, and audio slideshows. Ethics as it applies to photojournalism. Prerequisite: sophomore standing.

JOUR 379-0 Connecting with Immigrant and Multiethnic Communities Multimedia reporting on immigrant experiences. Developing a forum for community-based personal narratives. Creating a social network across ethnic lines. Prerequisite: sophomore standing.

JOUR 380-0 Legal Reporting Students gain in-depth knowledge of legal issues while covering and writing stories related to the courts and the law. Students are encouraged to take this course in conjunction with a non-Medill course complementing the subject matter. Prerequisite: sophomore standing.

JOUR 381-0 Business Reporting Students gain in-depth knowledge of business and economic issues while covering and writing stories related to business. Students are encouraged to take this course in conjunction with a non-Medill course complementing the subject matter. Prerequisite: sophomore standing.

JOUR 382-0 Environmental Reporting Students gain in-depth knowledge of environmental issues while covering and writing stories related to the environment. Students are encouraged to take this course in conjunction with a non-Medill course complementing the subject matter. Prerequisite: sophomore standing.

JOUR 383-0 Health and Science Reporting Students gain in-depth knowledge of health and science issues while covering and writing stories related to health, science, medicine, and technology. Prerequisite: sophomore standing.

JOUR 385-0 Journalism Residency in Marketing Communications: Writing (2 units) Sharpening promotional, marketing, and public relations research, writing, and editing skills in an agency or corporate setting through hands-on assignments under deadline pressure with professional mentoring. Prerequisites: JOUR 310; 320, 321, or 322; 370; IMC 300, 301, 304, 305, or 306. Taken with JOUR 386.

JOUR 386-0 Journalism Residency in Marketing Communications: Tactics Students develop and implement social media, including media pitches, media monitoring, media placement, and Intranet development; work flow will vary depending on location. A team approach may be stressed in some settings, particularly for brand strategy and communications functions. Prerequisites: JOUR 312; 320, 321, or 322; 370; IMC 300, 301, 304, 305, or 306. Taken with JOUR 385.

JOUR 388-0 Internship (0 units) Student-initiated internships in journalism. Supervised by Medill's career services director. Prerequisites: sophomore standing and consent of Medill's Director of Career Services.

JOUR 388-1 Undergraduate Research (0 units) Student-initiated research projects, such as the Eric Lund Global Reporting and Research Grant projects. Application required.

JOUR 390-0 Special Topics (1 unit) Specialized experimental courses offered from time to time by faculty. Topics may include journalism in a networked world and depth reporting using documents and databases. Prerequisites: vary depending on the course.

JOUR 391-0 Special Topics (.5 unit) Courses, such as Strategies for Career Success, offered for one-half of a quarter.

JOUR 399-0 Independent Study Academic work sponsored and supervised by a faculty member working one-on-one with the student. Prerequisite: consent of Medill's senior director of undergraduate education and teaching excellence.

INTEGRATED MARKETING COMMUNICATIONS

The Integrated Marketing Communications Certificate Program focuses on effective marketing communications strategies and tactics for an increasingly digital media environment. It prepares students for entry-level marketing communications positions in such fields as advertising, public relations, corporate communications, and database and social media marketing.

The program covers traditional and digital areas of marketing communications. Students develop skills for understanding and analyzing consumers in traditional markets and newly forming digital communities and social networks. They learn how to conduct research and analyze data on consumer behavior, media usage, and marketing communications effectiveness. Through a wide variety of media channels, they learn about message creation and delivery.

Students in all undergraduate schools at Northwestern are eligible to apply to the certificate program; see the Medill website for more information. They may apply after completing the 3 prerequisite courses and IMC 301 or 302 with a minimum 2.7 GPA.

Certificate in Integrated Marketing Communications

Certificate requirements (8 units)

- 3 prerequisite courses:
  - ECON 202 or comparable microeconomics course
  - 200-level introductory statistics course (see website for approved courses)
  - 1 course from ANTHRO 211, 235, 389; BUS INST 390; COMM ST 205, 360, 363, 380; ECON 322, 330, 350; IEMS 383; POL SCI 348, 375; PSYCH 204, 228, 316, 335, 351, 385; SOCIOL 302, 303, 315, 332, 345
- 3 core courses: IMC 301, 302, 303
- 2 electives from IMC 304, 305, 306, 307, 308, 309, 310, 320

Courses

IMC 300-0 Introduction to Integrated Marketing Communications Basic introduction to the strategic marketing communications process, including consumer insight and research, market segmentation, brand positioning, communications messages, and media decisions. Overview of tactical areas, such as branding, advertising, digital media, and corporate communications. Course is for non–IMC certificate students only and does not count toward the certificate. Prerequisite: sophomore standing.

IMC 301-0 Consumer Insight Psychological, economic, communication, anthropological, and sociological perspectives on why and how individuals, families, and groups acquire, consume, and dispose of goods, services, ideas, brands, and experiences. Goals and experiences as means to understanding people as consumers. Prerequisite: sophomore standing.

IMC 302-0 Research for Marketing Communications Analytic methods and metrics, including web analytics and social media metrics, to develop, execute, and evaluate marketing communications. Designing questionnaires and analyzing survey results and databases to evaluate consumer behavior. Students develop hands-on analytic skills with Qualtrics survey and SPSS statistics software. Prerequisites: approved 200-level statistics course and ECON 202 or comparable course.

IMC 303-0 Integrated Marketing Communications Strategy Consumer insight and research, market segmentation, brand positioning, communication messages, and media decisions. Brand communications integrated with other aspects of marketing, including product strategy, pricing, and retailing. Case studies and writing-intensive assignments. Prerequisite: 301, 302, admission to IMC Certificate Program (may be taken the quarter the student applies for admission).

IMC 304-0 Media and Message Delivery The contemporary media landscape and how brand communications adapt to media technology and usage. Current case studies are used to understand the transition from passive consumption of traditional media to active participation in digital and social media. Engaging and communicating effectively with consumers through media. Prerequisites: 303 and admission to IMC Certificate Program.

IMC 305-0 Message Strategy and Persuasive Communications Development of message strategies for communicating with audiences. Understanding audiences, persuasion, development and execution of brand communications. Hands-on exercises in writing creative briefs and using digital and social media. Prerequisites: for non-Medill students, 303 and admission to IMC Certificate Program; for Medill students, JOUR 301.

IMC 306-0 Public Relations Strategies and Tactics Development and execution of communications strategies and relationship building with employees, the news media, government, investors, and the public. Outlets include traditional print and broadcast media and contemporary channels including blogs, social media platforms, and emerging technologies. Exercises in written communications. Prerequisites: for non-Medill students, 303 and admission to IMC Certificate Program; for Medill students, JOUR 301.

IMC 307-0 Direct and Interactive Marketing Communications Practices used to acquire and serve customers, including direct mail, direct response advertising, e-commerce, email, and social media platforms. Use of customer data to measure customer lifetime value, develop loyalty programs, manage customer relationships, and evaluate communications impact with web analytics. Prerequisites: 303 and admission to IMC Certificate Program.

IMC 308-0 Digital, Social, and Mobile Marketing Focus on the tools, methodologies, and programs used by companies to develop, justify, deploy, and measure their social and mobile marketing programs. Development of complete social marketing programs for actual companies using best-of-breed social monitoring, web analysis, social marketing systems, blogs, Twitter, Google Plus, LinkedIn, and other tools. Prerequisites: 303 and admission to IMC Certificate Program.

IMC 309-0 Entertainment Marketing Strategic and tactical use of entertainment, gaming, and other brand engagement programs in integrated marketing communications. The role entertainment plays in the lives of consumers. How entertainment brands are built and how managers use entertainment marketing and communications to achieve brand objectives. The business and financial scope of the entertainment industry, including the success and financial return of marketing programs. Prerequisites: 303 and admission to IMC Certificate Program.

IMC 310-0 IMC Law, Policy, and Ethics Legal and ethical issues and the policy side of communications, media, and marketing. Media law, First Amendment protection of commercial speech, contracts, intellectual property, privacy, and ethics. Prerequisites: for non-Medill students, 303 and admission to IMC Certificate Program; for Medill students, JOUR 301.

IMC 320-0 Capstone Project Students work with sponsoring organizations to develop comprehensive marketing communications programs in real-world settings. The final product is a report outlining the learning and insight behind strategic, creative, and marketing recommendations; a client presentation; and a project book detailing research, analysis, strategy, creative execution, media use, and other integrated communications activities. Prerequisites: 303 and admission to IMC Certificate Program.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

Henry and Leigh Bienen School of Music

www.music.northwestern.edu

One of the oldest degree-granting music institutions in the United States, Northwestern University's Henry and Leigh Bienen School of Music combines a nationally ranked music program of conservatory-level intensity with the academic rigor and scholarly resources found only at a world-class private research university. The Bienen School of Music is a professional school within the University. Entering freshmen rank on average in the top 10 percent of their high school class and show highest-level achievement in academics as well as music. The school believes that by carefully developing outstanding musicianship and keen intelligence, while nurturing a curiosity about the world, we can best encourage the emergence of each student's unique creative voice.

All students at the Bienen School of Music are expected to grow as artists and as people. They are encouraged to explore in depth other areas of interest, drawing on the vast resources of Northwestern's other schools, and to develop the critical thinking and communication skills necessary for a successful career in music.

Key to all degree programs is intensive one-on-one training with a celebrated faculty that includes members of the Chicago Symphony and Lyric Opera of Chicago Orchestras, internationally acclaimed soloists, sought-after conductors, and distinguished scholars and clinicians. Students work in small classes with these dedicated teachers and artists in a curriculum that comprises music history and theory, aural and piano skills, instrumental and voice lessons, and electives. Special programs include a five-year double-degree curriculum—enabling students to earn a degree in music as well as one in engineering, journalism, or arts and sciences—and the ad hoc (self-designed) degree, an option offered by no other major music school. Additionally, the world-class music making and other cultural resources of downtown Chicago provide exceptional opportunities for learning outside the classroom.

Performing and research opportunities abound at Northwestern. Students may participate in 16 ensembles and chamber groups and have access to more than 400 performances each year, including three critically acclaimed professional series as well as master classes given by such notables such as Renée Fleming, Oscar Ghiglia, Richard Goode, Lynn Harrell, Karl Leister, Rachel Barton Pine, and Murray Perahia. In addition, the school sponsors the biennial Michael Ludwig Nemmers Prize in Music Composition and the Jean Gimbel Lane Prize in Piano Performance, which regularly bring world-renowned composers and pianists to campus. The music collection in Deering Library comprises more than 142,000 books, scores, journals, and microfilms, and the Listening Center boasts 53,000 sound recordings. The library's collection of post-1945 music is considered the finest in the world and is frequently used by scholars from around the world.

A Bienen School of Music education provides students with skills and values—superb musicianship, a mastery of communication, a sense of discipline, a commitment to excellence—that prepare them for success wherever their interests may lead.

The Bienen School of Music is a founding member of the National Association of Schools of Music, which fully accredits all its degree programs.

ACADEMIC POLICIES

Programs of Study

The Bienen School of Music offers programs leading to the professional degrees of bachelor of music, master of music, and doctor of musical arts. The school also offers two nonprofessional degrees, the bachelor of arts in music and bachelor of science in music.

The curriculum allows flexibility for students while providing an education that is basic for all musicians. Applicants in all areas who are accepted by the Bienen School enter directly into a program of specialization that begins in the freshman year. The core studies, taken by all students, require the acquisition of minimum competencies and provide fundamental and essential experiences that complement the specialized studies in the declared major. Students are also required to complete studies in a number of allied subjects throughout the University.

Bachelor of Music

Courses of study leading to the bachelor of music degree include majors in piano, strings, voice, winds and percussion, jazz, music cognition, music composition, music education, musicology, and music theory. It is also possible to design an ad hoc major program that cuts across specializations to meet a particular student's needs and career ambitions. Ad hoc majors are designed in consultation with faculty and area professionals with expertise in the particular area of interest; specializations have included areas such as arts administration, music criticism, music theater production, and popular musicology. For degree requirements for the bachelor of music, see below.

Liberal Arts Degrees in Music
The bachelor of arts in music and bachelor of science in music are nonperformance degrees that offer a broad liberal arts education with a major in music. The requirements of the BA are essentially identical to those for the BA in the Weinberg College of Arts and Sciences; the requirements for the BS are the same as those for the BA except that the BS has no language requirement. Within these degrees' focus on music, there are a wide range of possibilities for study, from cultural musicology to cognitive studies of music and from music composition to advanced theory; the options also include an ad hoc specialization designed to meet a particular student's needs and career ambitions. These degrees are an excellent stepping-stone to further education in music or to any career for which a knowledge of music brings depth and enrichment. The curricula offer considerable latitude in designing a sequence of courses to suit the student's interests and goals. A key feature for the student is the planning and execution of a senior project. For specific degree requirements, see next column.

Dual Bachelor's Degree Programs
The Bienen School of Music offers dual bachelor's degree programs with the Weinberg College of Arts and Sciences (music and liberal arts), the McCormick School of Engineering and Applied Science (music and engineering), and the Medill School of Journalism, Media, Integrated Marketing Communications (music and journalism). For information on program requirements, see pages 28–29 in the Cross-School Options chapter. For information on applying to these programs, see Application to Dual Bachelor's Degree Programs on page 11.

Degree Requirements

Bachelor of Music (50–54 units)
Candidates for the degree of bachelor of music must complete 50–54 units, depending on the minimum number of courses required for their major. The degree can usually be completed within four years. All students in the bachelor of music degree program take a core set of music requirements (19 units of credit for all but jazz studies majors) in addition to the requirements for the individual major.

- Music core requirements (19 units; 15.5 for jazz studies)
  2 years of music theory (3 units)
  2 years of aural skills (3 units)
  1 year of keyboard skills (1.5 units)
  6 courses in music history (6 units)
  1 course in conducting (1 unit)
  1 year of ensemble (1.5 units)
  1 year of 100-level applied study (3 units)
- General education (nonmusic) (12 units; 8 units for music education)
- Free electives (music or nonmusic) (0–3 units)
- Major studies requirement (16–27 units)

Bachelor of Arts in Music (45 units)
Candidates for the degree of bachelor of arts in music must complete 45 units.

- Music core requirements (10 units)
  - 2 years of music theory (3 units)
  - 1 year of aural skills (1.5 units)
  - 4 courses in music history (4 units)
  - 1 year of ensemble (1.5 units)
- Additional music courses (10 units)
- General education (nonmusic) (13 units)
- Nonmusic electives (6 units)
- Foreign language (6 units)

Bachelor of Science in Music (45 units)
Candidates for the degree of bachelor of science in music must complete 45 units.

- Music core requirements (10 units)
  - 2 years of music theory (3 units)
  - 1 year of aural skills (1.5 units)
  - 4 courses in music history (4 units)
  - 1 year of ensemble (1.5 units)
- Additional music courses (10 units)
- General education (nonmusic) (13 units)
- Nonmusic electives (12 units)

Overlay Requirement in Business or Finance
All Bienen School undergraduates are required to complete a one-credit "overlay" requirement in business or finance. The requirement is so termed because it would not add to the existing number of courses required for undergraduate degrees; depending on which course is chosen, the course would count toward the student's general education or free electives requirement. See the Office of Student Affairs for a list of recommended courses.

Other Requirements
Music majors must earn a grade of C or above in all courses required in the major, including all core requirements and all specialization courses, in order to count those courses toward graduation requirements. A grade of D or above (including P grades for four-year students) may be used to fulfill distribution requirements and electives. If a student receives a D in a major course, then takes that course a second time and receives a C grade or above, the initial D grade remains on the permanent record and cannot count toward elective requirements. The second (improved) grade does not replace the first, and the same course cannot be counted twice in the degree. A maximum of 6 quarter-courses in nonmusic subjects taken under the P/N grade option may be counted toward the degree. Music students may not take music courses under the P/N

grade option, except for those courses graded solely with P/N grades.

If students interrupt their program of study for an extended period of time and degree requirements are changed during this period, they will normally be held to the new requirements.

Every candidate for a degree must file a graduation petition one year in advance of the date of graduation.

Students coming to Northwestern University for a second undergraduate degree must transfer at least 9 units of credit in music, audition for admission at the 300 level, complete the general education distribution requirement with transfer credit, and comply with the University's Undergraduate Registration Requirement for transfer students.

In addition to and independent of the requirements set by the Bienen School of Music, all students must satisfy the Undergraduate Registration Requirement (see page 17 in the Undergraduate Education chapter of this catalog).

Applied Music Study

The Bienen School of Music offers individual instruction for majors in piano, strings, voice, winds and percussion, and jazz. Students should consult their program coordinators for the assignment of an instructor. Consent of the instructor, program coordinator, and department chair as well as concurrent registration in ensemble are required. Elective applied study assignments are made by the appropriate program coordinator and department chair as space is available.

Attendance Policy

Students are expected to attend all sessions of courses and ensembles for which they are registered. It is the responsibility of students enrolled in the Bienen School of Music to acquaint themselves and comply with the attendance policy of their departments, class instructors, and ensemble conductors. In addition, students who are absent from classes for three or more consecutive days because of illness are required to notify the Office of Student Affairs.

Outside professional opportunities may arise for music students. If such an opportunity directly interferes in any way with curricular responsibilities, students must first obtain permission from faculty of record for courses potentially affected, including classes, opera, and ensembles, along with the signature of the program coordinator and a signature from one of the cochairs of the Department of Music Performance.

Failure to comply with these regulations can be cause for failure in the courses or ensembles for which a student is registered during that quarter.

See the Cross-School Options chapter for opportunities open to all Northwestern undergraduates.

ACADEMIC OPTIONS

Double Major

Students may earn a double major in four years by fulfilling the requirements of both majors. Typically, the double major within the Bienen School of Music combines a specialization in a performance area with one in an academic area, although double majors in two academic areas are also possible. A double major in two performance areas is generally not permitted. Four-year bachelor of music students may also complete a second major outside the music school but may earn only one bachelor's degree. Bienen School of Music students who choose to leave the school for another school at Northwestern may still complete a music major as a second major, although in these cases no degree from the Bienen School will be awarded.

Candidates for the bachelor of arts in music and bachelor of science in music may double major with any major offered in the Weinberg College of Arts and Sciences but may earn only one bachelor of arts degree.

Minor Programs

The Bienen School of Music offers minors in arts administration, commercial music, jazz studies, music cognition, music composition, music criticism, music education, musicology, music technology, and music theory and the certificate program in music theatre. Minor programs include a minimum of 6 and a maximum of 9 courses, of which a minimum of 5 courses are not double-counted in the major. Students must receive a grade of C or above in all courses counted toward the minor; no P/N grades are allowed. Students who wish to complete a minor program should fill out a Minor Declaration Form, available in the Office of Student Affairs, and should fill out a minor petition form one year before graduation. Students may pursue more than one Bienen School of Music minor.

Program Honors

Each year faculty are invited to nominate graduating students for program honors. To be eligible for program honors, students must have a cumulative GPA of 3.5 or above and be outstanding contributors to their respective programs. Additional criteria govern the selection of voice majors; see the coordinator of the voice and opera program for details. Faculty select only a small number of students in each program for program honors in a given year; for more information, contact the Office of Student Affairs in the Bienen School of Music.

Graduate Studies

The Bienen School of Music offers programs of study leading to the master of music and doctor of musical arts degrees. Information concerning these programs is available from the Office of Admission and Financial Aid in the Bienen School of Music. For information about

the requirements for the doctor of philosophy degree in music, contact the Graduate School.

Music Studies for Nonmajors

The Bienen School of Music offers many opportunities for students registered in other schools of the University to participate in ensembles and to take courses and private lessons. For information on these options, see page 263.

STUDENT RESOURCES

Musical Organizations

As a part of their program of study, music majors are required to participate in music school ensembles. Students from all other schools of the University are encouraged to participate in any organizations for which they qualify. Ensembles include Symphony Orchestra, Chamber Orchestra, and Philharmonia; Symphonic Wind Ensemble, Symphonic Band, Concert Band, and Wildcat Marching Band; Bienen Contemporary/Early Vocal Ensemble, University Chorale, University Singers, Alice Millar Chapel Choir, and University Women's Chorus; Jazz Orchestra and jazz small ensembles; Baroque Music Ensemble and Contemporary Music Ensemble; Guitar Ensemble and Percussion Ensemble; and chamber music ensembles.

Facilities

The Bienen School of Music occupies five buildings. The Music Administration Building houses administrative offices, classrooms, studios, and practice rooms. The faculties of the Department of Music Studies, Voice and Opera Program, and Piano Program have offices in this building. Regenstein Hall houses rehearsal facilities, practice rooms, a 200-seat lecture/recital room, the library and offices for the University bands, the Music Performance Department Office, and faculty studios for the Conducting and Ensembles, String Instruments, and Winds and Percussion Instruments Programs. Practice Hall (the "Beehive") contains 35 practice rooms. Lutkin Hall, seating 400, is used for student and faculty recitals and lecture classes. Pick-Staiger Concert Hall provides a 1,000-seat concert hall, rehearsal facilities, and offices and library for the University Symphony Orchestra. A new state-of-the-art building adjacent to Regenstein Hall of Music is scheduled to open in 2015. It will include a 400-seat recital hall as well as classrooms, labs, and rehearsal spaces.

Music Library

Among the nation's largest music libraries, the Northwestern University Music Library supports all areas of musical study with a broad collection of books, scores, sound recordings, periodicals, and online resources. The facility, located in historic Deering Library, offers a reading room rich in reference materials, a music listening center, and a computer lab equipped with specialized music hardware and software. The Music Library is also distinguished internationally for its extensive collection of contemporary music, which includes one copy of nearly every score published since 1945 as well as many original manuscripts by prominent composers such as Pierre Boulez, John Cage, George Crumb, and Iannis Xenakis. The Music Library's collections and staff serve the Bienen School of Music, the entire Northwestern University community, and researchers from around the world. For more information see www.library.northwestern.edu/music.

ACADEMIC OFFERINGS

INTERDEPARTMENTAL COURSES FOR MUSIC MAJORS

The music theory, aural skills, keyboard skills, and music history sequences are required for, and limited to, all undergraduates in the Bienen School of Music.

Courses Open to Undergraduates

MUSIC 101-1,2,3 Theory Skills Testing (0) Skills tests taken in conjunction with MUSIC 111-1,2,3.

MUSIC 111-1,2,3 Music Theory I, II, III (.5) Music as sound in time. Analytical studies in forms, media, textures, and harmonic and melodic materials. Prerequisite: preceding quarters of 111.

MUSIC 126-1,2,3 Aural Skills I, II, III (.5) Sight-singing and ear-training; drill in recognition of melodic, rhythmic, and harmonic patterns and aural analysis through listening and dictation. Progresses through six levels of proficiency.

MUSIC 127-0 Keyboard Skills (.5) Class instruction, in electronic piano classroom; six levels of proficiency.

MUSIC 211-1,2,3 Music Theory IV, V, VI (.5) Continuation of 111. Prerequisite: 111-1,2,3 or consent of instructor.

MUSIC 213-0 World Music Cultures Introduction to both the world's musical variety and common issues related to music cultures worldwide.

MUSIC 214-0 Western Music Cultures before 1600 An introduction to selected musical cultures of the Western world from before 1600; focus on music, its intellectual and cultural contexts, its creators, and its performance practices. Also introduces traditions of performing this music today and tools for music research. As a core component for music majors, this course assumes completion of 111-1,2,3 and 126-1,2,3 or their equivalents as prerequisites.

MUSIC 215-0 Western Music Cultures 1600–1800 An introduction to selected musical cultures of the Western world from 1600 to 1800; focus on music, its intellectual and cultural contexts, its creators, and its performance practices. Also introduces traditions of performing this music today and tools for music research. As a core component for music majors, this course assumes completion of 111-1,2,3 and 126-1,2,3 or their equivalents as prerequisites.

MUSIC 216-0 Western Music Cultures after 1800 An introduction to selected musical cultures of the Western world from 1800 to the present; focus on music, its intellectual and cultural contexts, its creators, and its performance practices. Also introduces traditions of performing this music today and tools for research. As a core component for music majors, this course assumes completion of 111-1,2,3 and 126-1,2,3 or their equivalents as prerequisites..
MUSIC 226-1,2,3 Aural Skills IV, V, VI (.5) Continuation of 126.
MUSIC 227-0 Keyboard Skills (.5) Continuation of 127.
MUSIC 298-0 Student-Organized Seminar (.5–1)
MUSIC 327-1 Advanced Keyboard Skills VII (.5) Advanced score-reading. Reading various voice parts in combination and harmonically reducing four-part textures.
MUSIC 327-2 Advanced Keyboard Skills VIII (.5) Techniques of accompanying by reducing and rewriting accompaniments to make initial performances more effective.
MUSIC 327-3 Advanced Keyboard Skills IX (.5) Advanced accompanying. Adding accompaniments to a given vocal line. Improvising accompaniments in various styles, including "swing." Transposition of individual lines.
MUSIC 335-0 Selected Topics in Music Topics vary; announced before registration. May be repeated.
MUSIC 350-0 Alexander Technique (.5) Methods of using the body efficiently to reduce unnecessary tension and stress in instrumental and vocal performance.
MUSIC 355-0 Final Performance Requirements (.5–4)
MUSIC 360-0 Career Innovation in Music and the Performing Arts Introduction to various models of performing-arts careers, exploration of innovative approaches to existing career paths. Case studies, guest speakers. Topics include fee and contract negotiation, artist and booking management, fundraising and grant writing, marketing and public relations, social media, and organizational and business structures. Open to music majors only.
MUSIC 361-0 Entrepreneurship in Music and the Performing Arts Students each develop a proposed career-building project, then research and critique each other's plans in a seminar format, resulting in business plans that can be implemented successfully. Open to music majors only.
MUSIC 397-0 Summer Internship (0) Field experience as an intern.
MUSIC 398-0 Internship (.5–4) Field experience as an intern. Requirements include journal and final paper.
MUSIC 399-0 Independent Study (.5–1)

MUSIC STUDIES

This department consists of the Composition and Music Technology, Music Education, Musicology, and Music Theory and Cognition Programs. Bachelor of music majors are available in composition, music cognition, music education, musicology, and music theory. These specializations are described on the following pages.

Composition and Music Technology

www.music.northwestern.edu/programs/composition.html
www.music.northwestern.edu/programs/musictech.html

Composition students pursue a course of study that develops analytical and creative skills and enjoy many opportunities to hear their works performed. Students have access to the electronic and computer music studios, which provide the latest technology for experimentation and experience with 21st-century compositional materials. Students intending to major in composition may substitute composition class for applied studies during their freshman and sophomore years.

Courses in music technology are offered primarily for music majors but are open to students from across the University as space permits.

Major in Composition

For a major in composition, 16 course units are required beyond the core degree and general education requirements.

- 212 Applied Composition (3 units; some credit may be given for applied instrument or voice lessons)
- 312 Applied Composition (6 units)
- 314-1 Instrumentation (1 unit)
- 314-2 Orchestration (1 unit)
- MUS THRY 316 Renaissance Counterpoint (1 unit)
- 335 Selected Topics (1 unit)
- 2 music theory courses in analysis (1 unit must be in 20th-century analysis)
- 1 300-level music technology course
- 380 Senior Recital (0 units)
- 12 quarters of 390 Composition Colloquium (0 units)

Minor in Composition

A minor in composition requires 9 units, of which a minimum of 5 courses are not double-counted in the major. Students must receive a grade of C or above in all courses counted toward the minor. Admission requires submission of a composition portfolio.

- 111 and 311 Class Composition (6 units)
- 314-1 Instrumentation or 314-2 Orchestration (1 unit)
- 1 elective chosen from 300-level music composition courses
- 1 elective in music technology
- 390 Composition Colloquium (6 quarters, 0 credit)

Minor in Music Technology

A minor in music technology requires 6 units, of which a minimum of 5 courses are not double-counted in the major. Students must receive a grade of C or above in all courses counted toward the minor. The 6 units required for the minor in music technology are to be chosen from the following list of courses.

- 259 Introduction to Music Technology or MUSIC ED 262 Technology in the Music Classroom

- 321 Producing in the Virtual Studio
- 322 Recording Techniques
- 335 Selected Topics in Music Technology
- 337 Multimedia for the Web
- 338 Programming
- 340 Composing with Computers
- 342 Computer Sound Synthesis
- 345 Technology-Based Performance
- 348 3-D Sound and Spatial Audio

Courses Open to Undergraduates

MUS COMP 111-1,2,3 Class Composition Class instruction in techniques of composition. Open to nonmusic majors. **1.** Writing for solo instruments. **2.** Writing for two to four instruments. **3.** Writing for instruments and/or voices. Prerequisite: preceding quarters of 111 or consent of instructor.

MUS COMP 112-0 Applied Composition Original composition; individual instruction.

MUS COMP 212-0 Applied Composition Original composition; individual instruction.

MUS COMP 311-1,2,3 Class Composition Class instruction in techniques of composition. Open to nonmusic majors. **1.** Writing for solo instruments. **2.** Writing for two to four instruments. **3.** Writing for instruments and/or voices. Prerequisites: for 311-1, 111-3 or consent of instructor; for 311-2,3, preceding quarters of 311 or consent of instructor.

MUS COMP 312-0 Applied Composition Original composition; individual instruction.

MUS COMP 314-1 Instrumentation Instruments of the orchestra; scoring techniques; analysis of instrumental combinations. Prerequisite: MUSIC 211-3 or consent of instructor.

MUS COMP 314-2 Orchestration Stylistic scoring projects; analysis of orchestral and chamber scores. Prerequisite: 314-1 or consent of instructor.

MUS COMP 314-3 Advanced Orchestration Contemporary scoring techniques; creative projects; analysis of orchestral and chamber scores. Prerequisite: 314-2, graduate standing, or consent of instructor.

MUS COMP 335-0 Selected Topics in Music Composition Topics vary; announced before registration. Writing projects; analysis of scores; 20th-century stylistic techniques, performers, and composers. Contemporary materials; in-class performances of original work. Prerequisite: preceding quarter of 335 or consent of instructor. May be repeated for credit.

MUS COMP 336-1,2 Contemporary Repertoire I, II Close study of specific recent compositional styles; modernism post-1945, music since 1975. Prerequisite: consent of instructor.

MUS COMP 337-0 Topics in Contemporary Repertoire Topics vary by quarter. Close study of specific recent compositional styles, which may include minimalism, complexity, music of the last decade, experimental music. Prerequisite: consent of instructor.

MUS COMP 338-0 Composer Portraits Composers vary by quarter. Portrait studies of the work of a major composer or composers, e.g., Ferneyhough; Lutoslawski; Cage; Birtwistle and Maxwell Davies. Prerequisite: consent of instructor.

MUS COMP 339-0 Compositional Concepts and Techniques Topics vary by quarter. Content, musical spaces, extended techniques, and spectralism. Prerequisite: consent of instructor.

MUS COMP 340-0 Composition Workshop Topics vary by quarter. Examples include Composer/Performer, Composing for Percussion, Composing for Dance, Composing for Solo Instrument. Prerequisite: consent of instructor.

MUS COMP 380-0 Senior Recital (0)

MUS COMP 390-0 Composition Colloquium (0) Discussion of contemporary compositional techniques.

MUS COMP 399-0 Independent Study (.5–1)

MUS TECH 259-0 Introduction to Music Technology Survey of music software and hardware for the professional musician. Topics include music notation, sequencing and MIDI, audio recording and editing, synthesis, multimedia, and web publishing. Assignments include projects demonstrating the practical use of software tools.

MUS TECH 262-0 Technology in the Music Classroom Survey of music software and hardware in the context of teaching. Topics include computer-aided instruction, music notation, sequencing and MIDI, multimedia, and web publishing. Assignments include projects related to teaching music. No prerequisite.

MUS TECH 300-0 Foundations of Music Technology for Music Majors Introduction of key concepts in acoustics, digital audio theory, production, and postproduction. Through projects and presentations, students will learn to record and edit their work, use notation software, communicate with recording engineers, and prepare and present work online.

MUS TECH 320-0 Physics of Sound Principles of physical acoustics. Acoustics of musical instruments, the human voice, and concert halls. Fundamentals of psychoacoustics. Assignments include informal experiments.

MUS TECH 321-0 Producing in the Virtual Studio Techniques for creating and producing music in the context of a computer-based audio production environment. Topics include MIDI, audio editing, plug-ins, effects processing, mastering, and basic surround mixing. Assignments include creative projects. Prerequisites: 259, 262, or equivalent experience and consent of instructor.

MUS TECH 322-0 Recording Techniques Microphone and placement techniques including stereo and close/distant miking of voices, acoustic instruments, and ensembles. Topics also include console design, signal flow, and dynamics processing. Projects include recording assignments.

Prerequisites: 259, 262, or equivalent experience and consent of instructor.

MUS TECH 335-0 Selected Topics in Music Technology Topics vary; announced before registration. May be repeated with change of topic.

MUS TECH 337-0 Multimedia for the Web Advanced instruction in web design and programming with a focus on the design and maintenance of multimedia intended for distribution via the Internet. Assignments include web-based projects. Prerequisite: consent of instructor.

MUS TECH 338-0 Programming Syntax of programming languages, program development, user interfaces, and music-specific algorithms. Techniques for creating musical applications. Prerequisite: 259, 262, or equivalent experience.

MUS TECH 340-0 Composing with Computers Foundational techniques of composition using music and audio software. Techniques of algorithmic composition, sound processing. Analysis of electroacoustic music. Assignments include student compositions. Prerequisite: 259, 262, or equivalent experience.

MUS TECH 342-1,2 Computer Sound Synthesis 1. Synthesis of musical sounds, including the characteristics of digital audio signals, wavetable synthesis, modulation, and sample-based synthesis. **2.** Processing of audio signals, including digital filtering, reverberation, and effects processing; physical modeling synthesis. Assignments include sound synthesis programming. Prerequisite: 259, 262, or equivalent experience.

MUS TECH 343-0 Sound Design for New Media Creative projects for the web and DVD. Topics include philosophies and techniques of sound design, authoring for 5.1 surround sound, techniques of sound montage. Prerequisite: consent of instructor.

MUS TECH 345-0 Technology-Based Performance Creation, rehearsal, and performance of technology-based music in a group setting. Topics include real-time interaction, technological performance interfaces, application of algorithmic methods. Prerequisite: consent of instructor.

MUS TECH 348-0 3-D Sound and Spatial Audio Techniques and applications of 3-D sound and spatial audio. The physical acoustics and psychoacoustics of spatial hearing, simulating 3-D cues, stereo sound reproduction, multichannel audio formats, environmental acoustics, and environmental simulation. Prerequisite: fundamental knowledge of acoustics.

MUS TECH 350-0 Studio Techniques for Electroacoustic Music Advanced projects in electroacoustic composition, audio programming (Max/MSP), audio engineering, or electronic instrument design; includes a large-scale project, typically developed from the student's previous music technology course work. Prerequisite: 340, 345, or equivalent experience.

MUS TECH 385-0 Senior Project Independent project in music technology. Prerequisite: permission of department.

MUS TECH 399-0 Independent Study (.5–1)

Music Cognition

See Music Theory and Cognition.

Music Education

www.music.northwestern.edu/programs/musiced.html

Graduates with a major in music education meet all requirements for teacher certification in the state of Illinois as well as most other states. Students take the professional program required of all music students, a structured sequence of courses in general education, a basic set of courses in music education, and special courses in the chosen music education specialization. The combination results in a program that prepares professionals with a broad understanding of music and education as well as the skills to be effective music teachers.

Students in the undergraduate music education program must take all the core studies in music and all the professional studies in music education plus the general education courses required for teacher certification. They must also choose one of the three specialization tracks—instrumental, choral, or general—and take the required courses for that track. A combined track is also available for students interested in a hybrid version of the music education major; see the music education program coordinator for advising on this option. All music education majors are required to complete 100 hours of clinical observation.

Major in Music Education

For a major in music education, 25 to 27 course units are required beyond the core degree and general education requirements.

- Additional applied lessons (6 units)
- Additional keyboard skills (as needed by track) (1.5–3 units)
- 258 Philosophy of Music Education
- 260 The Music Teacher as Communicator
- 314 Music Education Rehearsal Practicum (11 quarters, 0 units)
- 368 Teaching Composition in the Schools
- 380–387 Student Teaching (3 units)
- 390 Student Teaching Colloquium (0 units)
- MUS TECH 262 Technology in the Music Classroom
- CONDUCT 340-1,2, or 3 Advanced Conducting

Instrumental Track **(11.5 additional units)**

- Additional large ensemble (7 quarters, 3.5 units)
- Chamber music (1 quarter, .5 unit)
- 230 Flute Class (.5 unit)
- 232 Voice Class (.5 unit)
- 233 Clarinet and Saxophone Class (.5 unit)
- 234 Double Reeds Class (.5 unit)

- 235 High Brass Class (.5 unit)
- 236 Low Brass Class (.5 unit)
- 237 String Class (2 quarters, 1 unit)
- 239 Percussion Class (.5 unit)
- 362 Teaching General Music II
- 364 Teaching Instrumental Music I
- 365 Teaching Instrumental Music II

***Choral Track* (10 additional units)**
- Additional large ensemble (8 quarters, 4 units)
- 231-1 Guitar Class I (.5 unit)
- 232 Voice Class (.5 unit)
- 240 Classroom Instruments (.5 unit)
- 361 Teaching General Music I
- 362 Teaching General Music II
- 366 Teaching Choral Music I
- 367 Teaching Choral Music II
- Instrumental techniques elective (.5 unit)
- VOICE 111-1,2,3 Phonetics and Diction (0 units)
- VOICE 311 Vocal Solo Class (9 quarters, 0 units)

***General Track* (9.5 additional units)**
- Additional large ensemble (8 quarters, 4 units)
- 231-1,2 Guitar Class I, II (.5 unit each)
- 232 Voice Class (.5 unit)
- 240 Classroom Instruments (.5 unit)
- 361 Teaching General Music I
- 362 Teaching General Music II
- 366 Teaching Choral Music I
- Instrumental techniques elective (.5 unit)

General Education (8 units)
- ENGLISH 105 Expository Writing or 205 Intermediate Composition
- SESP 201 Human Development: Childhood and Adolescence or PSYCH 218 Developmental Psychology
- TEACH ED 322 Teaching Reading in the Content Area
- TEACH ED 327 Educating Exceptional Children or CSD 336 The Field of Special Education
- Weinberg distribution area I (natural sciences) (1 unit)
- Weinberg distribution area III (social and behavioral sciences) (1 unit)
- Weinberg distribution area IV (historical studies) and/or V (ethics and values) (2 units)

Minor in Music Education

A minor in music education requires 6 units, of which a minimum of 5 courses are not double-counted in the major. The minor in music education is open to music majors only. Students must receive a grade of C or above in all courses counted toward the minor.
- 258 Philosophy of Music Education
- 260 The Music Teacher as Communicator
- MUS TECH 262 Technology in the Music Classroom
- 1 methods class, chosen from 361, 362, 364, 365, 366, or 367 (1 unit)
- 1 300-level music education elective, chosen from 345, 368, or other courses that may be offered (1 unit)
- One capstone project (1 unit)

Courses Open to Undergraduates

MUSIC ED 230-0 Flute Class (.5)
MUSIC ED 231-1,2 Guitar Class I, II (.5)
MUSIC ED 232-0 Voice Class (.5)
MUSIC ED 233-0 Clarinet and Saxophone Class (.5)
MUSIC ED 234-0 Double Reeds Class (.5)
MUSIC ED 235-0 High Brass Class (.5)
MUSIC ED 236-0 Low Brass Class (.5)
MUSIC ED 237-0 String Class (.5)
MUSIC ED 239-0 Percussion Class (.5)
MUSIC ED 240-0 Classroom Instruments (.5)
MUSIC ED 242-0 Recorder Class (.5)
MUSIC ED 258-0 Philosophy of Music Education Philosophical issues in music education relating to the teaching and learning of music in schools.
MUSIC ED 260-0 The Music Teacher as Communicator Discussion and observation of school music programs and effective presentational skills.
MUSIC ED 314-0 Music Education Rehearsal Practicum (0) Students rehearse their peers in a public school–level ensemble, learn public school repertoire, and gain practical experience on their secondary instruments.
MUSIC ED 335-0 Selected Topics in Music Education Topics vary; announced before registration. May be repeated.
MUSIC ED 345-0 Music in the Interdisciplinary Curriculum For individuals interested in promoting music- and arts-based interdisciplinary experiences for elementary and secondary school students. Focuses on curriculum development that relates various arts disciplines to one another (such as music, art, and literature) and establishes valid connections between the arts and disciplines outside the arts (such as history and social studies).
MUSIC ED 361-0 Teaching General Music I For grades K–5, curriculum materials and strategies for developing musical growth. Laboratory experiences; developing creativity in the music classroom. Open only to music majors or with consent of instructor. Prerequisite: 240.
MUSIC ED 362-0 Teaching General Music II For grades 6–12, effective teaching of general music classes in middle and high school. Available curriculum materials; innovative approaches. Prerequisite: 231-1.
MUSIC ED 363-0 Teaching High School Nonperformance Courses Planning and teaching high school music, arts, humanities courses. Present practices; development of exemplary course plans.
MUSIC ED 364-0 Teaching Instrumental Music I Teaching and administrative principles for elementary and middle school instrumental music programs. Rehearsal dynamics,

conducting, rehearsal room management, and pedagogy for school ensembles. Prerequisites: 237 and 238.
MUSIC ED 365-0 Teaching Instrumental Music II Teaching and administrative principles for secondary school instrumental music programs. Rehearsal dynamics, conducting, rehearsal room management, and pedagogy for school ensembles. Prerequisites: 364 and 2 courses chosen from 230, 233, 234, 235, 236, and 239.
MUSIC ED 366-0 Teaching Choral Music I Development and application of skills, knowledge, and understandings for teaching choral music in elementary and middle school.
MUSIC ED 367-0 Teaching Choral Music II Continuation of 366. High school choral program, curriculum model, repertoire, sight-reading, rehearsal techniques, programming, administration.
MUSIC ED 368-0 Teaching Composition in the Schools Practical and research literature in teaching composition; design of curricular materials for teaching composition and improvisation in school music programs.
MUSIC ED 369-0 Research and Evaluation in Music Education Procedures and issues in research and evaluation in music teaching. Practical application of research to decision making.
MUSIC ED 390-0 Student Teaching Colloquium (0)
MUSIC ED 399-0 Independent Study (.5–1)

Student Teaching Courses

Students are assigned to specific classes in cooperating schools under joint University/school supervision.
MUSIC ED 370-0, 380-0 Student Teaching in the Elementary School: General Music (1–4)
MUSIC ED 371-0, 381-0 Student Teaching in the Middle School/Junior High School: General Music, Choral (1–4)
MUSIC ED 373-0, 383-0 Student Teaching in the Senior High School: Choral and Nonperformance Courses (1–4)
MUSIC ED 375-0, 385-0 Student Teaching in the Elementary School: Instrumental (1–4)
MUSIC ED 376-0, 386-0 Student Teaching in the Middle School/Junior High School: Instrumental (1–4)
MUSIC ED 377-0, 387-0 Student Teaching in the Senior High School: Instrumental and Nonperformance Courses (1–4)

Musicology

www.music.northwestern.edu/programs/musicology.html

An undergraduate major in musicology is available within the bachelor of music degree or as a specialization within the bachelor of arts degree. The courses required for this specialization are selected from musicology, analysis, and the departmental core. As some of the courses are offered on a two-year alternating schedule, certain courses may not be available during a given year.

Major in Musicology

For a major in musicology, 16 course units are required beyond the core degree requirements.

Historical Musicology Track
- 350–355 history of music courses (6 units)
- Musicology electives or cognates (6 units)
- Applied lessons/performance experience (3 units)
- 385 Senior Project (1 unit)
- 390 Musicology Colloquium (12 quarters, 0 units)

Ethnomusicology Track
- Ethnomusicology courses (3 units)
- Area and topics courses (9 units)
- Applied lessons/performance experience (3 units)
- 385 Senior Project (1 unit)
- 390 Musicology Colloquium (12 quarters, 0 units)

Minor in Musicology

A minor in musicology requires 6 units, of which a minimum of 5 courses are not double-counted in the major. The minor in musicology is open to all undergraduates. Students must receive a grade of C or above in all courses counted toward the minor.
- 6 units in musicology
  - At least one must be chosen from 323 or 326–329 (courses on music of the world's cultures).
  - At least one must be chosen from 350–355 (courses on historical art music).
- Students who wish to emphasize a particular concentration within the field of musicology should speak to the program coordinator or a musicology faculty member of their choosing.

Courses Open to Undergraduates

MUSICOL 323-0 Topics in Ethnomusicology Ethnomusicology; its history, bibliographical resources, methods, and theories.
MUSICOL 326-0 Topics in World Music: Asia The musical traditions of South Asia, East Asia, and Southeast Asia. Topics include characteristics of instruments and instrumental ensembles, sound structures, theatrical traditions, and vocal performance.
MUSICOL 327-0 Topics in World Music: Africa Introduces students to the diverse musics of Africa through the multidisciplinary lens of ethnomusicology. Topics include music learning and transmission, aesthetics, musical styles and structures, performance practice, compositional process, musical change, and the role of music in society.
MUSICOL 328-0 Topics in World Music: The Americas An ethnomusicological perspective on music of the Americas as influenced by the European, African, Hispanic, and native American cultures. The socioeconomic impact of jazz, rock, gospel, and popular music; the role of music

in the spiritual and social life of the Americas' diverse peoples.

MUSICOL 329-0 Music and Islam History, basic tenets, and aesthetic of Islam; the musics of Islamic cultures from North Africa, Spain, the Middle East, central Asia, and the Indian subcontinent. Methods of contextualizing musical cultures and critical methodology related to gender, postcolonial theory, and religion.

MUSICOL 330-0 Russian Fairy Tale and Opera Russian cultural and national identity through the study of folk tales and their musical counterparts in such operas as Glinka's *Ruslan and Ludmila*, Tchaikovsky's *The Sleepers*, and Rimsky-Korsakov's *The Snow Maiden*, *Sadko*, and *The Tale of Tsar Saltan*. Current critical theory, concepts related to the portrayal of women, the interplay of nationalism and gender, and the dichotomy between East and West.

MUSICOL 331-0 Orientalism and Music The imagery of the East in the music of the West expressed in musical genres of various historical periods; focus on romantic opera and contemporary musical culture. Orientalism as formulated by Edward Said and developed by John MacKenzie is defined and further clarified through references in literature and the visual arts.

MUSICOL 332-0 Music and Gypsies Romany music from Hungary, Spain, the Balkans, Turkey, the Middle East, and India; Andalucian flamenco; 19th-century opera and operetta (Bizet's *Carmen*, Verdi's *La Traviata*); instrumental works by Haydn, Liszt, Brahms, and others; and more recent "world" music phenomena.

MUSICOL 333-0 Europop Explores major popular genres such as French chanson, Italian disco, Russian bardic song, and British ensembles. Second half of the quarter focuses on Eurovision song contest relative to the structure and dynamics of the European Union, studying popular musics as entwined with sociopolitics, gender, and globalization.

MUSICOL 335-0 Selected Topics in Musicology Topics vary; announced before registration. May be repeated.

MUSICOL 338-0 Expressionism The interaction of music with other art forms (painting, poetry, theater, dance) in early-20th-century Germany and Austria. Schoenberg, Berg, Webern, Weill, Hindemith; poets such as Stefan George; playwrights such as Frank Wedekind and Bertolt Brecht; choreographers such as Kurt Jooss; visual artists such as Vasily Kandinsky.

MUSICOL 339-0 Music and Gender The many intersections between music and ideas of gender; focus on issues of composition, characterization, patronage, and performance. Elite and popular forms of Western music from the Middle Ages to 2000 explored in relation to gender issues in musics of other cultures.

MUSICOL 341-0 Music and the Visual Arts The many ways in which the senses of sight and hearing interact in Western images of music and music making as well as in select musical works inspired by concurrent ideas or movements in the visual arts.

MUSICOL 342-0 Authenticity Focus on authenticity in music at the end of the 20th century and beginning of the 21st century by examining the three music genres most closely associated with the cultural and philosophical considerations of the idea: early music, country music, and "world" or "ethnic" music.

MUSICOL 343-0 Music and Shakespeare An exploration of some of the many intersections between Shakespearean drama and music from the late 16th through early 21st centuries, including study of plays, opera, ballet, film, musical theater, art song, popular music, and the symphony.

MUSICOL 344-0 Music and Film Theory and practice of music as a part of the processes of making and viewing films, from the beginning of the sound era to the present. Specific topic varies from year to year but typically concentrates on a specific film genre and its musical traditions, techniques, personalities, and problems.

MUSICOL 345-0 From Literature to Opera to Film Selected operas, based on literary or theatrical works, that in turn inspired films. Examination of the literary or theatrical inspiration, the opera as written for stage, and film and video adaptations. Cross-listed as COMP LIT 375.

MUSICOL 346-0 Composer Topics Topics vary; announced before registration. May be repeated.

MUSICOL 347-0 The Lied Survey of voice-piano settings of German poems, from Mozart through Richard Strauss.

MUSICOL 348-0 Bel Canto Opera Italian opera in the early- to mid-19th century. The relations of Rossini, Donizetti, and Bellini to the operatic culture of their time.

MUSICOL 350-0 Topics in Medieval Music Gregorian and medieval chant, secular monophony, and the development of polyphony from the earliest records through the music of Ockeghem and Busnois.

MUSICOL 351-0 Topics in 16th-Century Music Middle and late renaissance and early manifestations of the baroque, from Josquin through the Gabrielis.

MUSICOL 352-0 Topics in 17th-Century Music The baroque from Monteverdi through Bach and Handel.

MUSICOL 353-0 Topics in 18th-Century Music Representative works and critical studies of European art music from the Arcadian reform of opera through the Napoleonic era.

MUSICOL 354-0 Topics in 19th-Century Music Representative works and critical studies of European art music from the Congress of Vienna to the death of Mahler.

MUSICOL 355-0 Topics in 20th-Century Music Representative works and critical studies of art music from Debussy to the present.

MUSICOL 385-0 Senior Project

MUSICOL 390-0 Musicology Colloquium (0)

MUSICOL 399-0 Independent Study (.5–1)

Music Technology

See Composition and Music Technology.

Music Theory and Cognition

www.music.northwestern.edu/programs/musictheorycognition.html

Undergraduates majoring in theory or cognition receive a broad education in music and the cognitive sciences. The emphasis is on cognitive musicology, whereby music is studied using the tools and insights of cognitive science and musicological research.

Major in Music Theory or Music Cognition

For a major in music theory or in music cognition, 16 course units are required beyond the core degree requirements.

Major in Music Theory

- 300- and 400-level courses in music theory and cognition (6 units)
- Musicology (2 units)
- Music technology (1 unit)
- Cognate areas (3 units)
- Applied lessons/performance experience (3 units)
- 385 Senior Project (1 unit) (optional)

Major in Music Cognition

- 251 Music and Mind (1 unit)
- 336 Selected Topics in Music Cognition (2 units)
- PSYCH 201 Statistical Methods in Psychology (1 unit)
- PSYCH 205 Research Methods in Psychology (1 unit)
- Cognate areas (3 units)
- Electives (4 units)
- Applied lessons/performance experience (3 units)
- 385 Senior Project (1 unit) (optional)

Minor in Music Theory or Music Cognition

Students must receive a grade of C or above in all courses counted toward the minor.

Minor in Music Theory

A minor in music theory requires 6 units, of which a minimum of 5 courses are not double-counted in the major. The minor in music theory is open to music majors only.

- 3 300-level music theory courses in music analysis
- 3 300-level courses in music cognition

Minor in Music Cognition

A minor in music cognition requires 9 units, of which a minimum of 5 courses are not double-counted in the major.

- 3 units in music cognition
- 3 units in musical analysis and music technology
- 3 units in cognate areas (psychology, linguistics, and/or communication sciences and disorders)

Courses Open to Undergraduates

MUS THRY 251-0 Music and Mind An introduction to music cognition for music undergraduates as well as students with limited music backgrounds. Readings primarily from secondary sources, with some primary sources as well.

MUS THRY 316-0 Renaissance Counterpoint Contrapuntal textures from two to four voices. Cadence and form, melodic line and motive, rhythm, simple and complex imitation, and treatment of dissonance in the sacred music of Lassus, Josquin, and Palestrina.

MUS THRY 317-0 Figured Bass The study of harmony at the keyboard as learned by musicians since the early 17th century. Figured bass is an essential subject for performers of early music (including Bach and Mozart) and a key to the analysis of most pre-20th-century European music.

MUS THRY 318-0 Baroque Counterpoint Baroque dance suite, chorale prelude, invention, fugue, chiefly involving the music of J. S. Bach. Melodic, harmonic, structural characteristics; contrapuntal techniques.

MUS THRY 321-0 Analytical Techniques Detailed analysis of all parameters of selected musical examples; compositional procedures as a means of developing an intelligent rationale for interpretation. Prerequisite: MUSIC 211-1,2,3 or consent of instructor.

MUS THRY 331-0 Analytical Studies Extension and refinement of concepts and techniques acquired in MUSIC 111-1,2,3, MUSIC 211-1,2,3.

MUS THRY 335-0 Selected Topics in Music Theory Topics vary; announced before registration. May be repeated.

MUS THRY 336-0 Selected Topics in Music Cognition Topics vary; announced before registration. May be repeated.

MUS THRY 355-0 Atonal Analysis Techniques for analysis of atonal and nonfunctional tonal music, including serial, set-theoretic, and parametric approaches. Emphasis on music of Schoenberg, Webern, Berg, Stravinsky, and Debussy. Selected readings in analytic literature. Prerequisite: MUSIC 211-1,2,3 or equivalent.

MUS THRY 385-0 Senior Project (1)

MUS THRY 390-0 Music Theory/Cognition Colloquium (0) Discussion of current research in music theory and cognition.

MUS THRY 399-0 Independent Study (.5–1)

Other Minor Programs

Students must receive a grade of C or above in all courses counted toward the minor.

Minor in Arts Administration

A minor in arts administration requires 8 units, of which a minimum of 5 courses are not double-counted in the major. The minor in arts administration is open to music majors only.

- ECON 202 Introduction to Microeconomics
- MKTG 201 Marketing I: Principles of Marketing (School of Continuing Studies)
- ADVERT 203 Basic Advertising (School of Continuing Studies)

- ORG BEH 309 Human Resource Management (School of Continuing Studies)
- ORG BEH 367 Strategic Planning and Management (School of Continuing Studies)
- MUSIC 360-0 Career Innovation in Music and the Performing Arts
- MUSIC 361-0 Entrepreneurship in Music and the Performing Arts
- MUSIC 398 Internship

Minor in Commercial Music
A minor in commercial music requires 8 units, of which a minimum of 5 courses are not double-counted in the major.
- JAZZ ST 330 Jazz Composition and Arranging (2 units)
- RTVF 383 Sound Production
- MUS COMP 311 Class Composition
- MUS COMP 314-1 Instrumentation
- 2 courses chosen from music technology
- 1 course in popular music

Minor in Music Criticism
A minor in music criticism requires 7 units, of which a minimum of 5 courses are not double-counted in the major. The minor in music criticism is open to music majors only.
- JOUR 201-1 Reporting and Writing
- JOUR 201-2 Multimedia Storytelling
- JOUR 301 Enterprise Reporting in Diverse Communities (prerequisite: 201)
- JOUR 202 Introduction to 21st-Century Media or 370 Media Law and Ethics
- JOUR 310 Media Presentation: Newspaper/Online, 311 Media Presentation: Magazine, or 312 Media Presentation: Video Producing for Broadcast and the Web
- MUSIC 398 Internship or 399 Independent Study
- 1 300-level musicology course

MUSIC PERFORMANCE

This department consists of the Conducting and Ensembles, Jazz, Piano, Strings, Voice and Opera, and Winds and Percussion Programs.

Conducting and Ensembles

Courses in the Conducting and Ensembles Program are available to all music majors.

Courses Open to Undergraduates

CONDUCT 323-0 Marching Band Techniques Writing for marching and pep bands; rehearsing for the marching band.
CONDUCT 326-0 Basic Conducting Fundamentals in both instrumental and choral conducting; transpositions, ranges, and podium technique. Extensive laboratory experience with videotaped evaluation.
CONDUCT 335-0 Selected Topics in Conducting Topics relevant to the professional needs of conducting majors.
CONDUCT 336-0 Wind Orchestral Repertoire for Conductors (.5)
CONDUCT 340-1,2,3 Advanced Conducting Separate quarters of band, orchestral, and choral conducting that emphasize the techniques of score preparation and analysis, repertoire, and rehearsal methods. Prerequisite: 326 or equivalent. May be repeated for credit.
CONDUCT 341-0 Choral Literature I A comprehensive examination of choral music literature from 1600 to 1800.
CONDUCT 342-0 Choral Literature II A comprehensive examination of choral music literature from 1800 to the present.
CONDUCT 345-0 Orchestral Bowing: Style and Function Designed for nonstring-playing conductors, teachers, and composers wishing to enhance their knowledge of bowing principles and practices as well as string players wishing to explore teaching concepts and in-depth bowing analyses. Topics include sound production principles, applied bowing techniques and pedagogy, performance practice, interpretation, and analysis.
CONDUCT 364-0 Choral Organizations (.5) University Chorale, University Singers, University Chorus, Alice Millar Chapel Choir, and Women's Chorus. Open to all qualified students.
CONDUCT 374-0 Band Organizations (.5) Marching Band, Concert Band, Symphonic Band, Symphonic Wind Ensemble. Open to all qualified students.
CONDUCT 378-0 Contemporary Music Ensemble (.5) Membership by audition.
CONDUCT 391-0 Chamber Music (.5) Performance of chamber music literature in a variety of small-ensemble settings.
CONDUCT 393-0 Orchestral Organizations (.5) Membership by audition in Symphony Orchestra, Chamber Orchestra, or Philharmonia.
CONDUCT 395-0 Baroque Music Ensemble (.5) Performance of choral, solo, and instrumental music of the Middle Ages through the early baroque.
CONDUCT 399-0 Independent Study

Jazz

www.music.northwestern.edu/programs/jazz.html
The jazz program offers courses in jazz improvisation, composition and arranging, history, and ensembles.

Major in Jazz Studies
For a major in jazz studies performance, 23.5 course units are required beyond the core degree requirements. For jazz majors, the 19-unit core requirement for the bachelor of music degree is reduced to 15.5 units by the omission of one year of keyboard skills (1.5 units) and two music history courses (2 units). Those requirements are replaced by the jazz keyboard and jazz history requirements below.
- 210-1,2 Jazz History (2 units)

- 236-1,2,3 Jazz Improvisation (1.5 units)
- 262 Applied Jazz (3 units)
- 330-1,2 Jazz Composition and Arranging (2 units)
- 336-1,2,3 Jazz Improvisation (1.5 units)
- 337 The Business of Jazz (.5 unit)
- 361-1,2 Jazz Keyboard (1 unit)
- 362 Applied Jazz (6 units)
- 377 Jazz Orchestra (3 units)
- 380 Senior Recital (0 units)
- 391 Small Ensemble (3 units)

Minor in Jazz Studies
A minor in jazz studies requires 8 units, of which a minimum of 5 courses are not double-counted in the major. Students must receive a grade of C or above in all courses counted toward the minor. Admission requires a performance audition.
- JAZZ ST 160 Applied Jazz (3 quarters, 1.5 units)
- JAZZ ST 210-1,2 Jazz History (2 units)
- JAZZ ST 236-1,2,3 Jazz Improvisation (1.5 units)
- JAZZ ST 377-0 Jazz Orchestra or 391-0 Small Ensemble (6 quarters, 3 units)

Courses Open to Undergraduates

JAZZ ST 160-0 Applied Jazz for Minors (.5)
JAZZ ST 162-0, 262-0, 362-0 Applied Jazz
JAZZ ST 210-1,2 Jazz History The origins of jazz, its performers, and their contributions. Includes a look at contemporaneous social conditions during its development.
JAZZ ST 236-1,2,3 Jazz Improvisation I, II, III (.5 each) The language of jazz. Focus is on melodic development and ear training via repertoire and solos of jazz's most influential figures.
JAZZ ST 305-0 Optional Recital (0)
JAZZ ST 330-1,2 Jazz Composition and Arranging The techniques of composing and arranging for large and small ensembles in the jazz tradition. Study of scores by major composers and arrangers from throughout jazz history.
JAZZ ST 333-0 Jazz Theory (.5) Chord symbols, melodic and harmonic structures, and other analyses as applied to the language of jazz.
JAZZ ST 335-0 Selected Topics in Jazz Studies Topics vary. May be repeated for credit as topics change.
JAZZ ST 336-1,2,3 Jazz Improvisation IV, V, VI (.5 each) Continuation of 236-1,2,3.
JAZZ ST 337-0 The Business of Jazz (.5) A survey of the music industry as it pertains to jazz. Includes discussions on songwriting, music publishing, national and international copyright law, music licensing, artist management, music production, and related topics.
JAZZ ST 361-1,2 Jazz Keyboard (.5 each) Basic keyboard skills, with an emphasis on jazz voicing, harmonization, and analysis.
JAZZ ST 377-0 Jazz Orchestra (.5)
JAZZ ST 380-0 Senior Recital (0)
JAZZ ST 391-0 Small Ensemble (.5)
JAZZ ST 399-0 Independent Study (.5–1)

Piano

www.music.northwestern.edu/programs/piano.html
The major in piano performance focuses on private lessons, studio classes, piano repertoire, piano pedagogy, and accompanying classes. Frequent performances as a soloist and as an assisting musician develop skills in public presentation. Solo recitals, required in both the junior and senior years, are considered an integral part of the program.

Major in Piano
For a major in piano performance, 17 course units are required beyond the core degree requirements.
- 261 Applied Piano (3 units)
- 313-1,2,3 Repertoire Studies (3 units)
- 315-1,2,3 Piano Pedagogy (3 units)
- 328 Beginning Collaborative Piano (1.5 units)
- 340 Piano Recital Hour (12 quarters, 0 units)
- 361 Applied Piano (6 units)
- 370 Junior Recital (0 units)
- 380 Senior Recital (0 units)
- CONDUCT 391 Chamber Music (.5 unit)

Students enrolled in a five-year double-degree program may substitute three 300-level musicology and/or music theory electives for the pedagogy requirement.

Courses Open to Undergraduates

PIANO 161-0, 261-0, 361-0 Applied Piano
PIANO 255-0 Piano Sight-Reading (.5)
PIANO 305-0 Optional Recital (0)
PIANO 313-1,2,3 Repertoire Studies Analytical and historical study of piano solo and concerto repertoire from early keyboard literature to the present.
PIANO 315-1,2,3 Piano Pedagogy Lecture/demonstration/laboratory course in piano teaching at all levels. Principles and techniques of group and individual instruction; survey of teaching materials. Seniors and graduate students.
PIANO 328-1,2,3 Beginning Collaborative Piano (.5) Piano students work with a singer and instrumentalist in the preparation and performance of mainstream recital repertoire.
PIANO 329-0 Duo Collaborative Coaching (.5) Provides an opportunity for pianists and their vocal and/or instrumental partners to receive intensive coaching on works of their choice. A final performance is required.
PIANO 335-0 Selected Topics in Piano Topics vary; announced before registration. May be repeated.
PIANO 340-0 Piano Recital Hour (0)
PIANO 358-0 Other Keyboard: Instruction in Harpsichord or Organ (.5)
PIANO 370-0 Junior Recital (0)
PIANO 380-0 Senior Recital (0)
PIANO 390-0 Studio Classes (0)

PIANO 392-0 Studio Ensemble (.5)
PIANO 393-0 Repertoire Studies (.5) Topics vary by quarter.
PIANO 399-0 Independent Study (.5–1)

String Instruments

www.music.northwestern.edu/programs/strings.html
Majors in string instruments prepare for professional performance and teaching as well as for advanced study. The curriculum is built around individual study and ensemble participation, including chamber music and orchestra, with orchestral repertoire studies and string pedagogy available to qualified juniors and seniors. A junior recital and a senior recital are required. Students in this program may major in violin, viola, cello, double bass, harp, or classical guitar.

Major in String Instruments

For a major in violin, viola, or cello, 19.5 course units are required beyond the core degree requirements.

Violin, Viola, and Cello Performance
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 300-level string pedagogy (1.5 units)
- 319-1,2,3 Orchestral Studies (1.5 units)
- 370 Junior Recital (0 units)
- 380 Senior Recital (0 units)
- CONDUCT 391 Chamber Music (3 units)
- CONDUCT 393 Orchestral Organizations (4.5 units)

For a major in double bass performance, 18 course units are required beyond the core degree requirements.

Double Bass Performance
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 300-level string pedagogy (1.5 units)
- 319-1,2,3 Orchestral Studies (1.5 units)
- 370 Junior Recital (0 units)
- 380 Senior Recital (0 units)
- CONDUCT 391 Chamber Music (1.5 units)
- CONDUCT 393 Orchestral Organizations (4.5 units)

For a major in harp or guitar performance, 16.5 course units are required beyond the core degree requirements.

Harp Performance
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- Large ensemble (4.5 units)
- 318-1,2,3 Harp Pedagogy and Maintenance (1.5 units)
- 319-1,2,3 Orchestral Studies (1.5 units)
- 380 Senior Recital (0 units)

Guitar Performance
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 376-1,2,3 Guitar Pedagogy (1.5 units)
- 370 Junior Recital (0 units)
- 374 Guitar Ensemble (4.5 units)
- 375-1,2,3 Lute and Guitar Literature (1.5 units)
- 380 Senior Recital (0 units)

Courses Open to Undergraduates

STRINGS 141-0, 241-0, 341-0 Applied Violin
STRINGS 142-0, 242-0, 342-0 Applied Viola
STRINGS 143-0, 243-0, 343-0 Applied Cello
STRINGS 144-0, 244-0, 344-0 Applied Double Bass
STRINGS 151-0, 251-0, 351-0 Applied Harp
STRINGS 171-0, 271-0, 371-0 Applied Classical Guitar
STRINGS 305-0 Optional Recital (0)
STRINGS 311-0 Suzuki Pedagogy (.5) Fundamental principles of Suzuki philosophy and materials, with emphasis on application to violin. Open to all string players.
STRINGS 312-0 String Class Pedagogy (.5) Group teaching strategies, materials, and techniques for violin, viola, cello, and double bass. Pedagogical applications to school settings and teaching college-level string techniques classes. Open to all string players.
STRINGS 313-0 History of String Pedagogy (.5) Historical survey of major violin, viola, cello, and double bass pedagogues from the early baroque through the 20th century and their contributions to contemporary pedagogical schools. Open to all string players.
STRINGS 314-0 Comprehensive String Pedagogy (.5) Survey and application of general principles of successful string teaching. Lecture, discussion, and demonstration format. Open to all string players.
STRINGS 315-1,2,3 Beginning Violin and Viola Pedagogy (.5) Developmental approach to teaching beginning through advanced precollege violin and viola students. Includes apprenticeship teaching and observations. Designed as a one-year sequence. Open to all violinists and violists.
STRINGS 316-1,2,3 Beginning Cello and Double Bass Pedagogy (.5) Developmental approach to teaching beginning through advanced precollege cello and double bass students.
STRINGS 317-0 Advanced/College-Level Studio Teaching (.5) In-depth analysis of pedagogy for advanced violin, viola, cello, or double bass playing. Observation of artist faculty. Open to all string players.
STRINGS 318-1,2,3 Harp Pedagogy and Maintenance (.5) **1.** Guests and master classes related to playing and teaching. **2.** Instrument maintenance and repair clinic with hands-on experience in routine maintenance and common repairs. **3.** Pedagogical instruction and demonstration of teaching techniques for all levels and ages.
STRINGS 319-1,2,3 Orchestral Studies (Violin, Viola, Cello, Double Bass, Harp) (.5)
STRINGS 335-0 Selected Topics in Strings Topics vary; announced before registration. May be repeated.
STRINGS 370-0 Junior Recital (0)

STRINGS 374-0 Guitar Ensemble Performance of the chamber literature for guitar: guitar duos, trios, and quartets; flute and guitar; voice and guitar; chamber works with strings; other instrumental combinations.
STRINGS 375-1,2,3 Lute and Guitar Literature Analytical and historical survey of the literature for plucked instruments from the 16th through the 20th centuries. The study of tablatures, instrument construction and tuning, performance practice, and style.
STRINGS 376-1,2,3 Guitar Pedagogy Principles of individual and group study. Survey of development of right- and left-hand technique from 16th-century lute and vihuela tutors through modern classical guitar methods. Interaction between musical texture and technical innovations; influence of fingering on stylistic inflection and ornamentation.
STRINGS 380-0 Senior Recital (0)
STRINGS 390-0 Studio Classes (0)
STRINGS 392-0 Studio Ensembles (.5) Small ensembles based on studio instruments.
STRINGS 393-0 Repertoire Studies (.5) Topics vary by quarter.
STRINGS 399-0 Independent Study (.5–1)

Voice and Opera

www.music.northwestern.edu/programs/voiceandopera.html

Students majoring in voice take a concentrated program of courses designed to prepare them for professional performance. In addition to individual instruction, students take courses in vocal pedagogy, conducting, opera workshop, repertoire, and diction. A senior recital is required, and students are urged to take advantage of the numerous other performance opportunities offered by the school.

The opera program generally presents three opera productions each year, including two with full orchestra.

Major in Voice

For a major in voice performance, 18 course units are required beyond the core degree requirements.

- 100 Freshman Practicum (0 units)
- 111-1,2,3 Phonetics and Diction (0 units)
- 210 Applied Voice (3 units)
- 211 Sophomore Practicum (0 units)
- 212 Opera Crew (0 units)
- 310 Applied Voice (6 units)
- 311 Vocal Solo Class (12 quarters, 0 units)
- 323 Vocal Pedagogy for Undergraduates (.5 unit)
- 351-1,2,3 Opera Workshop for Juniors (1.5 units)
- 352-1,2,3 Opera Workshop for Seniors (1.5 units)
- 380 Senior Recital (0 units)
- 393 Repertoire Studies (2 quarters, 1 unit)
- CONDUCT 364 Choral Organizations (4.5 units)

It is recommended that voice performance majors take 3 units of one foreign language and achieve a level-five competency in Keyboard Skills. See the voice program coordinator concerning the honors program in voice performance.

Courses Open to Undergraduates

VOICE 100-0 Freshman Practicum (0)
VOICE 110-0, 210-0, 310-0 Applied Voice Lessons consist of individual instruction, with each student receiving the equivalent of 50 minutes of instruction weekly.
VOICE 111-1,2,3 Phonetics and Diction (0) Required of freshman and transfer students majoring in voice. Three quarters: Italian, German, French.
VOICE 211-0 Sophomore Practicum (0)
VOICE 212-0 Opera Crew (0) One quarter required for voice majors. Students work crew for one opera production during sophomore year.
VOICE 305-0 Optional Recital (0)
VOICE 311-0 Vocal Solo Class (0) Weekly recital hour. Required for any student registered for full-credit private voice lessons.
VOICE 323-0 Vocal Pedagogy for Undergraduates (.5) The fundamentals of vocal production, including laryngeal anatomy, posture, breathing, resonance, articulation, and registration. Topics also include health care of the professional voice and some pathologies of the vocal folds.
VOICE 335-0 Selected Topics in Voice Topics vary; announced before registration. May include chanson, recitative, and non-English languages. May be repeated.
VOICE 351-1,2,3 Opera Workshop for Juniors (.5) Advanced techniques for the performance of arias; methods of text and character analysis; audition techniques; study of opera scenes. Must be taken sequentially.
VOICE 352-1,2,3 Opera Workshop for Seniors (.5) Specialty seminars (stage makeup, combat, etc.); audition techniques, opera scene work and performance. Prerequisites: 351-1,2,3. Must be taken sequentially.
VOICE 370-0 Junior Recital (0)
VOICE 380-0 Senior Recital (0)
VOICE 390-0 Studio Classes (0)
VOICE 393-0 Repertoire Studies (.5) Topics vary by quarter and may include the German Lied, chanson, oratorio repertoire, and recitative.
VOICE 399-0 Independent Study (.5–1) Permission of instructor and department required.

Winds and Percussion Instruments

www.music.northwestern.edu/programs/windsandpercussion.html

Designed to prepare students for professional performance and teaching as well as for advanced study, the major in winds and percussion instruments offers a concentrated curriculum emphasizing applied studies, frequent master classes, required participation in large and small ensembles, and a required senior recital. (Some instrument areas may also require a junior recital; see the Bienen School *Undergraduate Handbook* for further information.) Students

anticipating graduate study in wind or percussion performance are advised to elect additional courses in 300-level theory and history.

Major in Winds and Percussion Instruments
For a major in winds and percussion performance, 17.5 to 19 course units are required beyond the core degree requirements.

Flute, Saxophone, and Brass Performance
(17.5 additional units)
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 359 Teaching Techniques (1 quarter, .5 unit)
- 370 Junior Recital (0 units)
- 380 Senior Recital (0 units)
- 393 Repertoire Studies (1 quarter, .5 unit)
- CONDUCT 374 Band Organizations or CONDUCT 393 Orchestral Organizations (4.5 units)
- CONDUCT 391 Chamber Music (3 units)

Oboe Performance **(19 additional units)**
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 357 Reedmaking (3 quarters, 1.5 units)
- 359 Teaching Techniques (1 quarter, .5 unit)
- 380 Senior Recital (0 units)
- 393 Repertoire Studies (1 quarter, .5 unit)
- CONDUCT 374 Band Organizations or CONDUCT 393 Orchestral Organizations (4.5 units)
- CONDUCT 391 Chamber Music (3 units)

Clarinet Performance **(18.5 additional units)**
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 359 Teaching Techniques (1 quarter, .5 unit)
- 380 Senior Recital (0 units)
- 393 Repertoire Studies: Clarinet Orchestral Studies (3 quarters, 1.5 units)
- CONDUCT 374 Band Organizations or CONDUCT 393 Orchestral Organizations (4.5 units)
- CONDUCT 391 Chamber Music (3 units)

Percussion Performance **(17.5 additional units)**
- 200-level applied study (3 units)
- 300-level applied study (6 units)
- 347 Percussion Pedagogy and Performance (1 quarter, .5 unit)
- 380 Senior Recital (0 units)
- 393 Repertoire Studies (1 quarter, .5 unit)
- CONDUCT 374 Band Organizations or CONDUCT 393 Orchestral Organizations (4.5 units)
- CONDUCT 391 Chamber Music (3 units)

Courses Open to Undergraduates

WIND PER 111-0, 211-0, 311-0 Applied Flute
WIND PER 112-0, 212-0, 312-0 Applied Oboe
WIND PER 113-0, 213-0, 313-0 Applied Clarinet
WIND PER 114-0, 214-0, 314-0 Applied Saxophone
WIND PER 115-0, 215-0, 315-0 Applied Bassoon
WIND PER 121-0, 221-0, 321-0 Applied Trumpet
WIND PER 122-0, 222-0, 322-0 Applied French Horn
WIND PER 123-0, 223-0, 323-0 Applied Euphonium
WIND PER 124-0, 224-0, 324-0 Applied Trombone
WIND PER 125-0, 225-0, 325-0 Applied Tuba
WIND PER 131-0, 231-0, 331-0 Applied Percussion
WIND PER 305-0 Optional Recital (0)
WIND PER 335-0 Selected Topics in Winds and Percussion Topics vary; announced before registration. May be repeated.
WIND PER 339-0 Performance Practices and Criticism (.5) Performance and criticism of woodwind, brass, and percussion repertoire in a master class setting. Team-taught.
WIND PER 347-0 Percussion Pedagogy (.5) Methods, materials, and writings related to percussion playing and teaching.
WIND PER 352-0 Preparing for an Audition (.5)
WIND PER 354-0 Woodwind Instrument Repair (.5)
WIND PER 357-0 Reedmaking (.5)
WIND PER 359-0 Teaching Techniques (.5)
WIND PER 360-0 Bass Clarinet (.5)
WIND PER 361-0 English Horn (.5)
WIND PER 362-0 Baroque Flute (.5)
WIND PER 370-0 Junior Recital (0)
WIND PER 380-0 Senior Recital (0)
WIND PER 390-0 Studio Classes (0)
WIND PER 392-0 Studio Ensembles (.5)
WIND PER 393-0 Repertoire Studies (.5) Includes winds/brass/percussion orchestral repertoire, clarinet orchestral studies, and studies in woodwind and brass literature.
WIND PER 399-0 Independent Study (.5–1)

MUSIC STUDIES FOR NONMAJORS

www.music.northwestern.edu/programs/nonmajors.html
Students registered in other schools of the University are encouraged to continue their development as instrumentalists or vocalists through ensemble participation, class instruction, or private study. Ensembles and music performance instruction require an audition. For more information, visit the Office of Student Affairs for a brochure.

Concentration in Music

The concentration in music is a program offered to students in any school at Northwestern outside the Bienen School of Music. The program requires a total of 6 units of credit and is focused on the academic study of music; no more than 2 credits of performance-related credits (nonmajor applied lessons and/or ensembles) may be counted

toward the concentration. The program is limited to 20 students per year. For information, contact the Office of Student Affairs in the Bienen School of Music.

Applied Lessons for Credit

Nonmusic majors may take half-hour individual music lessons for .5 course credit in GEN MUS 115 Applied Piano and Organ, 120 Applied Strings, and 125 Applied Winds/Percussion; they may take voice classes or individual voice lessons, for up to .5 course credit (subject to instructor consent), in GEN MUS 131, 133, 134, 160, 231, 260, and 360. A registration fee is billed to the student's tuition and fees account; for 2011–12 registration fees, see the "Music Opportunities for Nonmajors" brochure, available in the Bienen School's Office of Student Affairs. Students are accepted for instrumental lessons and for vocal lessons and classes based on an audition and the availability of an instructor.

Courses Open to Undergraduates

The following courses were designed to meet the needs of any students interested in studying music. Students with a basic music foundation are encouraged to register for 252 Harmony (a basic music theory course), followed by 253 Form and Analysis and/or Composition. The music literature sequence is designed to permit students with limited background to start with 170. For courses for which Weinberg students may earn distribution requirement credits, the distribution area is indicated in parentheses.

GEN MUS 115-0 Applied Piano and Organ (.5 units) Private lessons for nonmajors; audition required.

GEN MUS 120-0 Applied Strings (.5) Private lessons for nonmajors; audition required.

GEN MUS 121-0 Beginning Nonmajor Guitar Class (.5) Class instruction in classical guitar.

GEN MUS 125-0 Applied Winds/Percussion (.5) Private lessons for nonmajors; audition required.

GEN MUS 130-0 Applied Jazz (.5) Private lessons for nonmajors.

GEN MUS 131-0 Nonmajor Vocal Performance Seminar, Beginning (.5) Must be concurrently registered for 133 or 160.

GEN MUS 133-0 Nonmajor Class Voice, Beginning (.5) Audition required.

GEN MUS 160-0 Nonmajor Private Voice, Beginning (.5) Private lessons for nonmajors; audition required.

GEN MUS 170-0 Introduction to Music An introduction to key concepts and contexts, guiding students to become informed listeners and critical thinkers with respect to a broad range of musical styles and genres and to acquire the skills and vocabulary to discuss and write about music effectively. Individual sections may vary from quarter to quarter; see specific section descriptions for more information. No previous musical training or ability to read music notation is required. (VI. Literature and fine arts)

GEN MUS 175-0 Selected Topics Topics vary; announced before registration. May be repeated.

GEN MUS 220-0 History of the Symphony Study of music for the symphony orchestra from the 17th century to the modern period. (VI. Literature and fine arts)

GEN MUS 230-0 History of Opera History of opera from its origins in Italy at the end of the 16th century to the modern period. (VI. Literature and fine arts)

GEN MUS 250-0 History of Rock The basic elements of rock from its roots in pop, country and western, and rhythm and blues to the present. Prerequisite: consent of instructor. (VI. Literature and fine arts)

GEN MUS 252-0 Harmony A basic course in music theory fundamentals, including harmonic materials and tonal structures. Analysis of harmonic structures; harmonization of melodies. Prerequisite: 170 or consent of instructor. (II. Formal studies)

GEN MUS 253-0 Form and Analysis Nature of musical forms found in musical literature from renaissance to the present; analysis of musical examples. Prerequisite: 252, or music-reading skills and some understanding of harmony.

GEN MUS 260-0 Nonmajor Private Voice, Intermediate (.5) Private lessons for nonmajors; audition required.

GEN MUS 270-1 The Western Musical Tradition Major genres and composers from 1600 to 1825. Primary emphasis on the generations of Bach and Handel, Haydn and Mozart, Beethoven and Schubert. Prerequisite: 170 or equivalent. (VI. Literature and fine arts)

GEN MUS 270-2 The Western Musical Tradition Major genres and composers from 1825 to the present. Prerequisite: 170 or equivalent. (VI. Literature and fine arts)

GEN MUS 335-0 Selected Topics Topics vary; announced before registration. May be repeated.

GEN MUS 360-0 Nonmajor Private Voice, Advanced (.5) Private lessons for nonmajors; audition required.

Ensemble Participation

Nonmusic majors interested in auditioning for Bienen School ensembles should contact the ensemble director for audition information. The Department of Music Performance office (Regenstein 226, 847-491-7228) has a current list of ensemble directors. If admitted, nonmajors should register under the following course numbers.

GEN MUS 364 Choral Organizations (.5)

GEN MUS 374 Band Organizations (.5)

GEN MUS 377 Jazz Orchestra (.5)

GEN MUS 391 Chamber Music (.5)

GEN MUS 393 Orchestral Organizations (.5)

For More Information

Undergraduate Study
Full-time, freshmen and transfers
Office of Undergraduate Admission
1801 Hinman Avenue
Evanston, Illinois 60208-1260
847-491-7271
www.ugadm.northwestern.edu

Graduate Study
Office of Admissions
Graduate School
633 Clark Street
Evanston, Illinois 60208-1113
847-491-5279
www.tgs.northwestern.edu

Graduate Management Study
Full-time
Office of Admissions
J. L. Kellogg School of Management
2001 Sheridan Road
Evanston, Illinois 60208-2003
847-491-3308
www.kellogg.northwestern.edu

Part-time
Office of Admissions
Part-Time MBA Program
J. L. Kellogg School of Management
340 East Superior Street, 2M
Chicago, Illinois 60611-3008
312-503-8385
www.kellogg.northwestern.edu

Law Study
Office of Admissions
Northwestern University School of Law
357 East Chicago Avenue
Chicago, Illinois 60611-3069
312-503-8465
www.law.northwestern.edu

Medical Study
Office of Admissions
Feinberg School of Medicine
303 East Chicago Avenue
Chicago, Illinois 60611-3008
312-503-8206
www.feinberg.northwestern.edu/admissions

Continuing Education
Office of the Dean
School of Continuing Studies
339 East Chicago Avenue
Chicago, Illinois 60611-3008
312-503-6950
www.scs.northwestern.edu

Summer Study
Office of the Director
Summer Session
405 Church Street
Evanston, Illinois 60208-4220
847-491-5250
www.scs.northwestern.edu/summernu

For information about faculty, please see the Northwestern Scholars website at www.scholars.northwestern.edu and the websites of individual schools.

NORTHWESTERN UNIVERSITY
Evanston, Illinois 60208

Periodicals Postage Paid

NORTHWESTERN
UNIVERSITY