

NORTHWESTERN

Undergraduate Catalog 2003–05

Northwestern Undergraduate Catalog 2003–05
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This catalog for the two academic years beginning September 1, 2003, 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, School of Music, and other undergraduate programs. 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.

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Academic Calendar

Academic Year 2003–04

Fall Quarter

September 2003

1	Monday	Tuition due
19	Friday	New Student Orientation
24	Wednesday	Registration for fall quarter Classes for fall quarter begin 8 a.m.
30	Tuesday	Last day for late registration, adding any course, or changing a section*

October 2003

31	Friday	Last day for dropping any course Last day to withdraw without academic review*
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November 2003

17	Monday	Registration for winter quarter
26	Wednesday	Thanksgiving vacation begins 6 p.m.
27	Thursday	Thanksgiving Day

December 2003

1	Monday	Classes resume 8 a.m. Last day for current students to file an undergraduate financial aid application for winter quarter
6	Saturday	Last day of classes for fall quarter
8	Monday	Fall quarter examinations begin
12	Friday	Examinations end; vacation begins 6 p.m.

Winter Quarter

January 2004

1	Thursday	Tuition due
5	Monday	Registration for winter quarter Classes for winter quarter begin 8 a.m.
9	Friday	Last day for late registration, adding any course, or changing a section*
19	Monday	Classes suspended from 11 a.m. to 2 p.m. for observance of Martin Luther King Jr. Day

February 2004

13	Friday	Last day for dropping any course Last day to withdraw without academic review*
23	Monday	Registration for spring quarter

March 2004

1	Monday	Last day for current students to file an undergraduate financial aid application for spring quarter
13	Saturday	Last day of classes for winter quarter
15	Monday	Winter quarter examinations begin
19	Friday	Examinations end; vacation begins 6 p.m.
29	Monday	Registration for spring quarter Classes for spring quarter begin 8 a.m.

Spring Quarter

April 2004

1	Thursday	Tuition due
2	Friday	Last day for late registration, adding any course, or changing a section*

NOTE: Before the end of spring quarter, students planning to graduate in arts and sciences, communication, education and social policy, journalism, or music in June or August 2005 must file an application for a degree at the Office of the Registrar. Others must file at the appropriate school office. Students completing requirements in December or March should file an application for a degree one year in advance.

*Please see refund policy on page 20.

May 2004

3	Monday	Last day for current students to file undergraduate financial aid applications for Summer Session and for academic year 2004–05
7	Friday	Last day for dropping any course* Last day to withdraw without academic review
17	Monday	Registration for fall quarter 2004–05
31	Monday	Memorial Day — legal holiday; no classes

June 2004

5	Saturday	Last day of classes for spring quarter
7	Monday	Spring quarter examinations begin
11	Friday	Examinations end 6 p.m.
18	Friday	Baccalaureate 146th annual Commencement

Summer Session**June 2004**

1	Tuesday	Tuition due
21	Monday	Late registration for Summer Session Classes for Summer Session begin 8 a.m.
25	Friday	Last day for late registration, adding any course, or changing a section*

July 2004

1	Thursday	Tuition due
5	Monday	Independence Day holiday; no classes
30	Friday	Six-week Summer Session examinations begin 8 a.m.
31	Saturday	Six-week Summer Session ends 6 p.m.

August 2004

13	Friday	Eight-week Summer Session examinations begin 8 a.m.
14	Saturday	Eight-week Summer Session ends 6 p.m.

Academic Year 2004–05**Fall Quarter****September 2004**

1	Wednesday	Tuition due
14	Tuesday	New Student Orientation
22	Wednesday	Registration for fall quarter Classes for fall quarter begin 8 a.m.
28	Tuesday	Last day for late registration, adding any course, or changing a section*

October 2004

29	Friday	Last day for dropping any course Last day to withdraw without academic review*
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November 2004

15	Monday	Registration for winter quarter
24	Wednesday	Thanksgiving vacation begins 6 p.m.
25	Thursday	Thanksgiving Day
29	Monday	Classes resume 8 a.m.

December 2004

1	Wednesday	Last day for current students to file an undergraduate financial aid application for winter quarter
4	Saturday	Last day of classes for fall quarter
6	Monday	Fall quarter examinations begin
10	Friday	Examinations end; vacation begins 6 p.m.

Winter Quarter**January 2005**

1	Saturday	Tuition due
3	Monday	Registration for winter quarter Classes for winter quarter begin 8 a.m.
7	Friday	Last day for late registration, adding any course, or changing a section*
17	Monday	Classes suspended from 11 a.m. to 2 p.m. for observance of Martin Luther King Jr. Day

February 2005

11	Friday	Last day for dropping any course Last day to withdraw without academic review*
21	Monday	Registration for spring quarter

March 2005

1	Tuesday	Last day for current students to file an undergraduate financial aid application for spring quarter
12	Saturday	Last day of classes for winter quarter
14	Monday	Winter quarter examinations begin
18	Friday	Examinations end; vacation begins 6 p.m.

Spring Quarter**March 2005**

29	Tuesday	Registration for spring quarter Classes for spring quarter begin 8 a.m.
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April 2005

1	Friday	Tuition due
4	Monday	Last day for late registration, adding any course, or changing a section*

NOTE: Before the end of spring quarter, students planning to graduate in arts and sciences, communication, education and social policy, journalism, or music in June or August 2006 must file an application for a degree at the Office of the Registrar. Others must file at the appropriate school office. Students completing requirements in December or March should file an application for a degree one year in advance.

May 2005

2	Monday	Last day for current students to file undergraduate financial aid applications for Summer Session and for academic year 2005–06
6	Friday	Last day for dropping any course Last day to withdraw without academic review*
16	Monday	Registration for fall quarter 2005–06
30	Monday	Memorial Day — legal holiday; no classes

June 2005

4	Saturday	Last day of classes for spring quarter
6	Monday	Spring quarter examinations begin
10	Friday	Examinations end 6 p.m.
17	Friday	Baccalaureate 147th annual Commencement

Summer Session**June 2005**

1	Sunday	Tuition due
20	Monday	Late registration for Summer Session Classes for Summer Session begin 8 a.m.
24	Friday	Last day for late registration, adding any course, or changing a section*

July 2005

1	Tuesday	Tuition due
4	Monday	Independence Day — legal holiday; no classes
29	Friday	Six-week Summer Session examinations begin 8 a.m.
30	Saturday	Six-week Summer Session ends 6 p.m.

August 2005

12	Friday	Eight-week Summer Session examinations begin 8 a.m.
13	Saturday	Eight-week Summer Session ends 6 p.m.

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

*Please see refund policy on page 20.

The University

Northwestern University is committed to excellent teaching, innovative research, and the personal and intellectual growth of its students. Through a combination of close interschool cooperation and a flexible academic calendar, both undergraduate and graduate students and faculty are able to customize education and research across disciplines. Northwestern is a place where faculty work closely with students and each other and where students at all levels interact as part of an innovative and technologically sophisticated learning community.

Northwestern's emphasis on effective communication, regardless of field of study, fosters the ability to think analytically and write and speak clearly and persuasively. The result is that Northwestern graduates are exceptionally well prepared for academic and career success and become leaders in their fields.

The University's locations in Evanston, the first suburb north of Chicago, and in Chicago provide outstanding intellectual, professional, social, and cultural opportunities in beautiful settings on the shore of Lake Michigan.

The Undergraduate Experience

Northwestern provides an educational and extracurricular environment that enables students to become accomplished individuals and responsible citizens. Its alumni feel confident exploring a wide range of subjects and experiences, in school and beyond, regardless of their majors. Northwestern believes that students should not invest themselves too fully in one area that they're afraid to risk exploring unfamiliar academic disciplines. About 20 to 25 percent of freshmen enroll with a prospective major of "undecided"; many more change their minds and their majors before they graduate; and 25 percent of them transfer from one of Northwestern's undergraduate schools to another. Students frequently pursue two majors or even two degrees at the same time, and enterprising students, with their deans' permission, occasionally construct their own majors or programs of study.

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. All students in the six undergraduate schools take courses in science, mathematics and technology, individual and social behavior, historical studies, the humanities, and fine and performing arts. In addition to the traditional components of undergraduate education — general requirements and advanced work in the major — Northwestern prides itself on making unusual academic opportunities available. Students also are encouraged to pursue independent study, internships, research, and study abroad. At least 30 percent of Northwestern's undergraduates engage in internships, practicums, paid cooperative education programs, applied research, and other off-campus experiences, often for academic credit.

Underpinning the breadth of a Northwestern education is the quarter system, which gives students the opportunity to take more courses than they would under a traditional semester system. Undergraduates typically take 4 courses each quarter and 12 courses in an academic year.

In both its academic and extracurricular programs, Northwestern encourages students to obtain a broad understanding of the world in which they live and to cultivate the habits of critical inquiry, creativity, and reflection that characterize the educated person. The University places particular value on being able to communicate effectively, to interpret the developments in science and technology that shape our changing world, and to use the techniques of quantitative analysis that are necessary to effective professional and social life.

One of Northwestern's strongest traditions is the energetic involvement of its undergraduates in campus life, a tradition that often leads them beyond the campus itself. Northwestern is a major force in the economic, social, and cultural life of Evanston, Chicago, and nearby communities. Each year Northwestern students, faculty, and staff provide thousands of hours of volunteer service to the community.

Student Demographics

Northwestern recruits students of demonstrated academic achievement from diverse social, ethnic, and economic backgrounds. All 50 states and nearly 50 countries are represented in the undergraduate student body. Forty-three percent of the approximately 7,800 undergraduates are from the Midwest, 20 percent from the East, 20 percent from the West and Southwest, and 10 percent from the South, and 7 percent have overseas addresses. More than half are female, and 31 percent are members of minority groups. Sixty percent enroll with financial aid.

Graduation Rates

More than 90 percent of Northwestern undergraduates earn baccalaureate degrees within six years, a graduation rate that remains consistent. Of the 1,948 full-time freshmen who entered in 1995, 91.6 percent had graduated at the end of six years. For more information about graduation rates, see www.registrar.northwestern.edu/statistics/graduation_rates.html.

A Historical Overview

Excellence has been Northwestern's goal since nine pioneering Chicagoans met in 1850 to establish an educational institution that would rival any in the eastern United States. That group — a physician, three attorneys, two businessmen, and three Methodist clergymen — envisioned a university “of the highest order of excellence” to serve the people of the Northwest Territory. Northwestern University was officially established on January 28, 1851, when its act of incorporation was passed by the Illinois legislature.

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 location so impressed founder Orrington Lunt that he wrote, “I could not rid myself of the fairy visions constantly presenting themselves in fanciful beauties — of the gently waving lake — its pebbly shore — the beautiful oak openings and bluffs beyond.”

The town that grew up around Northwestern was named Evanston in honor of one of the University's most prominent founders, John Evans. A physician and businessman, Evans provided the cash to place a \$1,000 down payment on the land and assumed responsibility for the mortgage covering the balance. Evans was chairman of the board from the University's founding until his death in 1897.

After completing its first building in 1855, Northwestern began classes that fall 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. 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.

Today Northwestern enjoys a position as one of the country's leading private research universities. Approximately 17,300 full-time and part-time students are enrolled in 11 colleges and schools located on lakefront campuses in Evanston and Chicago. Undergraduate education takes place on the Evanston campus in the Judd A. and Marjorie Weinberg College of Arts and Sciences, the School of Communication, the School of Education and Social Policy, the Robert R. McCormick School of Engineering and Applied Science, the Medill School of Journalism, and the School of Music.

Accreditation

Northwestern University is accredited by the North Central Association of Colleges and Schools. Other professional, college, school, and departmental accreditations are listed under the respective areas in the following section.

Schools and Divisions

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

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. Through the School of Continuing Studies, Weinberg College also offers the degrees of bachelor of philosophy and bachelor of science in general studies and two certificates in arts and sciences.
- 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 degree of master of science in communication. Its programs are accredited by the American Speech-Language-Hearing Association and the National Association of Schools of Theatre.

- The School of Music (1895) offers the degrees of bachelor of music and bachelor of arts in music. In its graduate division the School of Music offers the degrees of doctor of music and master of music and a certificate in performance. The school is accredited by the National Association of Schools of Music.
- The J. L. Kellogg School of Management (1908) offers the master of business administration degree. It provides students with the opportunity to study general management; finance; marketing; entrepreneurship; family business; management strategy; decision sciences; health services; manufacturing; and public and nonprofit, real estate, technology, and biotechnology management. In addition to the full-time MBA, Kellogg offers a part-time evening MBA through its Managers' Program on Northwestern's Chicago campus, a weekend executive MBA through the Executive Masters' Program (EMP) on the Evanston campus, and international executive MBA (IEMBA) programs in Europe, the Middle East, and Asia. Kellogg also offers a wide range of nondegree executive education courses at its Allen Center on the Evanston campus. Kellogg is accredited by the American Assembly of Collegiate Schools of Business and the Accrediting Commission on Graduate Education for Hospital Administration.
- 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 engineering, materials science and engineering, mechanical engineering, and medical engineering (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 engineering management, product development, information technology, and project management and, jointly with the Kellogg School, the master of management in manufacturing.

McCormick programs are accredited by the Engineering Accreditation Council of the Accreditation Board for Engineering and Technology.

- The Graduate School (1910) controls all advanced programs leading to the degrees of doctor of philosophy, master of arts, master of fine arts, and master of science. The Graduate School bulletin, describing master's and doctoral programs in all schools and departments, is available on request.
- Summer Session (1920) provides summer programs for undergraduate, graduate, and visiting students.
- The Medill School of Journalism (1921) offers the degree of bachelor of science in journalism as well as master of science degrees in journalism and 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 degrees of bachelor of science in education and social policy, master of science in education and social policy, and master of arts in learning sciences. Programs in the School of Education and Social Policy are accredited by the Illinois Office of Education, State Teacher Certification Board; the Illinois Department of Registration and Education; and the American Psychological Association.

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 the Feinberg School seven 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, and joint degree programs with the Graduate School and Kellogg School offer an MD degree as well as PhD, MPH, and MBA 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) provides a superior foundation in legal reasoning, analysis, and writing. It offers the degrees of juris doctor, master of laws, master of laws in taxation, and doctor of juridical science. The School of Law and the Kellogg School offer a joint degree program allowing students to earn both juris doctor and master of business administration degrees in three years. Another joint program with Kellogg permits international and foreign-trained students to earn a master of laws degree and a certificate of business administration in one year. A joint degree program with the Medill School of Journalism allows students to earn a master of science degree in journalism and a master of legal studies degree. Students also can participate in a five-year program to earn a JD and a PhD in one of the social sciences. 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 an opportunity for adults to return to school in the evenings and weekends on a part-time or a full-time basis to earn a degree. In addition, students take courses for personal enrichment or enroll in credit and noncredit professional development programs. The latter include a business program series for beginning professionals and a baccalaureate prehealth programs series. Classes are offered on both the Chicago and the Evanston campuses. Through the School of Continuing Studies, Weinberg College offers the degrees of bachelor of philosophy and bachelor of science in general studies; the School of Communication offers the bachelor of philosophy in communication; and the Graduate School offers the master of arts in liberal studies and the master of literature. SCS also offers a master of science degree in computer information systems, which is awarded through the McCormick School of Engineering and Applied Science, and a master's degree in integrated marketing communications, awarded through the Medill School of Journalism. All degree programs are offered part-time in the evening for working adults.

University Research Centers

University-wide and specialized research centers facilitate new scholarly approaches to problems by enabling faculty to collaborate across the boundaries of traditional disciplines. These interdisciplinary centers have profound implications for undergraduates because such research often alters theory and practice within a given academic discipline and results in the development of new curricular programs.

Students also are involved directly with the centers through lectures or other special events and, in some cases, through research projects. University research centers include the following:

- Program of African Studies
- Center for Applied Psychological and Family Studies
- NU Atomic and Nanoscale Characterization Experimental (NUANCE) User Facility
- Institute for Bioengineering and Nanoscience in Advanced Medicine
- Center for Catalysis and Surface Science
- Center for Functional Genomics
- Materials Research Center
- Materials Research Institute
- Center for Mathematical Studies in Economics and Management Science
- Institute for Nanotechnology
- Institute for Neuroscience
- Institute for Policy Research
- Center for Public Safety
- Center for Reproductive Science
- Center for Sleep and Circadian Biology
- Synchrotron Research Center
- Center for Technology Innovation Management
- Transportation Center

For detailed information about these centers, see www.northwestern.edu/research/centers-facilities.html.

Libraries

Undergraduates at Northwestern have access to a wealth of library resources and services. With more than 4.1 million volumes in the University Library system, the Galter Health Sciences Library, and the Pritzker Legal Research Center, Northwestern offers its students the 10th largest library collection among private universities in the United States. Undergraduates are encouraged to explore the full range of

resources available to them and to develop their skills as information seekers.

Northwestern undergraduates have full access to interlibrary loan services and to materials from libraries worldwide. Through the Infopass program, students can gain admittance to other collections in the Chicago area, including those of the Newberry Library, the Field Museum library, the Art Institute of Chicago library, and other academic and private libraries.

University Library

"University Library" refers to the main library, which houses the University's major collections in the humanities and social sciences, as well as several specialized research collections; the adjoining Charles Deering Library, which houses fine arts and other specialized collections; the Seeley G. Mudd Library for Science and Engineering; the Geology Library; the Mathematics Library; and the Joseph Schaffner Library, which supports the research needs of students on the Chicago campus.

Northwestern's libraries offer many electronic and textual resources. NUcat, the online catalog of University Library, provides bibliographic, location, and circulation status information for materials from these libraries. NUcat and many other resources and services are available on the Web at www.library.northwestern.edu.

Main Library (Evanston Campus)

The main library building houses collections in three research towers: north for the social sciences, east for history, and south for the humanities.

The main library's General Information Center and Reference Department, both located on level 1, offer students research assistance and support. The General Information Center has both staff to answer questions and 50 workstations for electronic access to information. The Reference Department offers in-depth research assistance, online reference services, and instructional services. The reference collection contains 50,000 volumes as well as extensive electronic resources.

Also located on level 1 are the Circulation Services Department, the Periodical/Newspaper-Microtext Reading Room, the New Book Alcove, the Interlibrary Loan Department, and the Government Publications and Maps Department. Featuring an extensive collection of federal, state, and international documents, the Government Publications and Maps Department

is a depository for documents of the United States, the United Nations, the state of Illinois, and the European Union, as well as selected publications of other international agencies and state and local governments.

The Periodicals and Newspapers Reading Room contains current periodicals, extensive collections of newspapers and periodicals, and primary research materials in microform. On the lower level of the library there are computing labs and classrooms run by the Academic Technologies division of Information Technology.

The Marjorie Iglow Mitchell Multimedia Center, Forum Room, and Video Theater (for special programs and video presentations); Core/Reserve Collections; and a student lounge occupy level 2. The Multimedia Center features a videotape collection of classic films, documentaries, and performing arts titles. The Core Collection holds 35,000 books in all disciplines, ensuring easy access and permanent availability of works essential to undergraduates. Core books may be checked out for 24 hours.

Three special units are located on level 5. The Curriculum Collection houses K-12 textbooks and children's literature. The Melville J. Herskovits Library of African Studies (popularly called Africana) is known internationally for its comprehensive collection of materials on every aspect of Africa. The Transportation Library, one of the major collections of its kind in the United States, specializes in transportation socio-economics, law enforcement, police administration, and environmental impact statements.

Charles Deering Library (Evanston Campus)

The Charles Deering Library, attached to the main library, houses the Art Collection, University Archives, the Charles Deering McCormick Library of Special Collections, and the Music Library and Listening Center. The holdings of Special Collections include 20th-century collections, underground press publications, women's movement literature, and numerous rare books, manuscripts, limited editions, and fine bindings. The Music Library meets the curriculum, research, and performance needs of students and faculty at the School of Music. This library contains 170,000 scores, journals, books, manuscripts, and nearly 67,000 sound recordings, which can be heard in the Listening Center.

Seeley G. Mudd Library for Science and Engineering, Geology Library, and Mathematics Library (Evanston Campus)

The Seeley G. Mudd Library for Science and Engineering houses books and journals in applied mathematics, astronomy, biological sciences, chemistry, computer science, engineering, and physics. Two smaller departmental libraries, the Geology Library in Locy Hall and the Mathematics Library in the Lunt Building, also serve the Evanston campus.

Joseph Schaffner Library (Chicago Campus)

The Joseph Schaffner Library in Wieboldt Hall serves the School of Continuing Studies, the evening Managers' Program of the J. L. Kellogg School of Management, and the Medill School of Journalism graduate programs.

Other Libraries

The Galter Health Sciences Library, which serves the Feinberg School of Medicine, and the Pritzker Legal Research Center, which serves the School of Law, are located on the Chicago campus and are open to all Northwestern students. The collections of these libraries are listed in NUCat, the library's online catalog. Materials may be checked out directly or may be sent to Evanston libraries through online request forms.

Also open to all Northwestern students are the outstanding collections on religion held in the United Library of Garrett-Evangelical and Seabury Western Theological Seminaries, located on the Evanston campus. The United Library's holdings are listed in NUCat.

Information Technology Services

At Northwestern computers are used in a wide variety of applications designed to enhance the education of students both inside and outside the classroom. The need to understand computer applications cuts across disciplines. Students in the arts, humanities, journalism, and law have as much to gain from computer use as do those in the physical and social sciences, engineering, medicine, and business.

The Northwestern University Information Technology division (NUIT) is the principal campus unit charged with planning and managing computing facilities and services for students, faculty, and staff.

Buildings on the Evanston and Chicago campuses are connected through high-speed networks to the

Internet, allowing access to a wealth of information at other universities and organizations worldwide. All sleeping rooms in University residence halls are connected to the University's network, giving students with network services accounts convenient access to electronic mail and to the World Wide Web, including the University home page (www.northwestern.edu), the HereAndNow Online student portal (www.hereandnow.northwestern.edu), and the University's online library catalog, NUCat. For students with laptop computers, wireless Internet access is available from dozens of locations on both campuses.

Through NUIT's Academic Technologies unit, both Windows and Macintosh computers can access computer facilities that offer a variety of hardware and software resources in a networked environment. The NU Media Works lab offers students advanced capabilities including video and image editing, illustration, and interactive Web development. NUIT offers short courses to students who want to take full advantage of this media production facility.

At the beginning of each academic year, NUIT's Technology Support Services unit welcomes new students to Northwestern. NUIT has developed a CD-ROM-based tutorial to acclimate students to the University's electronic environment. To accommodate students with little computer experience, NUIT schedules classes on computer basics during New Student Week.

The NUIT Information Center in Kresge Centennial Hall, 1880 Campus Drive on the Evanston campus, is Northwestern's primary information resource for computing and networking. The center provides walk-in and phone consulting on University-supported hardware, software, operating systems, and computing facilities. Hours during the academic year are 8 a.m. to 10 p.m. Monday through Thursday, 8 a.m. to 5 p.m. Friday, 9 a.m. to 5 p.m. Saturday, and noon to 10 p.m. Sunday.

On the Chicago campus, the NUIT office is located in suite 600 of Abbott Hall, 710 North Lake Shore Drive. Its hours are 8:30 a.m. to 6 p.m. Monday through Thursday and 8:30 a.m. to 5 p.m. Friday. This office is a walk-in convenience center for password problems and for purchasing software. It provides technical assistance by appointment only.

Call 847-491-HELP to speak to a consultant for either campus.

Student Services

Student Affairs

The Office of the Vice President for Student Affairs is responsible for many programs and services available to Northwestern students. Students are encouraged to take advantage of these opportunities and services, which are designed to help them establish and meet personal, academic, and career goals; assist them in acquiring skills to confront problems and issues in their lives; and provide them with essential services as part of a residential community.

In recognition of students as members of the Northwestern University community, the University has adopted a statement on student rights and responsibilities (see the Student Handbook for the complete statement).

African American Student Affairs

The services and activities of African American Student Affairs include support and referral on personal, academic, and career issues; tutoring in math, the sciences, economics, and writing; New Student Week activities, lectures, and receptions; and oversight and coordination of publicity for Black History Month events. The office also advises more than 12 student groups.

The African American Student Affairs building is home to a number of student organizations and provides office and meeting space for students as well as staff. The programs of this office are designed to promote academic achievement, provide cultural and social outlets, and give voice to the needs and concerns of the African American student community.

Asian/Asian American Student Services

The Office of Asian/Asian American Student Services provides culturally sensitive advising, counseling, advocacy, programs, and resources for Asian and Asian American students and student organizations at Northwestern. Its services help to address the needs of Asian and Asian American students as well as to facilitate their academic achievement, professional development, cultural enrichment, and social enhancement.

Counseling and Psychological Services Center

The Counseling and Psychological Services Center (CAPS) is the University's primary counseling resource. CAPS counselors, social workers, psychologists, and

psychiatrists offer students a variety of academic and personal services, including individual and group counseling. When students have problems, talking with an experienced counselor often can provide relief. Students may talk with a counselor confidentially about specific problems such as managing stress and difficult relationships or about nonspecific feelings of anxiety or loneliness.

CAPS offers group counseling on eating behavior, self-esteem, sexual identity, shyness, grief, stress management, self-exploration, and relationship enhancement. Groups and topics can be added in response to student interests or needs.

While there is a limit of 12 individual CAPS counseling sessions, this office can refer students who will benefit from additional help to other appropriate and affordable counseling facilities. Students who participate in group counseling are still eligible for 12 individual sessions.

Counseling is available to full-time students (those registered for at least three courses). Crisis intervention and consultation, assessment, and referral resources are available to part-time students.

Health Service

All students are required to have hospitalization insurance coverage. For information about the program offered through the University, consult the Health Service insurance office.

The University maintains a health service for students, including a pharmacy, laboratory, radiology suite, and health education program at Searle Hall. Students registered for full-time study (as defined by their program and the registrar) are entitled to the full privileges of this service. Students registered for less than full-time may use the service by paying a clinic-use fee each academic quarter or by paying on a fee-for-service basis. (This does not apply to School of Continuing Studies students; regardless of academic load, they must pay the clinic-use fee each quarter to use the Health Service.) The Health Service has forms for these options. The fee may be paid by check.

Full-time students must comply with Illinois state and Northwestern University health, immunization, and insurance requirements, which are described in Health Service and insurance office letters sent to them after they are accepted to the University. They must return the completed medical and insurance forms sent with the letters at least six weeks before

registration. If they fail to comply, they will be subject to late fees, and their registration will be withheld until they meet these requirements.

Hispanic/Latino Student Services

The coordinator of Hispanic/Latino Student Services provides support, services, and programs to Hispanic/Latino students and student groups on campus. The staff advocates for the needs of Hispanic/Latino students, identifies problem areas, articulates strategies to address these concerns, and provides opportunities for the campus community to learn more about Hispanic/Latino culture, students, needs, and issues. The services and programs offered by the office are rooted in a strongly held belief that diversity is a valuable part of the overall educational experience at Northwestern.

Multicultural Center

Supporting Northwestern's institutional belief in and commitment to racial/ethnic and religious diversity, the Multicultural Center serves as the nucleus for campus-wide activities and programs through which students, faculty, staff, and alumni engage in cross-cultural communication, participate in multicultural education and outreach activities, and explore and reflect. Visitors are always welcome at the center.

Norris University Center

Norris University Center is the community center of the University. It provides programs and services that enhance the quality of campus life for students, faculty, parents, staff, alumni, and guests. Norris Center and Northwestern's many student organizations sponsor a variety of activities that promote social, cultural, and educational interaction outside the classroom. Norris Center works to develop a campus environment that enables students to become accomplished and informed individuals, sensitive to the needs of a pluralistic society.

Additionally, Norris Center provides amenities and conveniences that enrich the quality of daily campus life for the University community. These include the campus bookstore, Norris Main Desk, a food court, meeting rooms, a full-service branch bank and multiple ATMs, a box office, a convenience store, WildCARD office, Pulse Copy Center, and more than 25 student organization offices. Special services include a game room, a wide variety of minicourses, outdoor recreation equipment rental, sound and sight

equipment rental, a leisure library, and an interactive information kiosk.

Through the Dittmar Memorial Art Gallery and the craft studio, Norris demonstrates the importance of the visual arts to the campus community.

Organizations and Activities

The Campus Activities Office at Norris University Center is a resource for all student organizations at Northwestern. The staff are the primary advisers for student organizations recognized by the Associated Student Government. The office is organized into four areas: programming, leadership development, organizational development, and community service.

Programming. Social, cultural, and educational programs are developed to support the mission of Norris Center. Student employees develop and implement a wide variety of programs that provide opportunities for social interaction and for developing a better understanding and awareness of diverse cultures, religions, and ethnicities. All events are free.

Leadership development. Everyone defines leadership differently, and thus the Campus Activities Office invites students to participate in a variety of workshops, conferences, and programs to define leadership for themselves and determine their own leadership style. Programs include CATalyst, Freshman Emerging Leaders Program, Leadership Institute, Women in Leadership Conference, lunch with President Bienen, and the annual Student Recognition Banquet. Anyone interested in participating in or planning these programs should call the office at 847-491-2350.

Organizational development. Central to the mission of the Campus Activities Office is support and advice for student organizations. The office directly advises a variety of student groups, including activist, pre-professional, cultural, theatrical, musical, and political groups. To support these groups, it offers an organizational development symposium, Student Organization Symposium (SOS), in the fall; a student organization handbook; and a resource Web site, www.northwestern.edu/norris/sos.

Community service. Student Community Service is dedicated to incorporating Northwestern University students into service and volunteer activities that improve Evanston and Chicagoland. It coordinates transportation to volunteer sites, a holiday gift drive, and one-day and other service projects. Groups and individuals interested in exploring volunteer possibilities

can find information at the community action search engine (CASE), www.volunteer.northwestern.edu, and at www.northwestern.edu/norris/community.html.

Norris Main Desk

The main desk at Norris Center provides the University with a central location for inquiries regarding general campus and event information. Visitors are welcome to call or drop by when on campus to ask about University services and special events.

Residence Halls and Food Services

Students at Northwestern have a wide variety of living facilities available to them. Smaller residences accommodate as few as 27 students; larger units house more than 600. Most rooms are doubles, but residences also contain single, triple, quadruple, and suite arrangements. A student may select a residential college, a coeducational residence hall, or a same-sex facility. Some of the houses are older, ivy-covered residences; others are modern, recently built halls. Each building has its own character and spirit and its own distinct advantages.

Approximately 4,200 undergraduate students live in the University's residence halls; another 900 students have chosen to live in fraternity and sorority houses. The approximately 2,700 remaining undergraduates commute from home or live off campus.

The residence halls bring together individual students with diverse backgrounds and various interests. Each residence hall is free to set its own norms of behavior within the general guidelines of the law and University policy. Students adopt constitutions and elect their own hall officers. Living in a residence hall makes a student a member of its government, with the rights, privileges, and responsibilities of membership.

Residence hall activities are planned by the elected officers and developed by the residents to provide social, academic, and cultural experiences. These programs are financially supported through voluntary social fees.

Students take their meals at any of the six dining facilities located in the larger residence halls. Twenty meals are available each week: breakfast, lunch, and dinner, Monday through Saturday, and brunch and dinner on Sunday. Both traditional and block meal plans are available. Both types of plans include a quarterly allocation of points, which may be used for guest meal purchases and at the retail food services on

campus. The traditional plans offer a fixed number of meals per week and may be used only in the residence halls food services. Block meal plans provide a fixed number of meals per quarter and a greater allocation of points than the traditional meal plans. Residents are required to sign a contract for a minimum of 13 traditional meals per week, selecting whichever 13 meals meet their individual needs and schedules.

Complete information about Northwestern's residences, including rental rates, is mailed to applicants after they have been admitted to the University and paid the required tuition deposit.

Student Affairs Office

The Office of Student Affairs in Scott Hall is a general source of information and referral for students with personal and academic problems or concerns. This office also coordinates orientation and other transition programs for students, organizes family weekend, and produces publications for parents of undergraduates. See www.northwestern.edu/studentaffairs for links to all Student Affairs departments.

In addition, the Office of Student Affairs counsels students who believe they have been victims of sexual harassment by other students. The associate vice president for student affairs oversees the University Hearing and Appeals System and the Sexual Assault Hearing and Appeals System.

University Career Services

University Career Services (UCS) provides a full spectrum of career counseling and advising services, workshops, special events, and targeted programming for freshmen, sophomores, juniors, and seniors, as well as services for graduate students and alumni. It aims to help students translate their superb Northwestern education into excellent professional opportunities, graduate study, and successful job and internship searches. Services include

- Confidential career counseling, career assessments (Myers-Briggs Type Indicator and Strong Interest Inventory), and advising about the graduate and professional school application process
- Internship-finding assistance, including individualized help, programs, and vacancy listings
- Help for students and alumni with the job search process, including strategies, resume review, and advice on interviewing and salary negotiation
- Counseling about part-time and summer jobs and full-time employment

- Access to Careertrak, an online searchable database listing thousands of full-time, part-time, and internship positions as well as other online resources
- Campus recruiting visits and information sessions by hundreds of employers seeking interns and full-time employees

The office has print, computer, and media informational resources about industries and occupations, internship opportunities, employer contacts, and salary information; graduate and professional school catalogs; and test preparation materials.

Special events include fall and winter Career Expo job fairs, Virtual Career Fairs, Graduate and Professional School Fair, Martin Luther King Jr. Public Interest Job Fair, Internship Forum, and Career Horizons program.

Northwestern University is a national testing center for the MCAT, GRE, LSAT, and Foreign Service Exam, and the office has information and forms for these tests.

Students are encouraged to register with UCS at 620 Lincoln Street, Evanston. They may open a reference file to store recommendation letters for use when applying for graduate study or employment. Call 847-491-3700 for appointments. For more information, see www.northwestern.edu/careers.

University Chaplains

The Office of the University Chaplains provides support for religious life at Northwestern. The Alice S. Millar Chapel and Religious Center, which includes Parkes Hall and the Jeanne Vail Meditation Chapel, has facilities for religious programs and services such as lectures, study groups, discussions on faith and life, weddings, baptisms, and other special events. The facilities are available to recognized religious groups. Events may be scheduled through the chaplains' office.

The University chaplains also work closely with denominational religious centers on campus sponsored by Protestant denominations, the Roman Catholic Church, and the Jewish community. University chaplains and campus ministers and rabbis are available to meet with individuals and groups as counselors, teachers, and resource persons.

Religious organizations are recognized through the Office of the University Chaplains. The chaplains serve as the University's liaison with student religious groups. For information about the recognition process, contact the office to make an appointment.

Information about campus religious organizations is published on the Office of the University Chaplains' Web site, www.northwestern.edu/chaplain.

Services for Students with Disabilities

The Office of Services for Students with Disabilities provides services and referrals for Northwestern students with disabilities. Students with disabilities should contact the office for assistance and guidance in meeting their academic obligations.

It is Northwestern University policy to ensure that no qualified student with a disability is denied the benefits of, excluded from participation in, or otherwise subjected to discrimination in any University program or activity. In response to a request made by a qualified student with a documented disability, the University will arrange, at no cost to the student, for the provision of educational auxiliary aids and reasonable academic accommodations that the University determines necessary to afford such student the opportunity for full participation in University programs.

Northwestern University's programs and activities are accessible for full participation to all its students, including those with mobility problems and with difficulties such as learning disabilities or auditory, visual, or other special problems.

A brochure, "Services for Students with Disabilities," describing various support services for students with disabilities, is available in University admission offices and in the Office of Services for Students with Disabilities. The brochure includes maps of the Evanston and Chicago campuses indicating building access and parking locations.

International Office

International students, visiting scholars, and staff will find assistance for themselves and their families at the International Office. Although the main focus is immigration related, the office provides a variety of programs and services that enhance the educational experience of the international population. Students and scholars have an opportunity to explore Chicago and the surrounding communities; deal with cultural adjustment issues; and attend workshops on immigration issues and career and employment seminars. The office also coordinates new student orientation for international students and scholars and serves as an information center for locating services and activities available both on and off campus.

A volunteer organization, the Community Council for International Students, works effectively with the office to provide international visitors such services as English language tutoring, the International-American Women's group, a resale shop, and a play group for children.

More information on the office's services can be found at www.northwestern.edu/international.

Women's Center

The Women's Center is a gathering place for all students, staff, and faculty where the achievements of women are celebrated. It serves the needs of all University women across lines of race, class, and sexual orientation, with the goal of achieving gender equity. The center provides educational programming with a particular emphasis on women's health, women and leadership, career and professional development, safety and self-defense, stress management, and issues of balancing work and family or other work/life concerns. The center provides advocacy services for women and men who have experienced sexual harassment, sexual assault, relationship violence, and discrimination. Many of its goals are achieved through outreach and coalition building. Counseling services are provided through individual appointments and support groups. Additional services include a referral service and resource library. Students can call 847-491-7360 or 312-503-3400 for information on programs or services, or they can check out the Web site www.northwestern.edu/womencenter.

Fitness and Recreation

All students at Northwestern are strongly encouraged to participate in University-sponsored sports, fitness, and recreation activities, which include intramural, club, informal, and instructional sport and fitness programs.

Intramural competition is conducted in a variety of individual and team sports. League play and tournaments are provided for men and women, both separately and recreationally. Competition is organized for individuals and teams, by independent groups, living units, fraternities, sororities, and University departments and organizations.

Sport clubs offer competitive and noncompetitive sports experiences. Extramural competition, with outside institutions and sports groups, is available in baseball, basketball, crew, cycling, equestrianism, fencing,

ice hockey, lacrosse, roller hockey, rugby, running, sailing, ski racing, soccer, squash, tennis, Ultimate Frisbee, volleyball, and water polo. Noncompetitive special-interest clubs include aikido, karate, tae kwon do, and jujitsu. Clubs are student directed.

Drop-in recreation periods are scheduled throughout the day and evening at Blomquist Recreation Center, Patten Gymnasium, and the Henry Crown Sports Pavilion, Norris Aquatics Center, and Combe Tennis Center. Included are facilities for badminton, basketball, cardiovascular activities, floor hockey, group fitness programs, jogging, racquetball, squash, swimming, tennis, volleyball, and weight training.

Noncredit instructional sports classes are offered in a variety of areas. Students can register for sports and fitness classes by visiting the recreation registration office in the sports pavilion and paying a nominal fee. Courses for each quarter are listed in the "Programs and Services" guide and on the Fitness and Recreation Web site (www.northwestern.edu/athletics).

The Sailing Center offers instructional and informal sailing programs for beginning and novice sailors. The fleet consists of 420 class and laser sailboats as well as Windsurfers.

University Police

The University Police Department is responsible for crime prevention, law enforcement, parking control, special events, and emergency management on both the Evanston and Chicago campuses. University Police officers are on duty 24 hours a day, seven days a week. All officers are police academy graduates with full police authority; many have bachelor's degrees.

The police division on the Evanston campus provides a number of services, including customized crime prevention programs. Specialty training programs include rape aggression defense, alcohol and designer drugs awareness, and CPR. Other services provide unlocking of vehicles, residence hall security checks, sale of bicycle locks (at cost), and loan of battery jumper cables. Emergency phones on campus, located in yellow boxes with blue lights above, automatically connect with University Police when a person lifts the receiver or pushes the button.

Additional information about campus crime and crime prevention programs is available on the University Police Web site (www.northwestern.edu/up) or by requesting a copy of "Campus Safety: A Shared

Responsibility” from the University Police Department, 1819 Hinman Avenue, Evanston, Illinois 60208-1320.

Motor Vehicles

Regulations governing the possession, operation, and parking of motor vehicles on the Evanston campus are described in the parking regulations handout available at the Parking Office, 1819 Hinman Avenue, or online at www.northwestern.edu/up/parking.

Parking permits are required in campus lots from 7:30 a.m. to 4 p.m. Monday through Friday (official holidays excluded), except in lots that are designated in the regulations as 24-hour enforced. Parking on campus is available only to seniors. Ryan Field remote parking is available to sophomores, juniors, and seniors who reside on campus and to all students residing off campus. Exceptions to these rules may be granted only by the Parking Committee.

Personal Losses

The University is not responsible for the loss of or damage to personal property belonging to students in any building it owns, whether the loss or damage occurs by theft, fire, or an unknown cause.

Identification Cards

The University identification card (WildCARD) identifies registered students and should be carried at all times. The WildCARD is the property of the University and is not transferable; its privileges may be canceled at any time the card is misused. Students are required to surrender their WildCARD to University officials upon request.

The student's ID number is encoded on the card and indicates whether the student is currently registered and if the card is valid. The card identifies the holder for admission to the library during hours of limited access and is needed at all times to borrow books. If a student has a meal plan, the WildCARD admits the student to residence hall dining facilities. It also identifies the holder at the Health Service, Norris University Center, student functions and elections, and University athletic events.

Lost or stolen cards should be reported to the WildCARD office, where replacement cards are issued. For the cost of replacing an ID card, see Service Fees under Tuition and Fees in the next section of this catalog.

Undergraduate Education

Admission

General Requirements for Admission

Northwestern University historically has sought a student body of high ability and diversity representing a cross section of American society.

It is the policy of Northwestern University not to discriminate against any individual on the basis of race, color, religion, national origin, sex, sexual orientation, marital status, age, disability, or veteran status in matters of admissions, employment, housing, or services or in the educational programs or activities it operates, in accordance with civil rights legislation and University commitment.

Any alleged violations of this policy or questions regarding the law with respect to nondiscrimination should be directed to Director of Equal Employment Opportunity, Affirmative Action, and Disability Services, 720 University Place, Evanston, Illinois 60208-1147, phone 847-491-7458; Office of the Provost, Rebecca Crown Center, Evanston, Illinois 60208-1101.

Candidates for admission should demonstrate a level of performance in curricular and extracurricular areas that indicates they will be able to compete successfully 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 (the Scholastic Assessment Test [SAT] I of the College Entrance Examination Board or American College

Test [ACT], required of all candidates; three SAT IIs, required of candidates for certain special programs and of all home-schooled applicants [see table on page 15] and recommended for other candidates)

- music audition (required for School of Music candidates)
- the candidate's statements on the application and other evidence of special skills, such as writing, art, music, mathematics, and science, or of special accomplishments in extracurricular areas of interest
- any other information received by the University that bears on the candidate's readiness for study at Northwestern

SAT IIs

Recommended for Regular Programs

- Weinberg College of Arts and Sciences, School of Communication, School of Education and Social Policy, Medill School of Journalism, and School of Music: Writing and two others of student's choice
- McCormick School of Engineering and Applied Science: Writing, Mathematics I or IIC, and Chemistry or Physics

Required for Special Programs and Home-Schooled Applicants

- Honors Program in Medical Education: Writing, Mathematics IIC, and Chemistry
- Integrated Science Program: Mathematics IIC, Chemistry or Physics, and another science unless Writing is required for another application
- Home-schooled applicants: Writing, Mathematics IIC, and a third test of their choice

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 to Northwestern, 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, the Medill School of Journalism, and the Schools of Communication, Education and Social Policy, and Music require 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, which include 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. Unlike other selective universities, Northwestern does not defer Early Decision applicants into its Regular Decision pool.

The accompanying table 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:

- File a completed application form. This can be obtained from the Office of Undergraduate Admission, Northwestern University, 1801 Hinman Avenue, P.O. Box 3060, Evanston, Illinois 60204-3060. The application can also be downloaded or completed online at www.ugadm.northwestern.edu. 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. The official results of the SAT I or the ACT are required for all students applying for admission to Northwestern as freshmen. In addition, all the special programs require each matriculant to present three SAT IIs as specified in the accompanying table. Home-schooled applicants are also required to submit three SAT II results. SAT IIs are recommended for all candidates.
- If applying for admission to the School of Music, present a music audition in person or a taped recording. (Audition guidelines will be furnished on request.)

Advanced Placement

In nearly all areas Northwestern awards credit for Advanced Placement Examination scores of 4 and 5; in some cases credit is also awarded for scores of 3. Specific questions concerning Northwestern's advanced placement policies should be addressed to the Weinberg College Office of Studies. In some

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 tests by (SAT I or ACT required; 3 SAT IIs recommended)	October test	December test
To apply for financial aid, file CSS Profile by and file FAFSA by	December 1 February 1	February 1 February 1
Northwestern mails decision letter by	December 15	April 15
Reply by	February 1	May 1

Honors Program in Medical Education

	Regular Decision
HPME preapplication deadline	December 1
HPME application deadline	January 1
Freshman application to Northwestern by	January 1
Take tests by (SAT I or ACT required; 3 SAT IIs required; see page 13)	December test
To apply for financial aid, file FAFSA and CSS Profile by	February 1
Northwestern mails decision letter by	April 15
Reply by	May 1

Transfer Students for Any Quarter of Matriculation

	Fall	Winter	Spring	Summer
Apply by (Because space is limited in some programs, transfer candidates should apply well before these dates)	June 1*	November 1	February 1	May 1
Take tests by (SAT I or ACT; scores from previous academic years are acceptable)	June 1	November 1	February 1	May 1
Apply for financial aid by (Consult with Office of Undergraduate Admission)	May 1	October 1	January 1	April 1
Northwestern mails decision letter as soon as possible after the application deadline; a reply is due within three weeks.				

*Foreign transfer students for fall quarter should apply by May 1.

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 stated criteria to apply as a transfer candidate. Some undergraduate schools at Northwestern enroll transfer students in the fall quarter only. Transfer students must complete at least the last 23 quarter-courses and six full-time quarters in residence at Northwestern to be eligible for a bachelor's degree.

Admission Procedure

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

- File a completed application form available from the Office of Undergraduate Admission, Northwestern University, 1801 Hinman Avenue, P.O. Box 3060, Evanston, Illinois 60204-3060.

The application can also be downloaded or completed online at www.ugadm.northwestern.edu.

- Arrange with the officials of the high school to forward the complete high school report to the Office of Undergraduate Admission.
- Submit the results of the Scholastic Assessment Test (SAT I) or the American College Test (ACT).
- 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 (in person or a taped recording) if applying for admission to the School of Music (audition guidelines will be furnished on request).
- Submit application for admission before the deadline of June 1 (for admission in the fall quarter), November 1 (winter), February 1 (spring), or May 1 (summer).

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.

Foreign Students

In addition to meeting all regular admission requirements, foreign 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 the Test of English as a Foreign Language (TOEFL). Foreign students must have achieved outstanding school records to be considered for admission. Foreign transfer candidates may apply for fall quarter admission only and must submit their completed applications by May 1.

Returning Adult Students

Adults who interrupt their education following high school or during college and, after several years, decide to complete their undergraduate education are considered "returning adult students" by the Office of Undergraduate Admission. Ordinarily, returning adult

students have been out of high school for seven years or more. Depending on the amount of college credit previously earned, returning adult students apply as freshman or transfer candidates.

Evening Students

The School of Continuing Studies (SCS), Northwestern's continuing education division, offers courses in the evenings and on Saturdays for adult students seeking personal enrichment or professional mobility, preparation for graduate study, or pursuit of a degree or a certificate. Semester-long courses are offered on the Chicago and the Evanston campuses.

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 Web site, 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 course work 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, 162 Walter Annenberg Hall, Northwestern University, Evanston, Illinois 60208-2650.

Auditors

Course audits for degree-seeking undergraduates are not given formal recognition by either Northwestern or the Office of the Registrar. Only students in the School of Continuing Studies or summer nondegree students are permitted to formally audit classes.

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. 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 can be a loan, part-time employment, a grant, or a combination of these. Recipients may accept all or any part of the aid offered. The amount of an award is confidential between the University and the family of the student. For entering freshmen, financial aid is generally renewable for up to 12 quarters of enrollment, even if they are not offered financial aid for those 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 (i.e., a student who transfers with 3 quarters of acceptable credit is eligible for 9 quarters of assistance). Transfer students requiring additional quarters of aid must petition the Committee on Financial Aid to Students. Students must reapply each year and maintain the requirements established by the Committee on Financial Aid to Students. The amount of financial aid may change based on the family's financial circumstances.

During the 2002–03 academic year, undergraduate students at Northwestern received more than \$60.8 million in grant assistance: \$49.1 million from Northwestern, \$7.1 million from federal and state governments, and \$4.6 million from outside sources. The average Northwestern grant for the 3,255 students receiving aid was \$15,111. In addition, \$18 million in loan assistance and 3,000 campus jobs were available.

Assistance that is not need based is provided by the Reserve Officers Training Corps (see Military Studies) and from other sources discussed in the Northwestern publication “Making It Possible — Financial Aid at Northwestern,” distributed by the Office of Undergraduate Admission (see For More Information on the inside back cover).

Who Should Apply

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

Students graduating from community colleges and transfer students from four-year colleges may apply for financial assistance. However, since funding is limited, full funding may not be available for the first year of study. Transfer students must obtain transfer financial aid application materials from the Office of Undergraduate Admission.

Application Procedure

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

- Complete and submit the Application for Admission, which provides a place to request financial aid.
- File the Free Application for Federal Student Aid (FAFSA) and the Financial Aid Profile of the College Scholarship Service (CSS) and request that copies of both reports be sent to Northwestern.
- File the applications as soon as the need for assistance is realized by the family but not later than the dates indicated in the table titled Application and Testing Deadlines: Notification Plans (page 15).

Quarters of Eligibility

To comply with regulations for the disbursement of federal student assistance funds, Northwestern students are considered to be maintaining “satisfactory academic progress” if they (1) complete an average of nine units of academic credit per year and (2) complete their educational programs within 18 quarters of enrollment (22 quarters for specific five-year programs). Federal law specifies that by the end of the second academic year (measured as a period of time) students must have a C average or its equivalent, or “an academic standing consistent with the requirement for graduation from

the program,” if federal aid is to continue. These policies are supplemented by the qualitative requirements established by the undergraduate schools (see the respective school section in this catalog).

If students fail to maintain satisfactory academic progress as defined above, they may be awarded assistance for one additional payment period to reestablish “satisfactory” standing. Students who successfully complete a minimum full-time course load during this period will be considered to be again making satisfactory academic progress. Failure to successfully complete a minimum full-time course load during this period results in ineligibility for additional assistance until a minimum full-time course load is successfully completed at Northwestern for one payment period. Within two weeks of their notification of ineligibility, students may submit a written appeal to the Office of Financial Aid presenting evidence of unusual circumstances. The appeal is reviewed to determine if an exception to this policy is justified.

The above procedure will be followed except in these cases:

- When students are academically dismissed from the University according to the policies of their particular school and program. Such students will be eligible for federal financial assistance during the first quarter of full-time study on returning to Northwestern to reestablish satisfactory academic progress. On successful completion of a minimum full-time course load with a 2.0 grade point average, they will again be considered to be making satisfactory academic progress and will be eligible for federal and institutional financial assistance in subsequent quarters.
- When students have been in attendance at Northwestern for 12 quarters or the equivalent. Unless the course of study normally requires more than 12 quarters of enrollment, students are ineligible for financial assistance from University funds beyond the 12th quarter, even if they are maintaining satisfactory academic progress. The Committee on Financial Aid to Students may decide to continue aid when unusual circumstances exist and students demonstrate academic promise. Students admitted to the five-year BA/BMus, BS/BAMus, and BS in engineering/BMus programs will be eligible for University funds for up to 15 quarters of enrollment. Students pursuing other double-degree opportunities are eligible for only federal and state funding; Northwestern grant assistance is not available.

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 for 2003–04 are listed below. Rates are subject to change without notice, and increases should be expected in subsequent years. For tuition purposes, the term course refers to course credit. Some course offerings carry more than one course credit.

Undergraduate Tuition

All undergraduate students in degree programs must conform to the Undergraduate Residence Requirement. Full-time registration for all undergraduate degree-seeking students is three or more units of credit.

Tuition: each quarter

Enrollment prior to fall 1998	\$8,560
Enrollment fall 1998 and later	\$9,468

A student who takes more than four units of credit in a quarter will be subject to an overload charge if these credits are used to accelerate graduation. See the Undergraduate Residence Requirement for more complete information.

Acceleration tuition: each course, each quarter

Enrollment prior to fall 1998	\$2,140
Enrollment fall 1998 and later	\$2,367

Undergraduate Tuition: Nondegree-Seeking Students and Exceptions

Full-time tuition: three or four courses each quarter

Enrollment prior to fall 1998	\$8,560
Enrollment fall 1998 and later	\$9,468

Registration exceptions (less than full-time or courses over four units): each course, each quarter

Enrollment prior to fall 1998	\$3,046
Enrollment fall 1998 and later	\$3,371

Service Fees

Student Hospitalization Plan	\$1,376
Required for all students unless they have equivalent hospitalization coverage.	

Study abroad administrative fee (not refundable)

Non-Northwestern summer study abroad	\$580
Term fee (semester or quarter)	\$1,725
Annual fee (academic or calendar year)	\$2,900

Tuition deposit fee	\$400
Required for each new undergraduate student; applied on the first tuition bill and not refundable.	
Application fee (not refundable)	\$60
Returned check service fee	\$35
Replacement WildCARD fee	\$15
Transcript fee	\$5
Makeup laboratory time, breakage fee	varies

Other Fees

Late registration fee	\$25
If fee is billed	\$30
For registering at other than the scheduled times.	
Retroactive registration fee	\$225
For registering for a term after the last day of classes for that term.	
Housing deposit fee	\$200
Late payment penalty fee	\$100
For late payment of bills.	
Associated Student Government	\$40
Activity fee, each quarter	
Dependent Hospitalization Plan, each person	\$4,198
Field trip fee	varies
For courses in which field trips are required to earn credit.	

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.

eBill and ePay

A new electronic billing and payment option for tuition and fees is available free of charge to students and authorized payers such as their parents. The first visit to the eBill and ePay site at www.northwestern.edu/caesar activates a trial period to familiarize the user with the service. During the trial period, a user may view invoices and make payments online while still receiving tuition and fees bills in the mail. He or she may discontinue the receipt of paper bills at any time during the trial period. Additional information on eBill and ePay can be found at www.northwestern.edu/sfs.

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. For information, contact the Office of Student Accounts, Northwestern University, 619 Clark Street, Evanston, Illinois 60208-1132, 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, Rebecca Crown Center. 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 in University housing. Meal charges are assessed until the end of the week in which withdrawal is in effect. Adjustments may be made at the discretion of the Housing Office 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 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 \$100. 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 Residence 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.

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 course work beyond that normally required for the degree. For further information about this process, contact the Office of the Registrar.

Undergraduate Residence Requirement

The Undergraduate Residence Requirement (URR) replaced the Undergraduate Enrollment Requirement as of September 1, 2001. The URR is predicated on the principle that when a student receives a bachelor's degree from Northwestern University, the majority —

and certainly the most advanced portion — of his or her academic work is completed on a Northwestern campus as a full-time student under the instruction of Northwestern faculty during the regular academic year. Thus, being “in residence” for a quarter means that the student is enrolled during the fall, winter, or spring quarter at Northwestern, is being taught by or is under the supervision of Northwestern faculty, and completes three or more credits. It includes, for instance, Practicum in the School of Education and Social Policy and Teaching Media in the Medill School of Journalism. It does not include study abroad of any type or co-op in the McCormick School.

The URR applies only to undergraduate students seeking a bachelor’s degree. Its provisions are:

- A student entering as a freshman is required to be in residence for 12 quarters in a four-year degree program and 15 quarters in a combined degree program (or two bachelor’s degrees) involving two schools. Refer to the final paragraph under Quarters of Eligibility on page 18 for limitations on financial aid for students in combined degree (15-quarter) programs.
- A student entering as a freshman may gain exemption from the required residency by up to four quarters through any combination of a maximum of 12 credits earned through the Advanced Placement or the International Baccalaureate programs; a maximum of 12 credits earned through approved study abroad; credits earned through “credit by examination” at Northwestern; credits earned at Northwestern through less than full-time enrollment; and a maximum of four transfer credits from other (domestic) colleges or universities earned at any time prior to the final three quarters of residence. Each four such credits confer one-quarter exemption from the URR.
- A student entering as a transfer student will have his or her residence requirement determined at the time of transfer; in no case will the residence requirement be determined to be less than six quarters and 23 credits. The URR, once established, is not subject to the exemption possibilities listed above.
- A student who completes three or more credits in a single Northwestern Summer Session will gain exemption from one quarter of the URR. A second quarter of exemption may be earned by completing four credits in a second Summer Session.
- A student who receives Northwestern credit for study abroad must be in residence for either the final three quarters before the awarding of the degree or — if approved study abroad occurs in the senior year — in residence for five of the six quarters before the awarding of the degree.
- A student who takes more than four credits in one quarter will be subject to an overload charge if these credits are used to accelerate graduation. (Acceleration occurs when the total quarters completed by the student, including those allowed in the second and the fourth exemption provisions above, at graduation total less than 12 for a single-degree program or less than 15 for two bachelor’s degree programs involving two schools.)
- Students may appeal for URR variances to the Residence Requirement Appeals Committee, which consists of the associate provost of University enrollment, the associate provost for undergraduate education, the University registrar, and two associate deans from different undergraduate schools. The deans serve three-year terms on a rotating basis.

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.

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. The Office of the Registrar will determine the extent to which credit earned away from Northwestern may reduce the 12-quarter Undergraduate Residence Requirement.

Transfer Students

Students who transfer to Northwestern from another institution will be informed of the extent to which their previous work reduces the 12-quarter Undergraduate Residence Requirement. All transfer students have a six-quarter minimum URR. Those entering as transfer students from another institution may not apply any additional work taken outside the University toward the URR. Such courses beyond the maximum may be useful in meeting academic requirements but may not be used toward the URR.

Academic Regulations

Registration for All Students

- The Office of the Registrar maintains a complete, up-to-date online class schedule, which can be found by selecting the “View the Quarterly Class Schedule” link at www.northwestern.edu/caesar. The office also prints a reference copy of the Evanston campus class schedule each quarter during the regular academic year. Failure to read the registration information at www.registrar.northwestern.edu/registration or the printed class schedule does not excuse students from compliance with the information and regulations stated therein.
- The dates of registration for each quarter are announced in advance, and students not registered by the end of the period are subject to a fee for late registration. This fee is not intended as a penalty but is assessed to partly cover the cost of registration at other than the scheduled time. Inconvenience, illness, and other personal reasons for registering late are not accepted as reasons for waiving the fee. Late registration is permitted only through the fifth full day (Saturday is not a full day) of classes in any quarter.
- Credit is not given for work in a course in which a student is not properly registered.
- Any course duplicated for credit increases the required number of credits to graduate by an equal amount. Both the original and the duplicated course entries remain on the student’s permanent record and are used to calculate the cumulative grade point average.
- Credit is not given for a course that is a prerequisite for a more advanced course if that prerequisite is taken after the more advanced course has been completed. Waiver of prerequisites for admission to courses may be obtained from the instructor concerned or the chair of the department in which the course is offered.
- Undergraduate students may not enroll in less than three quarter-courses except by permission of the dean of their school. Permission is given only in extraordinary circumstances.
- In Weinberg College and the Medill School of Journalism, undergraduate students may not enroll for more than four quarter-courses except by permission of the dean’s office. This regulation applies to total

credit for courses taken in other institutions in addition to credit obtained in residence at Northwestern. Additional tuition may be charged for excess registration (see Undergraduate Residence Requirement).

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 registrations 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 undergraduate courses offered in Weinberg College or the School of Communication, students must obtain a permission number from the instructor or department representative for each course added. The permission number must be entered during registration through CAESAR, the student Web gateway (www.northwestern.edu/caesar). Undergraduate courses offered through the McCormick School, the School of Education and Social Policy, the Medill School of Journalism, and the School of Music do not require permission numbers during the change of registration period.
- To drop a course, students must log in to CAESAR and drop the course from the record. No special consent is required.
- Changes in ungraded sections (laboratory or discussion) are made in the departments 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 is regarded as a failure and is 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 facilities on both the Chicago and Evanston campuses and now also in a new Chicago Loop location, operates on the semester system. Students enrolled in an undergraduate school may take courses in the School of

Continuing Studies only with the approval of the office of the dean of their school and only when the courses are not given on the quarter system during the day or when there are clear cases of conflict. Such work is counted as a regular part of a student's registration.

Students enrolled in undergraduate schools are not guaranteed a place in SCS courses.

To register for SCS courses, students must

- pick up a Dual Registration Form from the Office of the Registrar in Evanston
- secure approval from the office of the dean of their school
- turn in the form at the Office of the Registrar in Evanston before the first meeting of the class

Fall semester courses are included as part of fall quarter registration; spring semester courses are included as part of spring quarter registration.

To drop an SCS course, students must pick up a Dual Registration Form from the Office of the Registrar, secure approval from the office of their dean, and return the form to the Office of the Registrar.

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. Consult the academic calendar at www.registrar.northwestern.edu/calendar for appropriate dates to process an application for interschool transfer.

Cancellation of Registration

Students who complete advance registration for a quarter and later decide not to attend classes that quarter 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 and graduate students who have not registered for one or more quarters of an academic year must file at the Office of the Registrar an application to reenter no later than six weeks before the first day of registration of the quarter in which they plan to return.

Students are not required to file the application to reenter under the following circumstances:

- If they have registered during the spring quarter and intend to return in the fall
- If they have registered in the spring quarter and intend to return during Summer Session of the same year
- If they are students in the Graduate School who have attended the preceding Summer Session and intend to register during the next Summer Session and have not registered during the academic 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 study. Forms for obtaining such approval are available in the Office of the Registrar. The McCormick School Academic Services Office also has forms available for engineering students, and the Medill Office of Student Records and Services has forms available for journalism students. Students in Weinberg College should secure the appropriate Weinberg College forms (and a copy of the regulations governing study away from

Northwestern) in the Weinberg College Office of Undergraduate Studies and Advising. Students also should check the regulations for the Undergraduate Residence Requirement.

If students take courses 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.

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.

Application for a Degree

Undergraduates must file a degree application one calendar year before anticipated graduation. Students in Weinberg College, the Medill School of Journalism, and the Schools of Communication, Education and Social Policy, and Music must file their applications with the Office of the Registrar. McCormick School students must file with that school's Academic Services Office.

Classification of Students

Students are classified as follows:

- Senior: has completed at least 33 quarter-courses
- Junior: has completed at least 22 but less than 33 quarter-courses (engineering co-op students are considered preseniors when they have completed 32 quarter-courses and seniors when they have completed 40 quarter-courses)
- Sophomore: has completed at least 11 but less than 22 quarter-courses
- Freshman: has completed less than 11 quarter-courses
- 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 three quarter-courses or the equivalent
- Half-time: enrolled in at least two but fewer than three quarter-courses or the equivalent
- Part-time: enrolled in fewer than two 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

At the end of a quarter a grade of X or Y 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 credit is forfeited. A notation of K must be resolved before

graduation. An unresolved K will be changed to Y and the grade point average recomputed.

Northwestern University does not rank its students.

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 (see the online class schedule at www.northwestern.edu/caesar).

Grade Reports

Quarterly grades are not mailed but are delivered through CAESAR (www.northwestern.edu/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.

Transcripts

Students who have satisfied all financial obligations to the University are entitled to an official transcript of their academic record, which they may order from the Office of the Registrar. A fee is charged for all transcripts (see Service 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. Because of the confidential nature of a student's record, telephone or e-mail requests for transcripts will not be accepted. Written requests should be submitted to the Office of the Registrar.

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.

Allow three days plus mail time for a transcript to be issued at any time except between quarters, when one week plus mail time is needed.

Northwestern University does not release or certify copies of transcripts received from other schools or institutions. Students needing official transcripts from study abroad experiences must request such transcripts from the institution or program attended.

More details about transcripts can be found at www.registrar.northwestern.edu.

Access to Student Records

Under the Family Educational Rights and Privacy Act (FERPA), all students have certain rights with regard to their educational records. A copy of Northwestern's student records policy is available on the Web at www.registrar.northwestern.edu/ferpa.

FERPA grants students the right 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 U.S. Department of Education concerning alleged failures by Northwestern University to comply with FERPA 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, both graduate and undergraduate, 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 charged with academic dishonesty may not change his or her registration in the course in which the charge is pending or in which a finding of academic dishonesty has been made, nor may a student receive a University degree while a charge of academic dishonesty is pending or while a suspension imposed pursuant to these policies is in effect. Information on procedures that will be followed in cases of alleged dishonesty can be obtained from the dean's office of each school. A complete statement of the University's principles regarding academic integrity can be obtained from the Office of the Provost.

The student-faculty Undergraduate Academic Conduct Committee works to maintain a high level of academic integrity at Northwestern; on the request of the provost, that committee also hears appeals from students of school decisions concerning academic dishonesty. Such appeals must be in writing and include a detailed statement setting forth the grounds for the appeal. Appeals to the provost are limited to alleged errors in procedures, interpretation of regulations, or the question of whether a finding or sanction appears manifestly contrary to the evidence. The provost will receive appeals only after a sanction has been specified for the alleged violation; an appeal to the provost may concern the finding and/or the proposed sanction.

Regular Examinations

Regular course examinations are held during the last week of each quarter at the times indicated in the quarterly class schedule and online at www.registrar.northwestern.edu/registration. Summer Session examinations are usually held at the last class meeting. Students are responsible for determining the time and location of each examination. Early examinations are not permitted. Permission to be absent from the final examination is given by the instructor and the dean only 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 credit is forfeited. In no case may such a grade be made up after a lapse of one year.

Makeup Examinations

All undergraduate students in residence in any school of Northwestern University must make up grades of X (absent) and Y (incomplete) before the end of the next

quarter, or credit is forfeited. Students not in residence may apply for a makeup examination. All such grades, however, must be made up within one year after the course was taken, or credit is forfeited. Permission to take a makeup examination to remove a grade of X must have the written approval of the instructor and the dean. Makeup examinations are conducted by the departments concerned early in each quarter. An application for a makeup examination must be filed several weeks in advance at the office of the school in which the course is offered. (See the academic calendar at www.registrar.northwestern.edu/calendar for exact dates the applications are due.)

Academic Standing

The decision concerning the academic standing of a student is the responsibility of the faculty of the school in which the student is registered.

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 two or more courses in any quarter or Summer Session
- 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 three quarter-courses or the equivalent in each of two consecutive quarters
- Students who, on account of dropped courses, failure, or uncompleted courses, have failed to earn credit for an average of three quarter-courses per quarter after six 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 four 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 two 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 and the Sexual Assault Hearing and Appeals System may not receive Northwestern credit for academic work at any other institution during the period of suspension.

Academic Advising

Academic advising is an essential component of an undergraduate education. All freshmen are assigned an academic adviser through their school. Upperclass students may obtain academic advice through their major department, from the dean's office of their school, and — for issues that transcend school boundaries — through the University-wide Academic Advising Center. For specialized academic advice — such as study abroad or field studies opportunities — consult the appropriate sources listed in the index.

Honors and Prizes

Academic Honors

Degrees with honors are awarded to the top 16 percent of the graduating class of each undergraduate school, as determined by grades in all work at Northwestern University. Students in the highest 3 percent of the class are awarded degrees *summa cum laude*; those in the next 5 percent, *magna cum laude*; and those in the next 8 percent, *cum laude*.

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.

Prizes

Prizes established through gifts and endowments are awarded to undergraduate students at Northwestern. Some are all-University prizes, and others are available only to students registered in the school, department, or program that administers the awards.

Honorary Organizations

Students who qualify by reason of superior scholarship or outstanding achievement are eligible for membership in certain honorary societies. New members of the following organizations are announced in the annual Commencement program:

- Arts and Sciences: Phi Beta Kappa
- Engineering: Eta Kappa Nu, Kappa Theta Epsilon, Omega Chi Epsilon, Tau Beta Pi
- Journalism: Kappa Tau Alpha
- Music: Pi Kappa Lambda

Other honorary organizations in various fields include Alpha Kappa Delta, Alpha Lambda Delta, Deru, Mortar Board, Norleggama, Orchesis, Phi

Delta Kappa, Phi Eta Sigma, Pi Mu Epsilon, Sextant, and Shi-Ai.

Academic Options

For more information about the following programs, see the relevant school sections 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 years. Applicants should be able to qualify for advanced placement in chemistry, mathematics, and one of the humanities on the basis of superior achievement in high school. Each year about 50 freshmen 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.

The first three years of the program are spent on the Evanston campus in Weinberg College, the School of Communication, or the McCormick School, and the last four years at the Feinberg School on the Chicago campus. HPME students must complete 36 courses that meet the HPME requirements in one of the three undergraduate schools mentioned. They also are responsible for an Undergraduate Residence Requirement of nine full-time quarters. Only courses taken at Northwestern or approved study abroad may be used to satisfy this enrollment policy.

During the first two years in Weinberg College, students take required courses in chemistry, physics, and the biological sciences. In addition, they take elective courses in the humanities, social sciences, and arts. The third year is usually devoted to advanced course work in the major. This may be done by studying abroad in a Northwestern-affiliated program or by completing the requirements for a BA degree in Weinberg College. Students may also take an additional undergraduate year at Northwestern or elsewhere.

Students in the McCormick School spend three 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.

School of Communication students spend three years in the Department of Communication Sciences and Disorders, studying the anatomy and physiology of hearing, speech, and the central nervous system as it relates to cognition and memory. They have opportunities to learn how people of all ages hear, speak, and learn — both normally and in the presence of disabling conditions. They also take courses in chemistry, physics, the biological sciences, the social sciences, and the humanities.

After completing the first three years, HPME students move to the Chicago campus as members of the first-year Feinberg School of Medicine class, which includes students who have completed the traditional four years of premedical education. 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 students qualify for a bachelor of science in medical engineering. At the end of seven years, HPME students qualify for the doctor of medicine degree from the Feinberg School.

Students who wish to be considered candidates for the HPME must return the card enclosed in the undergraduate application before December 1, reporting their test scores and requesting an HPME application. If the request is approved, the student must complete the special HPME application, in addition to the regular Application for Admission to Weinberg College, the School of Communication, or the McCormick School, by the appropriate deadlines (see the Application and Testing Deadlines table on page 15).

Integrated Science Program

Northwestern University offers a highly selective undergraduate program of integrated science studies within Weinberg College. The Integrated Science Program (ISP) is designed for students with superior high school records and strong motivation in science and mathematics. Its special 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. Graduates of the program are well prepared for

professional and graduate study leading to careers in science, medicine, and business.

Enrollment in ISP is limited to ensure small class sizes. Selection is made on the basis of scholastic record, test scores, and recommendations. Background requirements are a year of calculus, a year of chemistry, and a year of physics. To be considered for ISP at the time of their admission to Northwestern, students request the special ISP application and brochure in addition to the regular application from the Office of Undergraduate Admission (see Integrated Science Program in the Weinberg College section of this catalog).

Accelerated Master's Programs

Combined bachelor's/master's degree programs enable exceptional undergraduates in Weinberg College and the McCormick School to receive both degrees in less than the usual time. The programs are highly demanding intellectually and require early commitment to a discipline and careful planning.

In the McCormick School, a BS/MS program in engineering allows advanced students who are able to complete the BS requirements early (usually through Advanced Placement/International Baccalaureate or transfer credit) to accelerate study toward a master's degree. See Concurrent BS/MS in the McCormick School section of this catalog.

In Weinberg College, students receive a double count of nine credits that are applied toward both bachelor's and master's degrees, which can be completed in four years. The following departments and programs in Weinberg College have combined degree programs approved by the Graduate School:

- Chemistry
- Economics
- French
- Geological sciences
- Linguistics
- Political science
- Sociology
- Statistics

The approved departmental programs vary, but they share a common goal: the selection and training of exceptional students. The programs also share several underlying premises. First, each department invites students to participate in the program. Students do not select themselves, though they may, of course, inquire about their eligibility. Second, selection by a department is a recommendation to the

Graduate School for admission. Students are officially admitted to the Graduate School only after their credentials have been thoroughly reviewed and approved by the dean of the Graduate School.

For these reasons, students should be aware of guidelines used by the dean of the Graduate School and other guidelines affecting the operation of the program:

- No particular grade point average, however high, automatically entitles a student to participate in a combined degree program.
- Only one academic year — three quarters or two semesters or less — of transfer credit from another institution may be applied as credit toward the bachelor's portion of the combined degree, including credit for a junior year abroad. Any participating department may impose a more restrictive standard if it desires.
- A combined degree program requires a minimum of 12 full quarters of work. The master's portion must be completed during the final three contiguous quarters of registration, beginning with the fall quarter. In schools or departments of the University that operate on a four-quarter system, that is, that offer a full program during Summer Session staffed by the regular faculty, one Summer Session only may be counted toward fulfillment of the 12-quarter requirement. In schools of the University that do not operate on a four-quarter system, cases of one summer of credit will be considered on an ad hoc basis by petitioning the dean of the Graduate School.
- All requirements, both undergraduate and graduate, must be met by the conclusion of the fourth academic year. The bachelor's and master's degrees are awarded simultaneously.
- Both degrees will appear on a single transcript, as will the results of all work completed for both degrees.
- Continuation of graduate work at Northwestern by those who complete a combined degree program must receive separate approval by the department and the dean of the Graduate School.

Accelerated Master's Program in Journalism

Students who exhibit exceptional ability in undergraduate work in the Medill School of Journalism may apply to that school's graduate division for early admission to the graduate editorial program. This program allows students to qualify for bachelor of science in journalism and master of science in journalism

degrees in 12 to 15 quarters of full-time study. Students apply for this program during their junior year; however, interested students are encouraged to begin planning for this option early in their undergraduate careers. Information and admissions materials are available from the Medill Office of Graduate Admissions and Financial Aid (see Accelerated Master's Program in the Medill School section of this catalog).

Music Bachelor's and Journalism Master's

Northwestern offers extremely talented students the opportunity to earn in five years both a bachelor of music or bachelor of arts in music degree from the School of Music and a master of science degree in journalism from the Medill School of Journalism. The joint program is intended to prepare exceptional students for journalism careers emphasizing music and arts reporting. Some journalism courses are required at the undergraduate level before students enter the graduate program. Prospective students apply to this joint program while applying for undergraduate admission to Northwestern.

Combined Bachelor's Programs

Combined Liberal Arts and Engineering Program

Qualified students may undertake a program to earn both a bachelor of arts in a liberal arts discipline from Weinberg College and a bachelor of science in an engineering field from the McCormick School. Students in this BA/BS program, which takes five years, must complete all requirements of both schools as well as the Undergraduate Residence Requirement. To do the necessary planning, interested students should consult with the Weinberg College Office of Undergraduate Studies and Advising and the undergraduate engineering dean's office at the McCormick School as soon as possible after enrolling at Northwestern (see Five-Year BA/BS in the McCormick School section of this catalog).

Combined Liberal Arts and Music Program

Students accepted into the combined Weinberg College–School of Music program may simultaneously earn a bachelor of arts degree from Weinberg College and a bachelor of music degree from the School of Music. They must complete all Weinberg College degree requirements, including at least 30 Weinberg College courses, as well as all School of Music bachelor of music degree requirements, including at least 30 music courses. Fulfilling both music and

Weinberg College requirements takes five years of full-time study, and an Undergraduate Residence Requirement of 15 quarters is obligatory (see Undergraduate Education section of this catalog).

Participants in this combined program must be accepted by both the School of Music and Weinberg College. Interested students should consult with the associate dean for undergraduate studies in Weinberg College and the director of student affairs in the School of Music.

Combined Music and Engineering Program

Students accepted into the combined McCormick School–School of Music program may simultaneously earn a bachelor of science degree from the McCormick School and a bachelor of music or bachelor of arts in music degree from the School of Music. They must complete all McCormick School degree requirements, including at least 36 McCormick courses, as well as all School of Music degree requirements, including at least 30 music courses. Fulfilling both music and engineering requirements usually takes five years of full-time study, and an Undergraduate Residence Requirement of 15 quarters is obligatory (see Undergraduate Education).

Participants in this combined program must be accepted by both the McCormick School and the School of Music. Interested students should consult with the undergraduate engineering dean's office in the McCormick School and the director of student affairs in the School of Music.

Interdisciplinary Study

Mathematical Methods in the Social Sciences Program

The Program in Mathematical Methods in the Social Sciences (MMSS) in Weinberg College enables students to combine the study of social sciences with training in formal analytical methods. The program is intended for students with high mathematical aptitude and strong interest in social problems and issues, including policy and research implications.

Admission to the MMSS is very selective; it is limited to entering freshmen and students beginning their sophomore year who have earned superior academic records and demonstrated strong aptitude in mathematics. Prerequisite for admission consideration is a full-year course in calculus. (See Mathematical Methods in the Social Sciences in the Weinberg College section of this catalog.)

Integrated Science Program

See Accelerated Degree Programs.

Interschool Programs

Students in any undergraduate school may enroll in the Undergraduate Leadership Program. All undergraduates may enroll in the International Studies and Legal Studies Programs as adjunct majors. The Music Theatre Program is open by audition to School of Music voice majors and School of Communication theater majors. Majors in the School of Music and the School of Education and Social Policy are eligible for the new Partnership through the Arts Program. (See the Other Undergraduate Programs section of this catalog.)

Undergraduates in any school may earn a minor in transportation and logistics. Majors in the School of Music or the Departments of Art Theory and Practice, Computer Science, or Radio/Television/Film may earn a certificate in art and technology. (See the Other Undergraduate Programs section for descriptions of these programs.)

Undergraduates in schools other than Weinberg College may enroll in that college's minor programs. (See Minors under Special Opportunities in the Weinberg College section of this catalog.)

Center for the Writing Arts

Northwestern's Center for the Writing Arts sponsors a number of programs as well as a series of courses designed to highlight the University's commitment to excellence in writing. Many of the courses are taught by visiting professional writers. (See Other Undergraduate Programs section of this catalog.)

McCormick School Honors Programs

Honors Program in Undergraduate Research

The Honors Program in Undergraduate Research in the McCormick School provides an unusual opportunity for prospective freshmen with superior motivation and scholastic credentials to be admitted to work with an engineering faculty mentor/adviser in a challenging research project beginning in the first year and continuing throughout the undergraduate years.

Students may request the names and current research interests of participating faculty, enabling them to apply to a project of their choice. With the participation of a faculty sponsor, students will be selected for the program based on their high school

records; SAT I or ACT, SAT II, and Advanced Placement test scores; and, usually, an interview. Interested students may request an application and additional information from the undergraduate engineering dean's office in the McCormick School. (See Honors Program in Undergraduate Research in the McCormick School section of this catalog.)

Honors Program in Engineering and Education

The Honors Program in Engineering and Education is designed for students who have a strong interest in education and training as well as in science, mathematics, and engineering. Students join the program in the belief that a more technical background will give them an advantage in the research and development of educational software or in the understanding and enhancement of human learning in the classroom or workplace.

The program provides undergraduate engineering students possessing strong academic credentials and some advanced placement the opportunity to complete in five years an MA in learning sciences and a BS in engineering. Students also gain industrial and/or research experience related to their area of specialty.

High school students may apply to this program when they apply to the University. McCormick students may apply to the program during their junior year. All applications are reviewed by a committee of faculty and co-op engineering employers, who provide the industrial experience for participants.

Honors Program in Engineering and Journalism

The Honors Program in Engineering and Journalism is intended to prepare exceptional students for journalism careers emphasizing engineering, science, and technology. This joint program with the Medill School of Journalism involves completing a BS in engineering and an MS in journalism. Some journalism courses are required at the undergraduate level before students enter the graduate program. Prospective students apply for this joint program while applying for undergraduate admission to Northwestern. (See Honors Program in Engineering and Journalism in the McCormick section of this catalog.)

Honors Program in Engineering and Law

The Honors Program in Engineering and Law combines a Northwestern engineering degree, on-the-job work through the McCormick School co-op program,

and provisional admission to Northwestern University School of Law. Among the careers for which the program is unusually valuable are those in technology-intensive businesses and intellectual property, including patents. The undergraduate portion of the program is four years, including five academic quarters of co-op work. Students must maintain a 3.25 undergraduate GPA. They take the LSAT at the beginning of their junior year and are expected to score at or above the median of the previous year's entering law class. Their admission to the law school is reviewed late in the junior year.

Honors Program in Engineering and Management

Honors students are eligible to apply for a joint program at McCormick that offers deferred admission to the J. L. Kellogg School of Management. High school students with superior scholastic credentials and strong motivation for the study of business are best suited for this program. Contact the undergraduate engineering dean's office in the McCormick School for more information. (See also Honors Program in Engineering and Management in the McCormick School section of this catalog.)

Weinberg College Honors Programs

The Honors Program in Medical Education, the Integrated Science Program, and the Program in Mathematical Methods in the Social Sciences are described above. Several Weinberg College majors, e.g., American studies and the English Major in Writing, are special-admission majors. See the Weinberg College section of this catalog for full descriptions of Weinberg honors opportunities.

Formal Options

Pass/No Credit (P/N)

The P (pass) or N (no credit) option allows full-time students to explore fields beyond the areas of their specialization without concern about grade point average. Many undergraduate courses are open to the P/N option. For information about a particular school's P/N policy, see that school's section in this catalog.

Student-Organized Seminars (SOS)

Students who wish to pursue studies not included in the catalog can 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.

Residential College Offerings

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 up 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 one quarter is two units.

Double Major

A double major is available to all students who complete a full major program in two departments.

Self-Designed Major

A self-designed major permits all 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, the interdepartmental studies major in the School of Communication, and the Combined Studies Program in the McCormick School.

Departmental Honors Programs

Departmental honors programs are available to students through most departments of Weinberg College, most departments in the School of Communication, and all departments of the McCormick School and the School of Education and Social Policy. They involve advanced study through special undergraduate seminars or graduate courses and/or independent work under faculty supervision.

Teaching Certification

Weinberg College students also 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 section.)

Off-Campus Programs

Field Study

Many off-campus field studies, internships, and research opportunities sponsored by various schools and departments are available to Northwestern students. The programs vary greatly: Some carry academic credit; some are undertaken in conjunction with a class or seminar; some make provision for a stipend; some entail living away from campus.

Following is a representative list of field studies programs with their sponsoring school, department, or program:

- Business Institutions Program (arts and sciences)
- Chicago Field Studies Internship (arts and sciences)
- Communication Studies Field Studies Program (communication studies)
- Education and Social Policy Practicum (education and social policy)
- Internships in the Arts (art history)
- Internships in Business Institutions (business institutions)
- Internships in Environmental Sciences (environmental sciences)
- Internships in the Humanities (Alice Berline Kaplan Center for the Humanities)
- Internships in Media Production (radio/television/film)
- Internship in Women's Services (gender studies)
- Los Angeles Internship Program (communication)
- Northwestern Archaeological Field School (anthropology)
- Performance Studies Field Studies (performance studies)
- Political Campaigning (political science)
- Professional Apprenticeship in Music Education (music)
- Summer Field Studies in San Francisco or Washington, D.C. (education and social policy; open to all majors)
- Teaching Magazine Program (journalism)
- Teaching Newspaper Program (journalism)
- Teaching Practicum (education and social policy)
- Teaching Television Program (journalism)
- Theatre Field Studies (theater)
- Walter P. Murphy Cooperative Engineering Education Program (engineering)

Study Abroad

Northwestern encourages qualified students to study abroad when such study promises to enrich their academic programs. By starting to plan for study abroad early in their Northwestern careers, most students, regardless of school or major, should be able to study abroad and still graduate within four years.

The Study Abroad Office provides information and advising services to all students interested in study abroad. Students who wish to transfer credit earned through foreign study must receive the permission of the University Study Abroad Committee and the Study Abroad Office prior to their study abroad experience. Students are required to review their plans with the dean's office of their schools and in some cases with their department advisers.

Most Northwestern students studying abroad do so on one of the University's more than 100 affiliated foreign study programs. 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 foreign study programs must have their programs preapproved by the Study Abroad Office. No financial aid is available for them from the University, and Northwestern cannot process their outside aid.

All students approved by Northwestern to study abroad during the academic year remain registered at Northwestern while abroad. In most cases students pay only the cost of the study abroad program plus a Northwestern administrative fee.

Since foreign study often requires special language or other preparation, students interested in study abroad are encouraged to consult with the Study Abroad Office early in their Northwestern careers. The office hosts regular information sessions and houses an extensive resource library. For more information please consult its extensive Web site at www.northwestern.edu/studyabroad.

Undergraduate Schools and Courses

Key to Course Numbers

Although the course numbers 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 is issued for each quarter at www.northwestern.edu/caesar and contains a complete and updated listing of courses for that quarter. The University reserves the right to cancel courses for which registration is not sufficient.

Course Credits and Quarters

Daytime work in all the schools on the Evanston campus is on the quarter system. A quarter-course, the unit of instruction, is the work done in a class meeting at least three hours per week and carries the value of one unit of credit. Exceptions are courses meeting less than three hours per week, which may carry less than one unit, and 15-week courses, which carry 1.5 units. A quarter-course is the equivalent of $2\frac{2}{3}$ semester hours. (For transfer to other institutions or for certification stated in credit hours, undergraduates may consider a quarter-course equivalent to four quarter hours of credit.)

Summer Session combines the course offerings of the School of Continuing Studies, which is on the semester system, and the schools on the Evanston campus, which are on the quarter system. (For transfer credit, courses taken during Summer Session are the equivalent of four quarter hours or three semester hours.)

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 upperclass students, 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 may identify certain groups of courses. See departmental listings for details.

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

Judd A. and Marjorie Weinberg College of Arts and Sciences

The Judd A. and Marjorie Weinberg College of Arts and Sciences — oldest of Northwestern's 11 schools — has been the center of the University's academic and intellectual life since 1851. 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 college faculty of approximately 500 women and men 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 consisting of more than 2,000 courses as well as tutorials, laboratory rotations, internships, and other individualized forms of instruction. The 3,800 undergraduates and 900 graduate students in arts and sciences enjoy a great deal of choice, with access to 25 departments; 28 programs offering 35 majors, 8 adjunct majors, and 43 minors; as well as more than a dozen interdisciplinary programs offering majors and minors.

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 course work in several disciplines provides an overview of the complexity of the world and different ways of apprehending and solving problems. These foundational 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 another culture, while intensive course work in a required major or 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 also encouraged to develop firsthand knowledge of other cultures and greater intellectual and personal independence.

Weinberg College promotes participatory learning that begins in the first year of study in required freshman seminars and continues in professional linkage and honors seminars, laboratory experiences, internships, 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 offer liberal arts students unusual opportunities to extend their interdisciplinary studies and to pursue applied work in several areas, in some cases leading to a special concentration or certification. The University's outstanding libraries, research centers, and graduate professional schools further support and enrich the educational pursuits of liberal arts undergraduates.

Academic Policies

Program of Study 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 the framework of general education and major requirements specified in the following section. Guidance in planning a coherent personal curriculum is available in several places. General advising is 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 and is in the student's area of general academic interest. At the end

of freshman year, 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 selection, majors and minors, and career opportunities in their particular area.

Requirements for the Degree of Bachelor of Arts

Candidates for the bachelor of arts degree must complete 45 quarter-courses and fulfill the residence and grade requirements described below. First-year students must take two freshman seminars. Before graduation, all students must demonstrate proficiency in writing and competence in a classical or modern foreign language. They must satisfy distribution requirements in six major areas of intellectual inquiry and complete the requirements of a major in one of the departments or programs of Weinberg College.

Freshman Seminar Requirement

Freshman seminars, offered by nearly all departments in Weinberg College, 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 15 or 16 students to encourage discussion, and each seminar requires considerable expository writing — usually a minimum of 15–20 typed pages per quarter. These seminars ordinarily supplement rather than replace standard introductory courses and usually do not provide the preparation necessary for advanced work in a departmental program.

Every Weinberg freshman is required to complete two freshman seminars. Except for students in special programs (BA/MAs, HPME, ISP, and MMSS), who take their seminars in winter and spring, incoming freshmen are preassigned 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 academic adviser for the year. Also during the summer, freshmen are informed of the quarter in which they are to take their second seminar. Opportunities in the winter and spring include freshman seminars linked to large introductory courses taken in the previous quarter.

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 by achieving a score designated by the Weinberg College Council on Language Instruction on a College Entrance Examination Board Advanced Placement Examination, by passing a proficiency examination administered at Northwestern during New Student Week and periodically thereafter through the school year (language departments may impose a limit on the number of times a proficiency examination may be taken), or by successfully completing course work designated by the Council on Language Instruction.

Students who believe they are proficient in reading, writing, listening, speaking, and the culture of 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. In certain extraordinary cases of a professionally diagnosed learning disability directly related to foreign language acquisition, the Council on Language Instruction may authorize a substitute for the proficiency requirement. The council will not, however, simply excuse a student from the foreign language requirement.

Distribution Requirements

To ensure breadth of education, Weinberg College students must take two quarter-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 in the Office of Undergraduate Studies and Advising.

- I. Natural sciences

Courses in this area introduce methods of inquiry and fundamental concepts in the natural sciences.

- II. Formal studies

Courses in this area introduce concepts, methods, and use of formal rules of inference in mathematics, statistics, computer science, logic, linguistics, and cognate areas by showing how objects of thought and experience and their relationships can be analyzed in formal terms.

- III. Social and behavioral sciences

Courses in this area introduce the theories, methods, and findings of empirical research on human behavior and its relation to social, cultural, economic, and political groups and institutions.

- IV. Historical studies

Courses in this area introduce the chronological development and historical relationships in cultural, social, political, economic, and military affairs in a broad temporal perspective.

- V. Values

Courses in this area introduce the analysis of moral, social, and religious values and how they have developed.

- VI. Literature and fine arts

Courses in this area foster understanding of how the attitudes, ideas, and values of individuals, groups, societies, or cultures are represented in their literature, arts, and creative activities.

Some of these distribution requirements may be satisfied 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.

Major Study Requirement

All students must fulfill the requirements of a major, which should be declared by the end of the sophomore year. Majors are declared by meeting with the designated adviser in the department or program offering the major; at that meeting a course plan is developed and a Declaration of Major Form is completed.

Students may pursue two or more majors by completing each department's major requirements. With limited exceptions in certain formal dual-major programs, the same course may not be applied to the major requirements of two departments. However, a

course used as a major course in one department may also fulfill a related course requirement for another major program.

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

- Departmental major

Each department offers one or more programs of specialization, which are described in detail immediately preceding the departmental course offerings in this catalog.

- Area or interdisciplinary major

The college offers 16 interdisciplinary majors that apply the approaches of several departments to certain scientific, cultural, and political areas. These programs, described in the corresponding entries, are American studies, Asian and Middle East studies, cognitive science, comparative literary studies, computing and information systems, drama, European studies, environmental sciences, gender studies, geography, legal studies, integrated science, international studies, mathematical methods in the social sciences, science in human culture, and urban studies. American studies, European studies, integrated science, legal studies, and mathematical methods in the social sciences are limited-admission majors that require a special application, as does the writing major in the English department. Gender 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 (that is, in conjunction with a second major).

- 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 by bringing together courses from various departments. Ad hoc majors must be approved by the faculty's Curricular Review Committee. Ad hoc majors approved in recent years include computational chemistry, formal systems and art, and African studies. For more information, see the assistant dean for curriculum in the Office of Undergraduate Studies and Advising.

Residence and Grade Requirements

Of the required 45 quarter-courses, the last 23 must be taken while students are enrolled as undergraduates at Northwestern. During the last three quarters preceding the granting of the BA degree, students must

be enrolled as degree candidates in Weinberg College. In addition, students returning from study abroad are expected to be enrolled in course work on the Evanston campus for at least one quarter after returning and before graduating.

Pass/No Credit Option

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

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.

Students must achieve a grade point average of C (2.0) or higher in courses offered to meet degree requirements. No work passed with a grade of D or P counts toward a major or minor (including any course prerequisite to a course required in the departmental unit or any related course), and a grade of C- or higher must be earned in the last course in a sequence taken to fulfill the foreign language requirement. Transfer students must complete the equivalent of at least four one-quarter upperclass (300-level) courses at Northwestern in the department of their major.

In addition to and independent of the requirements set by Weinberg College, all students must satisfy the Undergraduate Residence Requirement (see Undergraduate Education section of this catalog).

Registration in Courses in Other Undergraduate Schools of the University and at Other Universities

Weinberg College students may take advantage of Northwestern's undergraduate preprofessional schools to take as many as 11 of their required quarter-

courses; of those 11, up to 3 may be instruction in applied music. Dual registration in the School of Continuing Studies is not included in this restriction. A student desiring to take more than two courses outside Weinberg College in a given quarter must obtain the advance consent of the Office of Undergraduate Studies and Advising.

Courses taken in the School of Continuing Studies may be counted toward the BA degree only if they are similar to those offered in the regular curricula of the Evanston undergraduate schools. This determination is made by the Office of Undergraduate Studies and Advising.

No credit is given for shop work, individual instruction in speech, correspondence courses, or course work in music education or physical education.

No more than 4 of the required 45 quarter-courses may come from the offerings of the programs of Aerospace Studies, Military Science, or Naval Science. With the prior approval of the University Study Abroad Committee or the faculty, qualified students may study abroad or undertake work at another institution in the summer. Students should consult with the Office of Undergraduate Studies and Advising concerning limitations on the amount of non-Northwestern credit that may be used toward the BA degree and with the Office of the Registrar concerning limitations on the amount of such credit that may be used towards the Undergraduate Residence Requirement.

Special Opportunities

Junior-Year Tutorials

These tutorial classes for juniors, always with fewer than eight students, emphasize intense intellectual exchange and detailed mastery of texts and concepts. They develop critical skills, including research design if appropriate, through mutual criticism and practice in written and oral communication. Recent tutorials have included Ethics and Political Power (political science), 20th-Century Experimental Fiction from East Europe and the U.S.A. (English), and the CIA in the Third World, 1947-97 (history).

Professional Linkage Seminars

Undergraduates may take specially designed linkage seminars that approach social and work-related concerns through the eyes of an accomplished non-academic 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. In this way, they focus on the transition from the academic to the nonacademic world. Topics have included civil advocacy, medical ethics, philanthropy, the role of nongovernmental organizations, and issues of asylum in U.S. immigration law. Linkage seminars are announced to Weinberg College students before registration each quarter.

Undergraduate Seminars and Independent Study

By departmental invitation, seniors may take 398 Undergraduate Seminar in one or more quarters, up to a maximum of four quarter-courses.

Students, normally seniors as well as juniors with excellent records, may register for 399 Independent Study under the supervision of a faculty member. During the quarter before enrolling in 399, students must submit to the department for approval a detailed description of the work they will undertake and the basis for its evaluation. Upon completion of the course, they also must submit an abstract of the completed work to the department, where the description and the abstract are filed.

Students may not register for more than two credits of 399 in a quarter. No more than nine quarters 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

Each major in Weinberg College offers an honors program leading to the award, at graduation, of departmental honors to seniors with outstanding achievement in connection with a research project or other integrative type of work. Although the detailed criteria vary somewhat by major (and may be consulted under the listings of individual departments and programs), all share certain features.

Students recommended for departmental honors must have completed with distinction both such regular courses as may be required of them by their major and at least two quarters of 398 or 399 or their equivalent or 400-level courses or some combination thereof. The honors project must result in a research report, thesis, or other tangible record; course work alone, such as completion of 400-level courses, is not sufficient. Simple data collection, computer programming, analysis of data with canned programs, and

summaries of primary or secondary sources are not alone bases for the award of departmental honors.

Each major has an undergraduate honors committee responsible for administering its honors program and for preparing the final recommendations for honors that are submitted in May to the Weinberg College Committee on Superior Students and Honors. Students are proposed for honors by the faculty adviser, who writes a letter describing and evaluating the student project. Additional evaluative letters giving independent and substantive judgments of the project must be submitted by faculty members unconnected with the student's project. The departmental honors committee reviews all nominations for departmental honors in a given year during spring quarter and takes a separate recorded vote on each candidate. Approved nominations are then forwarded to the Committee on Superior Students and Honors for final review.

Minors

Students may choose to pursue a minor from among more than 40 departments and programs, as well as several interschool minors (see Other Undergraduate Programs). Specific minor requirements are given under the appropriate headings in this catalog. Completion of a minor is optional and not a degree requirement, and no more than one minor or minor concentration may be pursued and listed on a student's transcript. Except as explicitly stated and in the case of related courses, courses used to fulfill requirements for the student's major(s) may not be used to fulfill the requirements for the minor.

Concentrations in the School of Music and the School of Communication for Weinberg College Students

Students in Weinberg College may elect to pursue a special concentration in music studies offered by the School of Music or one of four special concentrations offered by the School of Communication. These special curriculum concentrations, consisting of five to six courses, have limited enrollment and are available only to Weinberg College students. More information is available at the Weinberg College Office of Undergraduate Studies and Advising.

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 work force directly.

All majors can furnish suitable preparation for professional schools, provided appropriate courses are included in the student's course of study. However, no major 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. The Office of Undergraduate Studies and Advising has prepared pamphlets describing in detail the admission requirements of graduate professional schools and the ways in which those requirements may be met at Northwestern.

Academic Options

Combined Bachelor's and Master's Degree Programs

Exceptional undergraduates may be able to earn both a bachelor's degree and a master's degree in four years of study in the following departments: chemistry, economics, French, geological sciences, linguistics, political science, sociology, and statistics. Students are admitted to these programs only by invitation of the department and with the approval of the Graduate School. (See Academic Options in the Undergraduate Education section of this catalog.)

Combined Weinberg College–Feinberg School of Medicine Program

The Honors Program in Medical Education (HPME) 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 and to the Feinberg School of Medicine. HPME students then participate in a challenging program, with the first three years in undergraduate study and the last four years in the Feinberg School, thus reducing the period of formal training by at least one year.

Students in HPME must successfully complete 36 quarter-courses while in Weinberg College and complete an Undergraduate Residence Requirement of nine quarters. The course requirement includes 11 prescribed science courses. Selection of the remaining 25 courses depends on the curriculum chosen by the student. Options include completion of a BA degree or study abroad in a Northwestern-affiliated, ad hoc,

or other program approved by the University Study Abroad Committee.

Further information may be obtained from the premedical adviser in the Office of Undergraduate Studies and Advising.

Combined Weinberg College–School of Music Program

Students accepted into the combined Weinberg College–School of Music program may simultaneously earn a BA degree from the college and a BMus degree from the School of Music. They must complete all Weinberg College degree requirements, including at least 30 Weinberg College courses, as well as all requirements for the bachelor of music degree in the School of Music, including at least 30 music courses. Fulfilling both Weinberg College and School of Music requirements takes five years of full-time study, and an Undergraduate Residence Requirement of 15 quarters is obligatory.

Participants in this combined program must be accepted by both the School of Music and Weinberg College. Interested students should consult with the associate dean for undergraduate studies in Weinberg College and the director of admissions in the School of Music for current information.

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. Areas of certification are art, biological sciences, chemistry, economics with history, English, French, German, history, Latin, mathematics, physics, political science with history, sociology with history, and 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 section of this catalog. Application should be made with the Office of Student Affairs in the School of Education and Social Policy.

Other Undergraduate Programs

Weinberg College students may enroll in courses offered by the interschool Undergraduate Leadership Program as well as those offered by several other interschool programs administered by the college,

including the Center for the Writing Arts, the Transportation Center, and the International Studies and Legal Studies adjunct majors (see the Other Undergraduate Programs section of this catalog).

Study Abroad

Weinberg College students are encouraged to study abroad, both in programs that are affiliated with Northwestern and those that are not. Prior approval is required in order to receive credit for any study abroad other than the summer programs in Mexico and Quebec operated by the Committee on Institutional Cooperation (consisting of the 11 Big Ten universities and the University of Chicago).

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, an economics major might study NAFTA in Mexico; 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. Complete study abroad information is available from the Study Abroad Office.

General Studies

These interdivisional courses are open to all qualified students.

GEN LA 280-7 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 nine students. Proposals for tutorials must be approved by the associate dean for undergraduate studies of Weinberg College.

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 associate dean for undergraduate studies 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. The associate dean for undergraduate studies forwards proposals to the Curricular Review Committee of the college, which must review and approve all seminars

to be offered. Students may enroll in only one Student-Organized Seminar per 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 studies for further details.

GEN LA 392-0 Herskovits Undergraduate Research Award (2 units) Selected students undertake self-designed, faculty-supervised research in the University's renowned Melville J. Herskovits Library of African Studies for two quarters, earning two units of credit.

GEN LA 393-0 Chicago Field Studies Internship (4 units) Full-time participant-observer experience in Chicago-area political, planning, and policy organizations; service, civic, and community institutions; groups committed to social change. Placement of students in responsible volunteer positions; "real-world" mode of inquiry complementing conventional campus-based and outside-observer approaches to understanding urban processes. The number of credits applicable toward the major, if any, is determined by the student's department. Prerequisite: consent of program director.

African American Studies

The study of the African American experience has a long and distinguished history in the United States. The field has developed exciting insights as well as firm intellectual and empirical foundations for the systematic study of the African American experience and, through such study, for a greater understanding of the larger American experience. From its beginnings, the field has been strongly interdisciplinary, bringing the perspectives of different disciplines to bear on understanding black life. The Department of African American Studies exemplifies these traditions and strengths and, through its courses, 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 African American experience is one of the key features of the department, distinguishing it 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 institutions such as the family; 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, health-care 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, since scholars and political leaders are paying increased attention to the Caribbean and Latin America as well as to blacks and other minorities in the United States, students of African American studies will enter a field that touches on issues of far-reaching national and international significance.

Major in African American Studies

Departmental courses

Core course 210-1, 2, 225, 236-1, 2

Concentration In addition to the core sequence, 6 courses selected from one of the following areas:

- Expressive arts and cultural studies
- Historical and comparative studies
- Politics, society, and policy (including data handling and analysis)

Depending on the topic, 380 may, with the consent of the director of undergraduate studies, be counted in any of these areas.

Senior seminar: 390 or 399 taken in the senior year

Related courses: Subject to approval of the department adviser, majors must take 5 courses offered by other departments at the 200 or 300 level, at least 3 of which are at the 300 level. Students are expected to choose related courses that develop the methodological skills and substantive focus appropriate to their areas of concentration.

Minor in African American Studies

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

Minor course requirements (8 units)

- 4 foundation courses chosen from 210-1, 2, 225, or 236-1, 2
- 4 additional courses in the department or approved by the department, including 3 at the 300 level

Honors in African American Studies

To qualify for honors, a student must demonstrate consistently high performance in the major and complete a major research project during senior year. Specifically, a student must have a cumulative grade point average of at least 3.3 in African American studies courses, with no grade below a B in any single course. A senior who meets these criteria and is interested in pursuing departmental honors must notify the honors coordinator during the fall of the senior year. The student will select a thesis adviser in consultation with the honors coordinator, who also serves as director of undergraduate studies. The thesis adviser need not be

a member of the department. Completion of the thesis ordinarily requires at least two quarters, during which the student and thesis adviser are expected to meet regularly. Merely completing a thesis does not guarantee honors; the thesis adviser and one other faculty member, selected by the honors coordinator, must recommend the project for honors to the Office of the Dean.

Core Courses

AF AM ST 210-1,2 Survey of African American Literature Two-quarter sequence on the literature of blacks from slavery to freedom. Works of major writers and significant but unsung bards of the past.

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

AF AM ST 236-1,2 Introduction to African American Studies Key texts and concepts in African American studies from a range of disciplinary perspectives. **1.** Africa, slavery, rural and urban life, class division, and the constructs of "race," "racism," and "blackness." **2.** The institutional development of politics, church, education, culture, women/family, and the social conditions that give rise to such formations. Both **1** and **2** will connect their respective themes to the historical and contemporary liberation struggle, featuring occasional guest lectures by faculty members.

Expressive Arts and Cultural Studies

An asterisk (*) preceding the course number indicates a course that may count toward one or more other areas of concentration.

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 316-0 African American Folklore African American folklore in a variety of genres and forms of presentation, from both rural and urban communities. Includes folk narratives, folksongs, the dozens, toasts, jokes and humor, folk beliefs, preachers, folk heroes, and the literary transformation of folk materials.

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 340-0 Slavery and Abolitionist Discourse** Investigation of the rise of abolitionist discourse in the West, including the evolution of the debates over slavery from the latter part of the 18th century to the late 19th century. May also count toward historical and comparative studies concentration.

***AF AM ST 345-0 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. May also count toward historical and comparative studies concentration.

AF AM ST 350-0 African American Literary Criticism and Theory Advanced introduction to African American literary cultural criticism and theory. Topics include the “black aesthetic”; black writers as critics; black feminism, representation, and sexuality; critiques of the roles of black intellectuals; and the uses of and resistance to poststructuralist theory in African American criticism.

***AF AM ST 355-0 20th-Century Intellectual and Popular Culture** Examination of the rise and persistence of the notion of black cultural/racial authenticity in the 20th century through the lens of various forms of intellectual and popular culture. May also count toward politics, society, and policy concentration.

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 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. Prerequisites: consent of instructor and 210-1,2 or another African American literature course.

AF AM ST 379-0 African American Women Playwrights Texts written from approximately 1916 to the present. Use of the stage as an arena of social activism, theatrical representations of “the folk,” the family, respectability, and feminism. Prerequisites: consent of instructor and 259 and/or other African American literature courses.

Historical and Comparative Studies

AF AM ST 212-1,2 Introduction to African American History 1. Key concepts in African American history from 1700 to 1861. Includes 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.

AF AM ST 214-1,2 Comparative Race Studies in the United States Problems and experiences of racialized minorities: blacks, Native Americans, Asian Americans, and Hispanic Americans. Comparative exploration of their relationships to each other and to the majority society. 1. 1600–1865. 2. 1865–1974.

AF AM ST 220-0 Civil Rights and Black Liberation Examination of the Northern and Southern civil rights

movements and the rise of black nationalism and feminism, 1945–72.

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; linkages among gender, sexuality, and diasporic sensibilities; the culture/politics nexus; hip-hop; and AIDS.

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 anti-lynching, women’s suffrage, civil rights movements, and World War II.

AF AM ST 345-0 Politics of Afro-Latin America Introduction to the racial politics of African American communities outside the United States; exploration of relationships between racial and social inequality, racial difference, and political development in selected Latin American nations.

AF AM ST 370-0 Black Activist Debates Analysis of African American political thought and advocacy since Reconstruction. Major ideological and tactical debates among Ida B. Wells, W. E. B. Du Bois, Booker T. Washington, and Marcus Garvey; the shift from civil rights to Black Power in the black liberation movement; the rise of black feminism and the gay and lesbian rights movement; the rise of black conservatism and the contemporary struggle for reparations for slavery and segregation.

Politics, Society, and Policy

An asterisk (*) preceding the course number indicates a course that may count toward one or more other areas of concentration.

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 319-0 Race, Ethnicity, and the American Constitution** Investigation of how race and ethnicity have influenced the evolution of the U.S. Constitution and legal debate and practice. Topics include affirmative action, school integration, and the death penalty. May also count toward Historical and Comparative Studies concentration. Prerequisite: POLI SCI 220 or 230 or AF AM ST 220.

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

AF AM ST 321-0 Researching Black Communities Introduction to the methodology and findings of qualitative research on black communities in the United States. Topics

include black migration, urban geography, black culture, class and gender stratification, racial identity.

***AF AM ST 325-0 Race, Poverty, and Public Policy in America** Examination of the scope of poverty in America, competing theories about its causes, and how racial stratification creates and perpetuates economic marginalization. Public policy responses to the plight of the poor; debates about the future of antipoverty policy, with emphasis on the relationship between racial and economic stratification. May also count toward Historical and Comparative Studies concentration. Prerequisite: 236-1 or SOCIOL 110-0.

***AF AM ST 327-0 Politics of African American Popular Culture** Examination of the debates within African American communities about the proper role and function of black art and artists in relation to black politics. May also count toward Expressive Arts and Culture concentration. Prerequisite: 236-1 or 236-2.

AF AM ST 332-0 Black Feminist Theories In-depth survey of major constituents of black feminist theory, utilizing interdisciplinary approach with readings from history, sociology, literature, popular culture, and religious studies.

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 studies, feminist theory, African American studies, cultural studies.

Courses for Advanced and Senior Students

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. Depending on the topic, 380 may, with consent of the director of undergraduate studies, be counted in any of the areas listed above.

AF AM ST 381-0 Topics in Transnational Black Culture Examination of middle-passage texts such as novels, poetry, film, drama, slave narratives, and historical texts in order to explore comparatively how artists from across the African diaspora have approached this historically and emotionally loaded event.

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.

AF AM ST 399-0 Independent Study Open to advanced students with consent of department.

Related Courses in Other Departments

Expressive arts and culture

ENGLISH 365 (if related to people of African descent), 366
FRENCH 365, 366
PHIL 368 (when appropriate)
GEN MUS 330, 340-1,2,3 (see the School of Music section of this catalog)

COMM ST 326 (see the School of Communication section of this catalog)

PERF ST 216, 309 (see the School of Communication section of this catalog)

THEATRE 368 (see the School of Communication section of this catalog)

Historical and comparative studies

AF ST 390, 398

ECON 321

HISTORY 301-1,2, 306-1,2, 355, 356-1,2, 357, 358-1,2

LATIN AM 391

Politics, society, and policy

ANTHRO 320, 332, 372 (when related to people of African descent)

ECON 325, 326, 354

POLISCI 327, 357 (when related to people of African descent), 359, 360

African and Asian Languages Program

The Program of African and Asian Languages (PAAL) offers opportunities to explore through language study some of the fascinating cultures that are vital for Americans to understand: those of Africa, China, India, Japan, Korea, and the Middle East. Students who combine study of one of PAAL's African or Asian languages with a major or background in such departments as history, economics, political science, or sociology will be well prepared for graduate study, professional programs, and careers in international business, journalism, trade, law, or diplomacy. Even the natural sciences have exchange programs in which knowledge of non-Western languages is useful.

PAAL offers courses in Arabic, Chinese, Hebrew, Hindi, Japanese, Korean, and Swahili. Minors are available in Chinese and Japanese. Other African languages can be made available. Any PAAL language may be taken to fulfill the Weinberg College requirement of two years of foreign language study. For undergraduate programs that integrate the language offerings of PAAL, see African studies, Asian studies, international studies, and Jewish studies.

Advanced language study may be taken through registration in AAL 399 Independent Study. Students are strongly encouraged to enrich their language learning by studying abroad. Interested students should consult an adviser in the Study Abroad Office as early as possible in their academic career.

Minor in Chinese or Japanese Language and Culture

These PAAL minors offer a concise and 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 course requirements (8 units)**Option A**

- Language (5 units):
3 quarter-courses of 200-level Chinese or Japanese
2 quarter-courses of 300-level Chinese or Japanese
- Literature/culture (3 units):
2 quarter-courses of Chinese or Japanese literature in translation (COMPLIT 271-1,2,3 or 274-1,2,3,4)
1 course from an Asian studies discipline (e.g., ART HIST 240; HISTORY 281, 284, 381, or 384)

Option B: Semester or full-year study abroad

- Language (5 units):
3 quarter-courses of 200-level Chinese or Japanese taken either partly or entirely in China or Japan (remainder taken upon return)
2 quarter-courses of 300-level Chinese or Japanese taken upon return
- Literature/culture (3 units):
Any 3 disciplinary courses taken in China or Japan

African Language Courses

AAL 105-1,2,3 Elementary Arabic Three-course introduction to modern standard Arabic. Speaking, reading, and listening comprehension skills developed.

AAL 106-1,2,3 Intermediate Arabic Grammar, reading of Arabic texts, oral communication in Arabic. Prerequisite: 105-3 or equivalent.

AAL 121-1,2,3 Swahili I Basic literacy skills and interactive proficiency; Swahili in cultural and historical context.

AAL 122-1,2,3 Swahili II Development of literacy and interactive proficiency skills; introduction to verbal arts. In Swahili. Prerequisite: 121-3 or equivalent.

AAL 207-1,2,3 High Intermediate Arabic Reading and discussion of Arabic writings relevant to students' interests and needs. Emphasis on writing skills. Prerequisite: 106-3 or equivalent.

AAL 223-1,2,3 Introduction to Swahili Literature Overview of Swahili oral verbal arts, classical literature, modern writing. In Swahili. Need not be taken in sequence. Prerequisite: 122-3 or equivalent.

Asian Language Courses

AAL 111-1,2,3 Elementary Chinese Speaking, aural comprehension, reading, writing of basic vernacular Chinese. Both standard and simplified characters involving about 1,500 compounds. Accelerated section available for students with some oral proficiency but no literacy.

AAL 112-1,2,3 Intermediate Chinese Conversation, aural comprehension, writing based on reading Chinese stories, poems, stories of ballets, historical and cultural texts. Accelerated section available for students with some oral proficiency but no literacy. Prerequisite: 111-3 or equivalent.

AAL 115-1,2,3 Japanese I Conversation, grammar, reading, writing for beginners. Issues of United States-Japan

cross-cultural communication. Five class meetings a week plus language laboratory.

AAL 116-1,2,3 Japanese II A comprehensive approach to conversation, grammar, reading, writing. Four class meetings a week. Prerequisite: 115-3 or equivalent.

AAL 125-1,2,3 Korean I Three-course introduction to basic literacy and oral proficiency. Accelerated section available for students with some oral proficiency but no literacy.

AAL 126-1,2,3 Korean II Development of literacy and interactive proficiency skills. Prerequisite: 125-3 or equivalent. Accelerated section available for students with some oral proficiency but no literacy.

AAL 128-1,2,3 Hindi I Three-course introduction to basic literacy and oral proficiency. Accelerated section available for students with some oral proficiency but no literacy.

AAL 129-1,2,3 Hindi II Three-course sequence developing literacy and interactive oral proficiency skills. Prerequisite: 128-3 or equivalent. Accelerated section available for students with some oral proficiency but no literacy.

AAL 213-1,2,3 Advanced Chinese Readings from the works of contemporary Chinese writers. Discussion and writing based on the reading materials. Prerequisite: 112-3 or equivalent.

AAL 217-1,2,3 Intermediate Japanese Advanced readings in modern colloquial Japanese; prose essay, literary, and newspaper styles. Prerequisite: 116-3 or equivalent.

AAL 318-1,2,3,4 Advanced Japanese 1. Advanced reading skills: comprehension, vocabulary acquisition, speed. Oral and written translation. 2. Newspaper reading and developing oral/aural skills. 3. Advanced writing skills, further reading, and oral/aural skill development. 4. Concentration on literary accomplishments and cultural contributions of major modern Japanese writers. Prerequisite: 217-3 or equivalent.

AAL 319-1,2,3 Chinese IV Advanced reading and writing skills and Chinese literature in the language. Prerequisite: 213-3 or equivalent.

Hebrew Courses

AAL 101-1,2,3 Elementary Hebrew Understanding, speaking, reading, writing of mainly conversational Hebrew. Hebrew used as language of instruction. Drill in language laboratory.

AAL 102-1,2,3 Intermediate Hebrew From language to literature: review of grammar; reading and discussing Hebrew literary works (prose and poetry) and newspaper articles. Compositions and oral presentations. Prerequisite: 101-3 or equivalent.

AAL 203-1,2,3 Advanced Hebrew Reading Hebrew literature, some Biblical but mostly modern prose. Compositions and oral presentations. Prerequisite: 102-3 or equivalent.

AAL 355-1,2,3 Hebrew IV Readings in Hebrew literature in the language. Prerequisite: 203-3 or equivalent.

All PAAL Languages

AAL 399-0 Independent Study For undergraduate students of any of the above languages who have advanced beyond the regular course offerings.

African Studies Program

In 1948 the distinguished scholar Melville J. Herskovits organized the Program of African Studies at Northwestern; more than a half-century later the program remains a model at the forefront of Africanist study and research. Through sponsorship of multidisciplinary courses with African content, language training, and promotion of Africa-based study, the program 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. Every year 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.

Minor in African Studies

The minor in African studies approaches the study of African societies, cultures, histories, and arts across the disciplines — in the humanities, social sciences, and the professions. Students earning a bachelor's degree in Weinberg College or another undergraduate school may complete a minor in African studies by merging a core of courses with African content with their major program of study. 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 course requirements (6 units)

- 6 courses with African content from at least two departments. At least 2 of the 6 courses must be from the 3-quarter sequence of HISTORY 255-1,2,3. Students are encouraged to develop full-length research papers on African topics, supervised by faculty with African interests. They may write these papers as part of regularly offered classes, independent study courses, or senior honors programs.
- Demonstrated competence in any African language or a European language other than English that is used in Africa (French or Portuguese) by completing the second year of language study or being certified by the appropriate language department. Professional school students

whose curricula preclude meeting this requirement as well as students with proficiency in another Weinberg College language may petition the program to count additional courses with African content toward the minor in lieu of fulfilling the language requirement.

- Minimum of an overall B average in these courses. Courses taken for P/N are not counted toward the minor.

Students applying for the minor in African studies, conferred at the end of each spring quarter, must present records showing a minimum of 5 courses not double-counted in their major. Program staff encourage students to meet with them to initiate and monitor progress toward meeting the requirements.

Courses

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

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 in topic.

American Studies Program

The American Studies Program is an integrated interdisciplinary major involving faculty members of several departments. By drawing on a broad range of knowledge from the humanities and social sciences, the program examines the components of American culture and ways of integrating them. Students are allowed a wide-ranging yet disciplined exploration of problems that cross the boundaries of traditional academic fields. Freshmen and sophomores apply for admission to the major in the spring quarter. Because this selective program has more applicants than available space, admission depends in part on academic distinction and on demonstrated interest in American cultural studies.

Major in American Studies

Program courses: All sophomore and junior majors must complete 301-1,2,3. Seniors must complete 390-1,2,3.

Related courses: 10 quarters at the 200 or 300 level from the general curriculum in American studies from throughout the University. These courses will be apportioned in a way that satisfies the interdisciplinary purpose of a major in American studies and expresses each student's explicit intellectual goals, but every major is required to take HISTORY 210-1,2 or an approved equivalent as early as possible in his or her academic career.

Courses Primarily for Freshmen and Sophomores

AMER ST 210-0 Topics in American Culture Topics of interest to the American cultural analyst and historian: for example, early American symbols of heroism, the meaning of the frontier. Aimed at large general undergraduate enrollment. May be repeated for credit with consent of program director.

Courses Primarily for Juniors and Seniors

AMER ST 301-1,2,3 Seminar for Majors Yearlong sequences sharing a broad theme, integrating methods and materials from different disciplines. Change of instructor each quarter; change of theme every year. Limited to 20 students — majors only.

AMER ST 310-0 Studies in American Culture Readings and discussions of topics in American cultural life: for example, law in 19th-century America; manners and morals in antebellum society. Limited enrollment with emphasis on student participation. Prerequisites vary (check with program director or in program office). May be repeated for credit with consent of program director.

AMER ST 390-1,2,3 Senior Project Thesis or field study. Required for honors.

AMER ST 399-0 Independent Study Readings and conferences on special subjects for students pursuing their area of interest within the major.

Anthropology

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 specific 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 its 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 who plan 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; 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. Two field schools, in archaeology and in cultural anthropology, provide practical proving grounds for classroom theorizing. All majors receive training and supervision in field research from faculty.

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. Five 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 thesis. This requirement provides students with an opportunity to conduct original research and, in the process, gain valuable analytical, critical thinking, and writing skills.

Departmental courses

- 211, 213, 214, and 215. Students with previous background in anthropology may petition to substitute a 300-level course for a 200-level requirement.
- 370
- 5 additional 300-level courses selected in consultation with an adviser. Normally, these courses are chosen from one of the three subfields listed below, but students may, with the consent of their adviser, develop a focus that bridges the subfields of anthropology (e.g., culture and technology, health and human development, the institutionalization of power).
 - Archaeology 322 and 4 courses chosen from 301, 302, 303, 311, 321 (offered in summer), 325, 328, 339, 362, 381, 382, 384, 390, 391, 396 (offered in summer)
 - Biological anthropology courses chosen from 306, 310, 312, 313, 314, 315, 317, 362, 383, 390
 - Cultural/linguistic anthropology 389 and 4 courses chosen from 310, 311, 320, 330, 332, 339, 341, 347, 350, 354, 355, 360, 361, 362, 363, 364, 372, 373, 374, 376, 377, 383, 390, 395
 - Human biology See Human Biology Concentration for requirements.
- 398 (senior year)

Related courses: Subject to the approval of the department adviser, 4 courses from other departments and programs. One of these courses must be in formal or statistical methods, and at least 2 of these courses 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 social sciences. Course work 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 the core premedical requirements (see related courses below). Junior- and senior-year course work 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 thesis.

Departmental courses

- 211, 213, 214, 215
- 370, 386
- 4 courses chosen from 306, 310, 312, 313, 314, 315, 317, 362, 383, 390
- 398 (senior year)

Related courses

Foundational courses (premedical requirements)

- BIOL SCI 110-1,2,3 or 210-1,2,3
- CHEM 101, 102, and 103; or 171 and 172
- CHEM 210-1,2 or 212-1,2
- MATH 214-1,2, STAT 202, or equivalent
- PHYSICS 130-1,2,3 or 135-1,2,3

Advanced courses Subject to the approval of the departmental adviser, 3 additional related courses at the 300 level from other departments. See the departmental adviser for 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 one of the subfields of anthropology (i.e., 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 two of the four 200-level courses required of majors in anthropology, one in the area of ethnography (211 or 215) and one in the area of origins (213 or 214), with five 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 course requirements (7 units)

- 211 or 215
- 213 or 214
- A coherent combination of 5 300-level courses in anthropology 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 can be designed to meet a student's particular needs or interests.

Note: Students who are following the department's previous curriculum should consult with the director of undergraduate studies.

Honors in Anthropology

Students wishing to be considered for departmental honors should make inquiries no later than spring quarter of the junior year. In order to be eligible for honors, students must have a grade point average of 3.5 or above in anthropology courses. Enrollment is required in one quarter of 399 Independent Study or an appropriate graduate-level course in addition to 398 (required for all majors). 399 should be taken before enrolling in 398. Students who meet these requirements and prepare an outstanding senior thesis will be nominated for honors in anthropology to the College Committee on Superior Students and Honors, which has final authority to grant the honors degree. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

Courses Primarily for Freshmen and Sophomores

ANTHRO 105-0 Fundamentals of Anthropology

Introduction to anthropology; the biological evolution of humankind; the evolution of culture; the comparative study of existing or historically recorded societies.

ANTHRO 112-0 New Directions in Archaeology New frontiers in archaeological perspectives of historical events, public policy, historic preservation, and prehistoric interpretation.

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

ANTHRO 214-0 Culture Origins 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 220-0 Evolution of Moral Systems Critical examination of evolutionary theories of the origin and development of the human propensity to make moral judgments. Prerequisite: 105.

ANTHRO 225-0 Evolution of Human Society Theories of the long-term evolution of human social organizations; comparative analysis of different scales of organization; population, environment, technology, subsistence, political economy, social stratification.

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.

Courses Primarily for Juniors and Seniors

For 300-level courses in anthropology, the prerequisite is sophomore standing or one 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 301-0 Hunter-Gatherer Archaeology Evolution and cultural history during the Pleistocene epoch. Interrelationship of biology, environment, and culture from earliest hominids through appearance of *Homo sapiens*. Prerequisite: 214 or equivalent.

ANTHRO 302-0 Agriculture: Its Origins, Environmental Impacts, and Social Transformations Beginnings of agriculture, one of the great revolutions in human history. Domestication of plants and animals, dispersal of domesticates, long-term intensification of agriculture, environmental consequences of agriculture, and related social and cultural transformations. Archaeological evidence from Mesopotamia, Europe, Mesoamerica, and North America. Prerequisites: 214, 225, BIOL SCI 204, or ENVRSCI 235.

ANTHRO 303-0 Origins of Civilization Comparative survey of prehistoric civilizations and systematic examination of the formative factors in their evolution. Prerequisite: 214 or equivalent.

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 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 The 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 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 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 325-0 Archaeological Methods Laboratory

Analysis of archaeological methods (faunal, botanical, artifact, or soil analysis) with various techniques. May be repeated for credit.

ANTHRO 328-0 The Maya The archaeology of the Maya in Latin America; life and society in pre-Columbian Maya civilization; history of Maya resistance to colonial and post-colonial domination (e.g., Zapatistas). Prerequisite: 100- or 200-level anthropology, history, or sociology course.

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

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 and 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 and 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 363-0 Language Variation and Change

Introduction to the study of language in its social context, with focus on quantitative sociolinguistics and the frameworks and methods of analysis developed by sociolinguists at work in this area. Prerequisite: consent of instructor.

ANTHRO 364-0 Pidgins, Creoles, and Language in

Contact Introduction to the study of Pidgin and Creole languages such as Tok Pisin, Bislama, Hawaiian Creole English, Guyanese Creole English, and Haitian Creole. Prerequisite: consent of instructor.

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 post-colonial 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. An archaeology course with heavy emphasis on theoretical perspectives from sociology and cultural anthropology. Prerequisite: 100- or 200-level anthropology, history, or sociology course.

ANTHRO 383-0 Ecological Anthropology Theory of interactions between organisms and their environments, with application to human populations.

ANTHRO 384-0 Introduction to Zooarchaeology Introduction to the study of animal bones from archaeological sites. Identification, sampling, quantification, hunting economies, domestication, and herding systems in complex societies. Prerequisites: 214; 301 or 302; or consent of instructor.

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 field work experience. Prerequisite: 321.

GEN LA 393-0 Chicago Field Studies Internship
See General Studies.

ANTHRO 395-0 Field Study in Anthropology Ethnographic field experience in the United States (e.g., the Southwest) 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 Senior Seminar Supervised group discussion of research in preparation of senior thesis. Required of all majors. Prerequisite: 388.

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

Related Courses in the School of Music

MUSICOL 323, 326-1,2

Summer Field Schools

For additional information, contact the Department of Anthropology.

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

Ethnographic Field School in Cultural and Linguistic Anthropology: 395

Art History

Art history is committed to exploring the historical meaning of art, architecture, and design. It addresses artworks from all places and times and attends to their form, technique, iconography, and historical function. Art history may also be concerned with philosophical aesthetics, artists' lives, art institutions, traditions, and audiences.

Art history offers opportunities to explore and understand the richness and diversity of visual arts from the past and present. It enables students to develop acute visual sensibilities and finely honed skills of critical looking, thinking, speaking, and writing. Art history thus offers students a solid basis for a lifelong appreciation and understanding of art as well as a foundation for further research in other academic and professional disciplines, including history, literature, philosophy, music, politics, and law.

Undergraduate degrees in art history may be antecedent to careers in the arts, education, or business. Art historians with a BA degree may teach in elementary, junior, and high schools. They may find jobs in libraries, art galleries, and auction houses or in journalism, book publishing, public relations, marketing, or advertising. They may elect to pursue professional degrees in architecture, art conservation, law, and medicine or attain MA or PhD degrees in art history itself or other fields of humanistic study.

Careers in museums generally require at least an MA degree. College and university teaching and research careers require the PhD. For additional information about careers in art history, contact the department undergraduate adviser at 847/491-3230 or e-mail art-history@northwestern.edu.

The art history curriculum is developmental and critical. Students are expected to acquire a broad knowledge of world artistic traditions and expertise about particular areas, forms, and practices. They begin in a large class and quickly proceed into smaller classes, seminars, and tutorials. During their first and second years, art history majors are highly dependent upon ideas and information contained in secondary sources; as juniors and seniors, they begin to conduct primary research and acquire the skills to think, criticize, and research on their own.

100-level freshman seminars treat a wide variety of art historical topics from the ancient to modern periods and from Africa to North America. The specific courses vary from year to year and are intended to introduce students to the discipline of art history and help them develop or improve their basic writing and research skills. These courses are not required for art history majors.

200-level courses offer broad introductions to African, ancient, pre-Columbian, American, Latin American, Asian, and European art and the history of architecture. They expose students to the richness and variety of visual art throughout history and across the globe. 200-level courses are taught in rotation, usually with at least three of the eight subject areas offered annually. The courses consist of two or three lectures and a single discussion class each week and provide students with the factual and methodological foundation for more advanced courses. Any student wishing to enroll in a 300-level class must have completed at least one course at the 200 level.

300-level courses are the backbone of the curriculum. They provide detailed explorations of important fields and issues in art history, including Gothic art and architecture, the Renaissance, Impressionism, and African American art. Students may choose from a large number of 300-level courses, and class enrollments are limited in order to facilitate discussion. In these classes students discover the special expertise of their professor and are introduced to advanced research in art history.

Undergraduate seminars (390) are available to art history majors only, except with special consent of the faculty. Seminars are limited to 10 students and meet once a week for instruction, discussion, and debate. In these classes majors hone their seeing, speaking, and writing skills and have the opportunity to work both cooperatively and individually. Seminar topics generally reflect the advanced research interests of the professor. Field trips to museums, private collections, and architectural monuments are often integrated into the class. Majors are required to take at least one seminar prior to graduation and may take as many as three.

Independent study (399) outside the academic curriculum can be arranged in exceptional circumstances. In these cases students must get the consent of their academic adviser prior to the term in which they intend to pursue their independent research.

Internships (396) at museums, galleries, or other suitable institutions can often be arranged. Students wishing to take an internship are strongly encouraged first to consult with the undergraduate adviser.

Scholarly resources at Northwestern include the University art collection, housed at the Mary and Leigh Block Museum of Art, and the fine arts collection in Deering Library, both on the Evanston campus. The slide collection in the art history department includes approximately 275,000 slides. Resources in the area include the Art Institute of Chicago, the Terra Museum of American Art, the Chicago Historical Society, the Field Museum, the Museum of Contemporary Art, the David and Alfred Smart Museum and the Oriental Institute at the University of Chicago, the Evanston Art Center, and other institutions. Research libraries that students may use with permission include the Ryerson Library at the Art Institute, the Newberry Library in Chicago, and the Regenstein Library at the University of Chicago.

The undergraduate adviser is the key liaison between students and the rest of the faculty, college, and University. Students are encouraged to consult early and often with the adviser, especially prior to each period of registration.

Major in Art History

Departmental courses

- At least 3 200-level courses
- 9 courses at the 300 level, with at least 1 each in ancient-medieval; Renaissance-Baroque; modern; and non-Western. The remaining courses are to be distributed at the student's discretion in consultation with the undergraduate adviser but must include at least 1 undergraduate seminar (390).
- 1 art theory and practice course

Related courses: At least 4 additional courses from one or more of the following departments or programs with the consent of the undergraduate adviser: anthropology, art theory and practice, classics, comparative literary studies, English, French and Italian, gender studies, German, history, music history, philosophy, radio/television/film, religion, Slavic languages and literatures, and Spanish and Portuguese.

Minor in Art History

Minor course requirements (8 units): No more than 2 of the 8 required courses may at the 200 level. Of the remaining courses, at least 2 must be in a non-European area.

Honors in Art History

Students may be nominated for honors in art history only if they have successfully completed a senior thesis demonstrating substantial research and high quality. Students who wish to write a thesis in art history must meet the following prerequisites:

- Achievement of a distinguished record in the major by

maintaining a grade point average of 3.5 or better in departmental and related courses.

- Successful completion of two preparation courses with a thesis adviser: either two independent study courses (399, taken in the fall and winter quarters of senior year) or one senior seminar on a topic relevant to the senior thesis (390, taken in junior or senior year) and one independent study course (taken in the winter quarter of senior year).

Completed senior theses are submitted by the end of April prior to graduation and evaluated by a departmental honors committee. For further information, please contact the undergraduate adviser. See also Honors and Prizes in the Undergraduate Education section of this catalog.

Courses Primarily for Freshmen and Sophomores

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 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 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 like 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 The theory and history of architecture in relation to cities and landscape.

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 Art of India, China, and Japan; major themes include development of Buddhist art in India and its transformation in East Asia, cult of the dead and early bronze culture of China, ink painting in China and Japan, and entertainment culture and printmaking in 18th-century Edo Japan.

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.

Courses Primarily for Juniors and Seniors

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.

ART HIST 320-1,2 Medieval Art Art and architecture in Europe during the Middle Ages. **1.** Late Antique and Byzantine. **2.** Carolingian and Romanesque.

ART HIST 330-1,2,3 Renaissance Art Painting, sculpture, and allied 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.** France, Germany, and the Netherlands from the 14th through the 16th centuries.

ART HIST 340-1,2 Baroque Art Painting, sculpture, and allied arts in Europe from the late 16th through the 17th centuries. **1.** Art and science in early modern Europe. **2.** Art in the age of Rembrandt. Prerequisite: 250 or consent of instructor.

ART HIST 350-1,2 19th-Century Art Survey of European painting and sculpture. **1.** The late 18th century to 1848. **2.** 1848–1900.

ART HIST 360-1,2 20th-Century European Art The artist and the environment: survey of European painting, sculpture, architecture, and design from the 1890s to the 1960s. **1.** Symbolism to constructivism. **2.** Berlin dada to the situationist international.

ART HIST 365-1,2 American Art Survey of the arts and other visual phenomena in the United States, encompassing architecture, painting, sculpture, photography, prints, film, and popular culture. **1.** Colonial times to 1900. **2.** The 20th century.

ART HIST 366-0 Postmodern Art Survey of art in the United States since 1945 seen from a global perspective. Prerequisites: 360-1 or -2; 365-1 or -2; or consent of instructor.

ART HIST 370-1,2 Modern Architecture **1.** The 19th century. **2.** The 20th and 21st centuries.

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 and the intersection of Western and non-Western urban patterns.

ART HIST 382-1,2 Chinese Painting Survey of Chinese painting, 7th–17th centuries. **1.** Visual culture of the Tang and Song dynasties. **2.** Yuan and Ming dynasties.

ART HIST 384-0 African American Art Art of the African-descended cultures of North and South America and the Caribbean.

ART HIST 386-0 Art of Africa Thematic and historical survey of the arts and architecture of Africa from the ancient period (Nubian Egypt) to the present.

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.

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, the art of three cultures.

ART HIST 339-0 Special Topics in Renaissance Art Content varies: for example, the art of Bosch and Brueghel; the history of collecting; the encounter of Old and New World cultures.

ART HIST 349-0 Special Topics in Baroque Art Content varies: for example, French art of the 16th and 17th centuries; prints, maps, and books of the Dutch republic.

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; French painting in the south of France.

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.

ART HIST 368-0 Special Topics in Modern Art and Performance Study of the interrelated histories of visual and performance arts in the 20th century. Content varies: for example, American painting and dance; postmodern art and performance from the Judson Church to Pina Bausch.

ART HIST 369-0 Special Topics in 20th-Century Art Content varies: for example, videospectres in the West (1995–2001); Latin American art and the Cold War; Paul Klee and the social history of modern art in the Europe of his time: Blue Rider, Bauhaus, Surrealism; totalitarian art.

ART HIST 379-0 Special Topics in Modern 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.

ART HIST 389-0 Special Topics in Non-Euro-American Art Content varies: for example, the art of Central Africa; aspects of painting in the Indian subcontinent: Mughal and Rajput; issues in seeing and displaying African art; issues of gender and sexuality in Japan and China from the 18th through the 20th century.

Courses Primarily for Majors

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

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.

ART HIST 396-0 Internship in the Arts Direct participation in the regular activities of an established arts organization in Evanston and elsewhere in the Chicago area, under the supervision of a faculty member. By petition, on a limited basis; may be taken only once.

ART HIST 399-0 Independent Study Special projects in art history involving reading and conferences with a supervising professor. Required for students writing a senior thesis in art history.

Art Theory and Practice

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. The major comprises a total of 19 departmental and related courses.

Departmental courses

Introductory courses (3) courses chosen from 120, 124, 125; 140 or 150

Intermediate and advanced courses (8) 300-level courses including 380; 4 other studio courses at any level

Art history and criticism courses (3) 270 or 272; 2 other courses chosen from 372 or ART HIST 220, 230, 240, or 250

Related courses (5) 5 courses chosen from 200- and 300-level courses in one or more of the following departments with the approval of the adviser: African American studies, anthropology, art history, classics, comparative literary studies, English, French and Italian, gender studies, German, history, music, philosophy, Slavic languages and literatures, and Spanish and Portuguese.

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 (SESP) and complete all requirements as outlined in the SESP section of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Minor in Art and Technology

Art theory and practice majors may complete a minor in art and technology. For details see the Other Undergraduate Programs section of this catalog.

Honors in Art Theory and Practice

Outstanding students may qualify for departmental honors in their senior year by enrolling in two consecutive or interrelated 399 courses in which they complete an approved studio project and related essay under the supervision of department faculty. See Honors under Academic Policies earlier in this section of the catalog.

Courses Primarily for Undergraduates

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

ART 124-0 Basic Design Introduction to principles of visual composition, including color theory; fundamentals of line, shape, texture, and value; pictorial illusion and/or symbolic and narrative form. No previous studio experience necessary.

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

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

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

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

ART 224-0 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 225-0 Intermediate Drawing Continued development of drawing skills, perceptual abilities, content, and creative thought. Prerequisite: 120 or 125.

ART 231-0 Relief Printmaking The design and production

of prints from wood, linoleum, and plastic surfaces; also collograph and monoprint techniques. Prerequisite: 120, 124, or 125.

ART 232-0 Intaglio Printmaking Etching, engraving, aquatint, mezzotint, and drypoint. Prerequisite: 120, 124, or 125.

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 Advanced lab work and the photographic techniques of archival processing and studio lighting. Prerequisite: 150.

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

ART 270-0 Introduction to the Understanding of Art Overview of the traditions and stylistic evolution of Western visual arts in the 20th and 21st centuries.

ART 272-0 Introduction to the Understanding of Contemporary Art Overview of issues in contemporary art; visual analysis and critical methods.

ART 310-0 Digital Art Exploration and production of digital art including Web-based works and/or computer-based interactive works. Prerequisites: 1 100-level and 1 200-level course in the department.

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

ART 325-0 Advanced Drawing Problems in form, technique, and content in drawing for the advanced student. Prerequisite: 225.

ART 333-0 Lithography Design and production of prints in lithographic processes. Prerequisite: 120, 124, or 125.

ART 340-0 Installation Art Exploration of installation art in all 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 350-0 Advanced Photography Projects A forum for the creation and discussion of photo-based work for the advanced student. Prerequisites: 150 and 1 200-level course in the department, or consent of the instructor.

ART 360-0 Video Art Methods of the studio-based production of video art, including shooting, editing, and presentation. Prerequisites: 1 100-level and 1 200-level course in the department.

ART 372-0 Contemporary Art Criticism An examination of the themes and multiple contexts of contemporary art, with emphasis on the role of art criticism. Prerequisite: junior or senior standing.

ART 380-0 Capstone Course for Majors 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: junior or senior status in the major or consent of the instructor.

ART 390-0 Special Topics in Art Variable content focusing on a topic or theme of special interest in contemporary art. Prerequisites: vary with the topic.

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

Asian American Studies Program

Asian American studies is a vital component of a liberal arts education, serving to broaden awareness and appreciation of the world, deepen understanding of the multiracial history and character of the United States, and place the American experience within a larger global context. By regarding Asian American experience as fundamental to American society and also linked to the experiences of other racial minorities and migrants in the United States and elsewhere, the program seeks to offer students perspectives that promote responsible participation in a rapidly changing world.

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 gives students the opportunity to pursue a coherent study of Asian American experience. It also lays the foundation for the interdisciplinary study of race, ethnicity, and migration.

Minor course requirements (7 units)

- 5 courses in Asian American studies chosen from the program's approved list, including ENGLISH 275 or HISTORY 214. Courses with significant coverage of Asian American issues may be approved at the discretion of the director. No more than 2 courses may be approved by petition.
- 1 course in Asian and Middle East studies
- 1 course in a discipline other than Asian American studies that focuses on race and ethnicity. The course should provide conceptual and comparative breadth concerning a topic related to Asian American studies.
- Grades of C- or higher in the above courses.

Courses

ASIANAM 201-0 Topics in Asian American Studies

Varying topics in Asian American religion, literature, politics, and culture. May be repeated for credit with different topic.

ASIANAM 380-0 Topics in Asian American 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.

ASIANAM 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 and Middle East Studies Program

The Asian and Middle East Studies Program accommodates the diverse levels of preparation and interest of students attracted to the study of Asia and the Middle East and Asian and Middle Eastern peoples. Most 100- and 200-level courses as well as many 300-level courses are designed for students with no background in Asian and Middle East studies. Students may take such courses for elective credit or to meet specific requirements of their programs of study.

Adjunct Major in Asian and Middle East Studies

The adjunct major in Asian and Middle East studies is taken in conjunction with another major. It requires completion of 11 quarter-courses, most offered in discipline-based departments (there is no Asian and Middle East studies department). Students must choose a concentration and complete 5 courses in that concentration. In most cases, the concentration will focus on one of the four culturally differentiated areas into which Asia and the Middle East are conventionally divided: East Asia, Southeast Asia, South Asia, or West Asia/Middle East. A list of approved courses for the adjunct major is available on the Asian and Middle East studies Web site.

Major in Asian and Middle East Language and Civilization

This major consists of 17 quarter-courses chosen in consultation with the Asian and Middle East studies director from the list of approved courses. The student and adviser will identify an appropriate geographic or other focus and typically select at least three courses from each of three disciplinary categories: social sciences, history, and humanities. Students will also complete six quarter-courses of language study in Arabic, Chinese, Hebrew, Hindi, Japanese, or Korean. (Native-speaker proficiency does not count for course credit).

Students should see the program director for further information about requirements for the Asian and Middle East studies major.

Minor in Asian and Middle East Studies

Students qualify for a minor in Asian and Middle East studies by satisfactorily completing eight quarter-courses chosen in consultation with the director from an approved list of Asian- and Middle East-related courses. At least two quarter-courses must be taken in each of three broad disciplinary categories: social sciences, history, and humanities; six such courses will suffice for students who also satisfactorily complete two years of language study in Arabic, Chinese, Hebrew, Hindi, Japanese, or Korean. (Native-speaker proficiency does not count for course credit.)

Within the framework of the above requirements, students will normally be expected to organize their programs with emphasis, but not exclusive focus, on one of the main regions or countries of Asia and the Middle East. Students are encouraged to complete at least one quarter of research in their area of interest in the form of an independent study. The Asian and Middle East studies adviser will help students plan a program to meet their individual needs and interests.

All students applying for minors in Weinberg College must present records that show a minimum of five courses not double-counted in their majors. Graduating seniors who have completed the requirements for a minor should request the application form from the program director.

Astronomy

See Physics and Astronomy.

Biochemistry, Molecular Biology, and Cell Biology

The Department of Biochemistry, Molecular Biology, and Cell Biology does not offer an undergraduate degree. See the following section for a description of the major in biological sciences.

Biological Sciences Undergraduate Program

The science of biology is the study of living organisms at all levels of complexity and in all their diversity. The Undergraduate Program in Biological Sciences (UPBS) draws particularly on two departments: biochemistry, molecular biology, and cell biology (BMBCB) and neurobiology and physiology (NBP). Additional opportunities in life sciences are available for students in other departments: anthropology, biomedical engineering, chemistry, geological sciences, philosophy, psychology, and communication sciences and disorders. The curriculum is intended to maximize students' access to offerings from these departments. The baccalaureate degree offered by Weinberg College through the Undergraduate Program in Biological Sciences is the bachelor of arts with a major in biological sciences. No minor in biological sciences is offered.

The Study of Biological Sciences

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 offering an introduction to fundamental areas of biological science
- areas of concentration that subsequently focus students' interests
- opportunities to participate in research

Major in Biological Sciences

Because biology is grounded in the principles of chemistry, mathematics, and physics, all majors must complete the courses listed under related courses below. During the freshman year, students usually complete 100-level chemistry and most or all of the mathematics requirements. In the sophomore year, students start CHEM 210-1 in the fall quarter concurrent with BIOL SCI 210-1. Physics courses should be completed by the end of the junior year.

Program courses

Core curriculum: To set the stage for study in biological sciences at the advanced level, each major must complete BIOL SCI 210-1,2,3. These three courses taken in sequence address the central topics in contemporary biology with the goal of preparing students for further study in either the biological sciences or professional school. This core sequence includes laboratories that provide students with an appreciation of the discipline as an experimental science.

Areas of concentration: 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 200-level core. To provide a variety of coherent pathways, seven areas of concentration have been designed. In addition to the four courses specifically required for each concentration, each student is required to take 315 plus three 300-level life science elective courses. The concentration will be noted on the transcript; only one concentration can be noted. Following are the seven concentrations and their respective requirements.

Biochemistry 309, 321, 361, 354

Developmental biology 304, 309, 391, 392

Evolutionary biology 301, 341 344, GEOL SCI 317

Genetics and molecular biology 309, 390, 395, 353

Human biology 301, 327, 359, ANTHRO 306

Neurobiology 301, 302, 306, 305

Physiology 301, 325, 356, 358

Related courses

Required foundational courses

- CHEM 101, 102, and 103 or 171 and 172
- CHEM 210-1,2 or 212-1,2
- MATH 214-1,2 and either 214-3 or a statistics course
- PHYSICS 130-1,2,3 or 135-1,2,3

Advising

Sophomores with declared biological sciences majors are assigned specific faculty advisers. Juniors and seniors involved in independent research also have research supervisors.

Independent Research: Honors Program

UPBS offers students the opportunity to work on a research project in a faculty member's laboratory. This is recommended for all students who may wish to consider a career

involving research. Students who have completed at least five quarters of course work and have attained a grade point average of 3.0 or higher in science and mathematics are eligible to apply for independent research with a faculty supervisor. A list of participating faculty is available on the UPBS Web page, www.biosci.northwestern.edu. Students meet with the faculty members whose research interests align with their own to explore the possibility of doing research in their laboratories. Together, they design a plan of study to be undertaken in a particular laboratory for at least nine months. The student's first two quarters of independent research must be taken as 398 and graded P/N. Thereafter, the student may register for graded 399, for which UPBS requires a quarterly signed form from the research supervisor.

Students engaged in independent research are encouraged to also submit an honors thesis abstract early in their senior year. Students complete laboratory work, data analysis, and writing of the thesis according to an established timetable. Upon satisfactory completion of the thesis, a student may receive program honors on the recommendation of a faculty committee and thus become eligible to compete for one of three awards given yearly for superior research. Completion of the thesis during the spring quarter enables students to treat 399 as a 300-level elective to be counted toward the major. In general, a research project leading to honors may not be pursued outside the 398/399 framework. For additional information, see Honors under Academic Policies earlier in the catalog.

Biological Sciences Second Major for ISP Students

The Integrated Science Program (ISP) 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 laboratory course appropriate for the chosen concentration
- 2 additional courses, as specified below for the indicated concentration:
 - Biochemistry 321, 361
 - Developmental biology 304, 391
 - Evolutionary biology 341, GEOL SCI 317
 - Genetics and molecular biology 390, 395
 - Neurobiology 304, 306
 - Physiology 325, 356
 - Human biology 327 and ANTHRO 306

Honors Program in Medical Education

300-level biological sciences course requirements for students also in the HPME program consist of BIOL SCI 315, the three nonlaboratory core courses appropriate for

the chosen concentration (the lab course constitutes an HPME waiver), plus three 300-level electives. If a second HPME waiver is applied to this major, it must be applied to a 300-level elective.

Premedical, Predental, and Preveterinary Students Majoring in Other Departments

Biological sciences requirements for most U.S. schools offering degrees in medicine, dentistry, and veterinary medicine are satisfied by either 110-1,2,3 or 210-1,2,3.

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 (SESP) and complete all requirements as outlined in the SESP section 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 Undergraduates

BIOL SCI 101-0 Biology in the Information Age

Fundamentals of the scientific process, using current events as illustrations. Choice of term project or tutorial. May not be taken for credit while or after taking any part of 110-1,2,3 or 210-1,2,3.

BIOL SCI 102-0 Human Abilities How technology, biology, and psychology interface to determine neuropsychological performance.

BIOL SCI 103-0 Diversity of Life Comparative survey of organisms, emphasizing adaptation and phylogenetic relationships. May not be taken for credit while or after taking any part of 110-1,2,3 or 210-1,2,3.

BIOL SCI 110-1 Biology: Genetics and Evolution

Principles of genetics and evolution and their application. Laboratory. May not be taken for credit while or after taking 210-1. CHEM 101 recommended.

BIOL SCI 110-2 Biology: Molecular and Biochemical Biology How genes direct synthesis of proteins; biochemistry. Laboratory. Prerequisite: 110-1. No credit while or after taking 210-2 or 210-3.

BIOL SCI 110-3 Biology: Physiology and Cell Biology How cells and tissues function. Laboratory. Prerequisite: 110-2. No credit while or after taking 210-2 or -3.

BIOL SCI 112-0 Biotechnology and Society

Examination of modern biotechnology and its interaction with human society. May not be taken for credit while or after taking any part of 110-1,2,3 or 210-1,2,3.

BIOL SCI 124-0 Biological Clocks Daily and annual biological rhythms, their mechanisms, and their effects on health, performance, and society. May not be taken for credit while or after taking any part of 110-1,2,3 or 210-1,2,3.

BIOL SCI 160-0 Human Reproduction Basic biology of reproduction; relation between hormones, emotions, intelligence, and behavior; related policy issues. May not be taken for credit while or after taking any part of 110-1,2,3 or 210-1,2,3.

BIOL SCI 164-0 Genetics Principles of inheritance. May not be taken for credit while or after taking any part of 110-1,2,3 or 210-1,2,3.

BIOL SCI 204-0 Environmental Biology Underlying biological principles necessary to make informed decisions about environmental issues. Prerequisites: 110-1, 164, or 210-1; 1 course in statistics.

BIOL SCI 210-1 Genetics and Evolutionary Biology Transmission and demic genetics; evolutionary biology. Laboratory. Prerequisites: MATH 214-1,2; CHEM 103 or 172.

BIOL SCI 210-2 Biochemistry and Molecular Biology Biochemical and molecular biology. Laboratory. Prerequisites: 210-1; CHEM 210-1; concurrent registration in CHEM 210-2.

BIOL SCI 210-3 Physiology and Cell Biology Cell biology and physiology. Laboratory. Prerequisite: 210-2.

BIOL SCI 212-1 ISP Biochemistry Synthesis and metabolism of organic molecules; structure and function of proteins. Laboratory. Prerequisite: CHEM 212-1.

BIOL SCI 212-2 Molecular and Cell Biology Cell biology, transcription, translation, regulation of gene expression. Laboratory. Prerequisite: 212-1.

BIOL SCI 301-0 Biochemistry Biochemistry with focus on metabolism, energetics, and control mechanisms. Prerequisites: 210-1,2,3; CHEM 210-2. Credit not allowed for both 301 and 309.

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, PHYSICS 130-2.

BIOL SCI 303-0 Molecular Neurobiology Mechanisms of signal transduction and synaptic plasticity; basic neurochemistry. Prerequisite: 302.

BIOL SCI 304-0 Developmental Neurobiology Cellular aspects of nervous system development; relationship between structure and function. Prerequisites: 210-1,2,3.

BIOL SCI 305-0 Neurobiology Laboratory Hands-on experience in the performance of classical 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 Biochemistry with focus on macromolecular structure and function, relevant gene expression, and photosynthesis. Use of current

literature. Prerequisites: 210-1,2,3, CHEM 210-1,2. Credit not allowed for both 301 and 309.

BIOL SCI 310-0 ISP Quantitative Biochemistry and Molecular Biology Protein interaction with small molecules; protein tertiary structure determination. Prerequisite: 212-1.

BIOL SCI 311-0 ISP Neurobiology Detailed look at membrane properties of single neurons and synaptic transmission. Prerequisites: 212-1,2.

BIOL SCI 314-0 Mind and Brain Neural transmission; how neural dysfunction can translate into cognitive abnormality. Prerequisite: 110-3 or 210-3.

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.

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. Prerequisite: 210-3.

BIOL SCI 320-0 Behavioral Ecology Seminar Evolutionary study of animal behavior, emphasizing theory but using field data to test or illustrate aspects of theory. Prerequisite: 210-1.

BIOL SCI 321-0 Physical Biochemistry Thermodynamic laws, diffusion, chemical equilibria, kinetics, and statistical thermodynamics. Prerequisites: 210-1,2,3; CHEM 103 or 172; MATH 214-2; PHYSICS 130-1 or 135-1.

BIOL SCI 323-0 Bioinformatics Utilization of informational and modeling techniques to explore evolutionary and other problems related to the genome. Prerequisites: 210-1,2,3 and a course in statistics.

BIOL SCI 324-0 Neurobiology of Biological Clocks Daily and circadian biological clocks: research regarding their causation and adaptive significance. Prerequisites: 110-1,2,3 or 210-1,2,3.

BIOL SCI 325-0 Systems Physiology Physiological principles and mechanisms responsible for the ability of animals to regulate variables in the steady state. Prerequisite: 210-3.

BIOL SCI 326-0 Neurobiology of Learning and Memory Molecular and neural bases of memory. Prerequisite: 302.

BIOL SCI 327-0 Biology of Aging Biological aspects of aging, from molecular to evolutionary. Prerequisites: 210-1,2,3.

BIOL SCI 340-0 Biological Aspects of Disease Cellular response to injury; inflammation and immunity; genetic basis of disease; developmental pathology. Prerequisite: 210-3.

BIOL SCI 341-0 Population Genetics Processes that affect allele frequency change and thus cause evolution. Prerequisites: 210-1,2,3.

BIOL SCI 343-0 Phylogenetics Current concepts of evolutionary biology as background for an understanding of systematics and phylogeny reconstruction. Prerequisite: 210-1.

BIOL SCI 344-0 Morphology of Vertebrates Laboratory Vertebrate phylogeny illustrated via comparative morphology; anatomical/functional considerations; dissections. Prerequisite: 210-1,2.

BIOL SCI 345-0 Topics in Evolutionary Biology Topics vary, but always deal with the biology of a major group of organisms. Laboratory. May be repeated for credit with different topic. Prerequisites: 210-1,2.

BIOL SCI 346-0 Field Ecology An intensive experience in field ecological research. Prerequisites: 164, 204, or 210-1; 1 course in statistics.

BIOL SCI 347-0 Conservation Biology Evolution, ecology, and conservation of patterns of biological diversity. Prerequisites: 164, 204, or 210-1; 1 course in statistics.

BIOL SCI 353-0 Molecular Biology Laboratory Project-based approach to learning lab skills in eukaryotic molecular biology. Prerequisites: 210-1,2,3.

BIOL SCI 354-0 Biochemistry Laboratory Advanced biochemical and biophysical experimentation. Prerequisites: 210-1,2,3.

BIOL SCI 355-0 Immunobiology Nature of host resistance; characteristics of antigens, antibodies; basis of immune response; hypersensitivity. Prerequisite: 210-3.

BIOL SCI 356-0 Vertebrate Endocrinology Physiology and biochemistry of hormones and glands of internal secretion in vertebrates; endocrine glands. Prerequisite: 210-3.

BIOL SCI 358-0 Physiology Laboratory Experiments in several physiological systems. Design, techniques, data analysis, and report writing emphasized. Prerequisite: 325.

BIOL SCI 359-0 Environmental Physiology Laboratory Experiments investigating how physiological systems of humans and other organisms respond to environmental variables. Data analysis and report writing emphasized. Prerequisites: 210-1,2,3.

BIOL SCI 360-0 Biophysics of Living Organisms Physical principles involved in functions of living organisms. Prerequisites: 210-3, PHYSICS 130-1,2, MATH 214-1,2.

BIOL SCI 361-0 Protein Structure and Function Structure and function of proteins; X-ray crystallography and NMR. Prerequisites: 301 or 309; PHYSICS 130-1,2,3 or 135-1,2,3.

BIOL SCI 362-0 Molecular Machines Biophysics of macromolecular assemblies, organelles, and cells. Prerequisites: 301 or 309; PHYSICS 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. Prerequisite: 210-3.

BIOL SCI 378 Functional Genomics Patterns of gene expression and their causes. Prerequisites: 210-1,2,3.

BIOL SCI 389-0 Biology of Reproduction Molecular aspects of gametogenesis and fertilization; signal transduction/receptors involved in fertilization. Prerequisites: 210-3 and consent of instructor.

BIOL SCI 390-0 Molecular Biology Nucleic acid structure; DNA mutation, repair, recombination, replication, restriction, and modification; translation. Prerequisite: 210-3.

BIOL SCI 391-0 Developmental Biology Molecular mechanisms underlying early embryonic development, including establishment of the body and organogenesis. Discussion of original literature. Prerequisites: 210-1,2,3.

BIOL SCI 392-0 Developmental Biology Laboratory Experimental approach to development — from gametogenesis to the differentiation of specialized cell types. Prerequisite: 391.

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 Undergraduate Research Seminar Advanced work for superior students. May consist of either supervised reading and discussion or the first two quarters of a research project. Prerequisite: consent of instructor.

BIOL SCI 399-0 Independent Research Supervised individual research open only to juniors and seniors meeting specified requirements. Prerequisites: 2 quarters of 398 relevant to the same project; consent of program director.

Business Institutions Program

The Program in Business Institutions approaches the study of business through a thoughtful investigation of the cultural, political, philosophical, literary, and social consequences of business institutions. Therefore, business institutions is not intended to constitute a narrowly conceived preprofessional training or to function as a business concentration within any single departmental major. This program is instead 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 eight courses: three required core courses and five elective courses. The program director may approve a course offered in a particular year as a substitution for an elective course when the syllabus demonstrates a business institutions emphasis.

Students interested in the minor in business institutions should consult with a program adviser. Information is available in the Weinberg College Office of Studies and the program office, University Hall, room 001. Students applying for the minor in business institutions must present records showing that a minimum of five out of the eight courses required for the minor are not double-counted in their major. Additionally, no more than five of the eight courses may be taken in the same department. Credits for

the minor may include one internship-related credit and up to two professional linkage seminar credits. Grades of P/N are not accepted.

Minor course requirements (8 units)

Core courses

- ECON 201 and 202 (which together count as 1 business institutions core requirement) or ECON 310-1
- ECON 250 or 350 or POLI SCI 375
- SOCIOL 302

Electives: 5 courses chosen from

ANTHRO 341
 BUS INST 239, 390, 392, 394
 ECON 260, 305, 307, 308, 309, 315, 323-1,2, 339, 349, 350, 355, 360
 HISTORY 367, 391
 IMC 303, 304 (Integrated Marketing Communications; see the Medill School of Journalism)
 MATH 301-1,2
 PHIL 260
 POLI SCI 353, 354, 361, 371, 372, 374
 SOCIOL 215, 312, 315, 331, 332, 335

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 390-0 Special Topics in Business Institutions Investigation of topics of current interest to faculty and students — for instance, arts management.

BUS INST 392-0 Business Institutions Program Internship Seminar Allows students to relate scholarship concerning an aspect of corporate culture to experience gained from a previously completed summer internship. Prerequisite: consent of department.

BUS INST 394-0 Professional Linkage Seminar Content varies. Possible topics include management in a cross-cultural environment and contemporary issues in public relations. Up to two professional linkage seminars on different topics may be counted toward the minor.

Chemistry

Chemistry is the study of molecular structure, chemical reactions, and the molecular basis of solids, liquids, and gases. The broad applicability of phenomena and rigorous methodology of chemistry provide a wide range of career options for chemistry majors. 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 is equally important.

The chemistry department offers courses carefully designed to provide a rigorous introduction to chemistry

for science or nonscience students. Additional courses provide several chemistry program options and serve the needs of Northwestern's engineering, biological sciences, and medical programs. The chemistry faculty conducts vigorous, original research that includes undergraduates, graduate students, and visiting scholars from around the world. This environment, i.e., modern instrumentation, seminars, colloquia, and informal contacts, invigorates the educational process and provides exciting opportunities for undergraduates.

The department offers programs to meet the needs of students with diverse career objectives, including professional chemistry, medicine, and teaching.

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 those seeking positions as professional chemists. Only this program qualifies students for certification as a professional chemist by the American Chemical Society.

Departmental courses: 101; 102; 103 or 171; 172; 210-1,2,3 or 212-1,2,3; 215; 329; 333; 335; 342-1,2,3; 345; 361

Related courses: MATH 214-1,2,3 and 215 (the accelerated mathematics courses 290-1,2 or 291-1,2 also satisfy this requirement); PHYSICS 125-1,2,3 or 135-1,2,3

Chemistry Program with Biochemistry Emphasis

This program is designed for students who wish to emphasize the biochemical aspects of chemistry. For example, this program is suitable preparation for medical school or for advanced study in fields that require a strong background in chemistry. Three courses from the regular chemistry program (335; 361; 215 or 345) are replaced by BIOL SCI 210-1,2 and one of the following: CHEM 316, 414; BIOL SCI 301, 354, 390.

Minor in Chemistry

The minor in chemistry allows majors in other fields to complete a significant portion of the course work required for a chemistry major. It permits the flexible selection of course work from the traditional subdisciplines of organic, inorganic, physical, and analytical chemistry.

Minors must obtain consent from the department to register in 212-1,2,3; 215; and 335. Majors have priority for registration in these courses, which may have limited enrollments, and in 399.

Basic courses: 103 or 172 or equivalent (300-level chemistry courses have additional chemistry, physics, and mathematics prerequisites)

Minor course requirements (6 units): 6 200- or 300-level chemistry courses (exclusive of 201, 204, and 399)

Sample programs: Life science majors and premedical students are advised to take 210-1,2,3 or 212-1,2,3, 343,

and 2 additional courses. Physical science majors should take 342-1,2,3, 345, and 2 additional courses. Students with interests in materials science, geological science, environmental science, or chemical engineering should take 210-1,2, 335, 343, and 2 additional courses. Other programs for the minor can be designed to suit the needs of individual students.

Four-Year BA/MS

Students who have done outstanding work during their first three years and who have a professional interest in chemistry or biochemistry are eligible to apply for the four-year BA/MS program. Applications should be made during the spring quarter of the junior year. By the end of three years, the applicant should have completed all the 300-level chemistry courses, all or nearly all Weinberg College requirements, and one quarter of independent study. To fulfill the MS requirements, students must take nine graduate courses, including four chemistry courses selected from a list approved by the department and at least units units of independent study. None of these nine courses may be used to fulfill any specific undergraduate Weinberg College or major course requirement. See Four-Year Master's Programs in the Undergraduate Education section of this catalog and consult a department adviser.

Chemistry Second Major for ISP Students

The Integrated Science Program (ISP) 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 the courses listed under one of the following options:

Chemistry option: 212-1,2,3; 215; 329; 333; 335; 345; 361

Biochemistry option: 212-1,2,3; 215 or 345; 329; 333 (ISP 398 may not be substituted for BIOL SCI 301,310)

Program in the teaching of chemistry: 212-1,2; 329; 333; 3 200- or 300-level chemistry electives

Honors in Chemistry

Seniors who have done outstanding work in the classroom and research laboratory are eligible for graduation with honors in chemistry. A student who is recommended must have completed the sequence of courses required by the department with a grade point average of 3.3 or above in chemistry and at least two quarters of either 398 or 399, during which the student was engaged in original research. A written report of research activities along with a strong recommendation from the student's research adviser is also necessary. For more information consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section 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

Entering students seeking advanced placement will be advised to register for 171, 210, or 212 according to their score on either the College Board Advanced Placement chemistry examination or the department chemistry placement examination.

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. With laboratory.

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. With laboratory. Prerequisite: 101 (C- or better) or consent of department.

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. With laboratory. A grade of C- or better in 103 required to enroll for any higher-level chemistry course. Prerequisites: 102 (C- or better) or consent of department; MATH 214-1.

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. With laboratory. Prerequisite: placement by the department through department placement exam.

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. With laboratory. Prerequisites: 171 (C- or better); MATH 214-1.

CHEM 201-0 Chemistry of Nature and Culture Chemistry for the nonscientist. Chemicals commonly encountered in everyday life. With laboratory.

CHEM 204-0 Environmental Chemistry The chemistry of the environment. Air, water, and soil; effects of pollution, heating, nuclear emissions, toxicity, and remediation. With laboratory. Primarily for environmental science majors but open to all qualified students. Prerequisites: 101, 102, 103 or 171, 172.

CHEM 210-1,2,3 Organic Chemistry 1. Basic concepts of structure, stereochemistry, and reactivity of organic compounds. The chemistry of hydrocarbons and alcohols. No P/N registration. Prerequisite: 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. With laboratory. No P/N registration. 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. With laboratory. No P/N registration. 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 laboratory 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 215-0 Organic Synthesis Laboratory A laboratory course in modern methods of synthesis, separation, and spectroscopic characterization of organic compounds. Included are organization, access, and use of chemical information. Prerequisite: 210-3 or 212-3 (students may take 212-3 concurrently).

Courses Primarily for Juniors and Seniors

CHEM 314-0 Bioorganic Chemistry Biosynthetic chemistry as basis for survey of major classes of biomolecules, carbohydrates, amino acids, lipids, nucleotides, nucleic acids, and proteins. Current topics in bioorganic chemistry.

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 with Laboratory Principles and applications of analytical methods with emphasis on chromatography and electrochemistry. With laboratory. No P/N registration. Prerequisites: 342-1 or 342-2.

CHEM 333-0 Inorganic Chemistry Descriptive chemistry of some important elements. Current concepts and models of chemical bonding. Prerequisites: two units of 200- or 300-level chemistry.

CHEM 335-0 Inorganic Synthesis Laboratory Laboratory course in modern methods synthesis, separation, and spectroscopic characterization of inorganic compounds. Introduction to current topics in inorganic chemical research. Prerequisites: 212-3 or 210-3, 333 (students may take 333 concurrently).

CHEM 342-1 Thermodynamics Laws of applications of thermodynamics. Thermochemistry, chemical potentials, solution thermodynamics, nonideal gases. Prerequisites: 103 or 172 (C or better); MATH 214-3; PHYSICS 135-1,2 (students may take PHYSICS 135-2 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 214-3 (215 recommended); 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 345-0 Spectroscopy Laboratory Experiments on modern spectroscopic methods and data analysis. Prerequisite: 342-2 (students may take 342-2 concurrently).

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 291-1,2,3; or consent of department.

CHEM 361-0 Advanced Laboratory Advanced laboratory in analytical and physical chemistry. Prerequisites: 329; 342-1,2; 345.

CHEM 380-0 Cooperative Chemistry Education Participation in approved industrial work experience away from the campus. No credit; no tuition. Prerequisite: consent of department.

CHEM 393-0 Green Chemistry Practices of environmentally benign chemistry as they apply 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.

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. Prerequisite: consent of department.

Classics

Classics is the multidisciplinary study of Greek and Roman civilization: 1,500 years of literature, history, and cultural achievement around the Mediterranean. The purpose of the undergraduate programs is to explore the rich

and diverse worlds of ancient Greece and Rome and elucidate the classical foundations of Western culture. The department also offers MA and PhD programs that prepare scholars for careers in teaching and research.

The classics programs at Northwestern are strong in history and literature. Complemented by resources in the Department of Philosophy, the department also is well qualified to offer undergraduate and graduate programs in Greek and Roman philosophy. A major commitment to classical studies is evident in the holdings of University Library, which provides extensive research opportunities to classics undergraduate and graduate students.

The Department of Classics offers a major in classics and minor concentrations in Latin and Greek. Additional information about classics programs and courses is available on the department's Web site at www.classics.northwestern.edu or by request from the department office.

Major in Classics

The major in classics, with concentration in Latin or Greek, provides broad instruction in the thought, literature, history, and languages of classical antiquity. Requirements for the major can be satisfied in 17 or 18 courses — 6 basic courses and 11 or 12 elective courses, the latter including classics courses with readings in the original languages (Latin and/or Greek), courses with readings in English, and, subject to approval, related courses from other departments (philosophy, political science, history, art history, comparative literary studies, gender studies, etc.). No previous knowledge of Latin or Greek is required to complete a classics major. Students may declare a classics major at any time during their freshman year, at the beginning of their sophomore year, or, under special circumstances, at later stages in their undergraduate careers.

Prerequisites for classics majors are the three-quarter sequence LATIN 101-1,2,3 or GREEK 101-1,2,3. Students may take a qualifying examination at any time that, at the discretion of the department, may exempt them from 1, 2, or all 3 courses in the sequence.

Departmental courses

Basic courses LATIN 201-1,2,3 or GREEK 201-1,2,3; CLASSICS 210, 211, 212

Elective courses:

- Students may select one of two options:
Option A: 5 300-level Latin or Greek courses in any combination
Option B: 3 300-level courses in one language and 3 at any level in the other. The latter may include courses from the three-quarter LATIN 101 or GREEK 101 sequences or any 200- or 300-level courses.

Students who have passed a qualifying examination in one language may take a qualifying examination in the second classical language at any time that, at the discretion of the department, may exempt them from the 101-1

and/or 101-2 courses in that language and allow the exemption(s) to count towards credit in their major course.

Subject to instructor approval, students may be allowed to take 300-level courses for credit before having completed the LATIN 201 and/or GREEK 201 course sequences.

- 3 200-level classics courses with readings in English.
(With consent of the department, related 200-level courses from other departments may be used to fulfill this requirement.)
- 3 300-level classics courses with readings in English.
(With consent of the department, related 300-level courses from other departments may be used to fulfill this requirement.)

Many 300-level courses are given in dual mode, with readings in either the original Latin or Greek or in English. Classics majors may select courses in either mode.

Minor Concentrations in Classics

The minor concentrations in either Latin or Greek consist of nine courses: three language courses at or above the 200 level, three 300-level classics courses, and three additional classics courses at any level, including 100-level courses in either language. No previous knowledge of Latin or Greek is required. Students may declare a minor in classics at any time during their freshman or sophomore year or at the beginning of their junior year. Under special circumstances students may also declare a minor in classics at a later stage of their undergraduate careers.

Many 300-level courses are given in dual mode, with readings in either the original Latin or Greek or in English. Classics minors may select courses in either mode.

Latin

Prerequisites: LATIN 101-1,2,3 (Students who pass a qualifying examination may be granted exemption from 1 or more courses in this sequence at the discretion of the department.)

Minor course requirements (9 units)

- 3 courses in Latin at or above the 200 level
- 3 300-level classics courses with readings in either Latin or English
- 3 courses at any level offered by the department with readings in Latin, Greek, or English

Greek

Prerequisites: GREEK 101-1,2,3. (Students who pass a qualifying examination may be granted exemption from 1 or more courses in this sequence at the discretion of the department.)

Minor course requirements (9 units)

- 3 courses in Greek at or above the 200 level
- 3 300-level classics courses with readings in either Greek or English
- 3 courses at any level offered by the department with readings in Latin, Greek, or English

Study Abroad

Qualified majors have the opportunity to attend the Inter-collegiate Center for Classical Studies at Rome or Arcadia University in Athens during their junior or senior year. Students interested in this program or similar opportunities should consult the department chair or an adviser in the Study Abroad Office.

Honors in Classics

Classics majors who have a grade point average of 3.4 in courses for the major and are interested in writing an honors thesis should declare their intention to the director of undergraduate studies no later than the end of their junior year. The thesis is produced during one or two quarters of Independent Study (LATIN or GREEK 399) and may build on previous work in a 300-level course. Credit earned by taking 399 to produce an honors thesis will count toward the major.

The Teaching of Latin

Weinberg College students pursuing a major in classics who also wish to be certified for secondary teaching 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.

Courses in Latin

LATIN 101-1,2,3 Elementary Latin Classical Latin vocabulary, grammar, and syntax with graded readings for translation. Four class meetings a week.

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. (See CLASSICS 390 for a similar course in English-only format.) Prerequisites: 201-1,2,3 or equivalent.

LATIN 399-0 Independent Study For advanced students approved by the department, individual programs under the direction of a department member.

Courses 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 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. (See CLASSICS 390 for a similar course in English-only format.) Prerequisites: 201-1,2,3 or equivalent.

GREEK 399-0 Independent Study For advanced students approved by the department, individual programs under the direction of a department member.

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 Early Western Civilization Comparative study of early Greek and Hebrew cultures against the background of other civilizations of the ancient Near East.

CLASSICS 211-0 Classical Greece History, literature, philosophy, and art in ancient Athens.

CLASSICS 212-0 Roman Civilization 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 240-1 The Literary Achievement of Greece and Rome Homer and Hellenism: the *Iliad*, the *Odyssey* and their early influence.

CLASSICS 244-0 The Ancient Novel Critical approach to the origins of the genre of the novel through works by ancient Greek and Latin authors.

CLASSICS 260-0 Classical Mythology Stories of gods and heroes as reflections of the structure and attitudes of Greek and Roman society and as changing models for human behavior.

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; 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 343-0 Greek Sexual Culture Study of Greek civilization from prehistory to the advent of Christianity, seen from the vantage point of its changing perspectives on sexuality.

CLASSICS 345-0 Greek Tragedy Readings in the plays of Aeschylus, Sophocles, and Euripides; emphasis on social and institutional contexts of Greek theater and its influence on Western drama.

CLASSICS 360-0 The Origins of Greek Democracy

Emergence of the world's first democracies in archaic Greece, 750–460 B.C. 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 390-0 Topics in Greco-Roman Civilization

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. In addition, GREEK 301 and LATIN 310 are offered in English-only format as CLASSICS 390. Contact the instructor for details.

Related Courses in Other Departments

ART HIST 310-2 Ancient Art

COMP LIT 201-1 The Epic in Cross-Cultural Perspective

HISTORY 274 History of Ancient Egypt

PHIL 265 Introduction to the Philosophy of Law

PHIL 320 Studies in Ancient Philosophy

POLI SCI 301 Moral Dilemmas and Political Theory

Cognitive Science Program

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 required 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 junior proseminar focuses on ongoing research in the field by Northwestern faculty. Qualified seniors will be invited to take a senior honors seminar to engage in independent research under the guidance of department faculty and to write a senior thesis.

For additional information about the Program in Cognitive Science, see the program director.

Major in Cognitive Science**Program courses**

Required introductory courses (3): COG SCI 207, 210, 211

Basic methodology requirements (3): COMP SCI 110 or 111; PSYCH 201, 205

Core course requirements (3): course from three of the following five areas:

- Artificial intelligence: COMP SCI 348
- Cognitive neuroscience: PSYCH 212, 361

- Cognitive psychology: PSYCH 228
- Learning sciences: COG SCI 212, 301
- Linguistics: LING 250, 260, 270

Advanced proseminar requirement (1): COG SCI 366 (should be taken in the junior year)

Advanced electives (6): 6 courses, with at least 3 in one area (major emphasis) and at least 2 outside that area

- Anthropology: ANTHRO 360; 389; 390; 395 or 595; 471
- Artificial intelligence: COMP SCI 325, 332, 337, 344, 432, 437-1,2
- Cognitive neuroscience: PSYCH 312-2, 314, 321, 324, 342, 363, 364, 460, 470; CSD 303; BIOL SCI 302, 306, 314, 377 (see the Undergraduate Program in Biological Sciences for prerequisites for these courses)
- Cognitive psychology: PSYCH 313, 314, 333, 334, 335, 360, 362, 460, 461, 466
- Communication sciences and disorders: CSD 303, 306, 309, 350, 392, 406, 492, 495-1
- Learning and instruction: CSD 303, 306, 350, 392, 492; LOC 301 (if not counted as a core course); LRNSCI 401, 402, 429, 451; MUSIC ED 437
- Linguistics: LING 310, 311, 330, 331, 333, 334, 341, 350, 360, 361, 370, 371
- Music cognition: MUS THRY 351; MUSIC ED 437, 438
- Philosophy: PHIL 325, 327, 330, 426

Other 300- and 400-level courses may be counted as advanced electives with consent of the cognitive science adviser. It is strongly recommended that students pursue independent study (399) in cognitive science or in one of the departments listed above. This course may count as an advanced elective. For students pursuing honors, the second quarter of the honors seminar (398-2) may count as an advanced elective.

Note: Cognitive science majors who wish to double major must show a minimum of 11 courses not double-counted in any other major(s). Cognitive science majors seeking a minor in another discipline cannot double-count for that minor any courses used to meet the major requirements in cognitive science.

Minor in Cognitive Science

The minor in cognitive science broadens the academic background of students majoring in related fields. The goal is to provide students with the methods and foundations for understanding cognitive issues in an interdisciplinary framework.

Minor course requirements (8 units)

- Introductory courses: 2 courses chosen from 207, 210, 211
- Basic methodology courses: 2 courses (at least 1 from outside a student's major area) chosen from PSYCH 201, 205; COMP SCI 110, 111
- Electives (4): 4 courses chosen from at least two areas, at least 3 at the 300 level and at least 3 outside the major. For available areas, see the advanced electives for the

major. At least 1 course must be chosen from the courses listed below.

Artificial intelligence COMP SCI 348

Cognitive neuroscience PSYCH 212, 361

Cognitive psychology PSYCH 228

Learning sciences SOC 301

Linguistics LING 250, 260, 270

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 in the field by Northwestern faculty.

Prerequisite: consent of instructor.

COG SCI 398-1,2 Senior Honors 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 Program

The Comparative Literary Studies Program (CLS) is an interdepartmental, interdisciplinary program for the study of literature across national and linguistic lines. Drawing on faculty from the various literature departments as well as from other disciplines (such as art history and philosophy), the program reflects the belief that literary texts can best be understood within the context of diverse literatures and other cultural phenomena. CLS encourages students not only to read and interpret literary texts but also to reflect on the assumptions, methods, and goals that shape literary and other humanistic studies.

In contrast to literature departments in which students trace the development of one literature in a particular culture over a specific time period, CLS juxtaposes literatures of different cultures and epochs in a variety of ways. Comparative literature studies the themes, conventions, and movements shared by distinct literary traditions as well as the features that differentiate them. Though the field has traditionally dealt with the canonical texts of the Western tradition, Northwestern's CLS program strongly encourages students to explore less traditional but equally crucial areas of research such as women's writing, the literatures of excluded or marginalized groups, and the texts of Asian, African, and other literatures outside the European and American canon.

CLS students also examine literary theories and critical approaches to literature. In considering texts ranging from the classics of Greek and Roman thought to contemporary critical theory, students not only learn to understand specific literary works but also to raise questions about their relations to other forms of discourse (e.g., historical, scientific, and philosophical) and about the nature of literature itself. To this end, the CLS program emphasizes both the study of various types of specifically literary theory (such as structuralist, poststructuralist, psychoanalytic, sociopolitical, and New Historical) and the examination of the theoretical and methodological concerns of other disciplines (such as anthropology, history, philosophy, gender 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 comparative literature courses, and students of comparative literary studies are also encouraged to take courses in other fields and disciplines.

Major in Comparative Literary Studies

Students in the CLS major pursue broadly based programs of literary study that may include work in a wide range of related disciplines. Through a three-tier system, the major offers both an introduction to the principal tools and questions of comparative literary studies today and an opportunity to develop individual areas of interest.

The first tier consists of six courses required of all majors. These courses include introductions to the canonical texts and genres of the Western tradition from the Greeks to the 20th century, to non-Western literatures and cultures, and to the range of critical, linguistic, philosophical, and cultural theories that have shaped the interpretation of literature and culture in recent years. First-tier courses aim both to introduce students to traditional skills and perspectives and to explore alternative modes of reading that question the assumptions of cultural and critical traditions.

The second tier is composed of seven courses beyond the 100 level that define an area of concentration. Concentrations are chosen by the spring of the junior year in consultation with an undergraduate adviser in the program. Examples of concentrations include genres, periods, and literature in relation to a discipline such as history, film, theater, or philosophy. A concentration should not focus on a single national literature or mimic concentrations already available in the various national language and literature departments at Northwestern.

A required senior thesis is the focus of the third tier. It begins with a fall-quarter senior tutorial (398) in one of numerous areas and periods. These small-group courses introduce students to the central research modes they will need to write a successful senior thesis. Enrolling in 399 during the winter and spring quarters, students write the

senior thesis while supervised by the faculty adviser of their choice. Final theses are evaluated by the student's adviser and by at least one outside reader from the CLS faculty.

First-tier courses (6)

Approaches (3)

COMP LIT 205, 206, 207

Genres (2)

COMP LIT 201, 202, 203, 204, 210

Non-Western literature/culture (1) Any course in the comparative literary studies program or in departments such as art history, religion, or anthropology that focuses on the literature and/or culture of Africa, Asia, or pre-Columbian America.

Second-tier courses/concentrations (7)

Concentrations comprise 7 courses that define a coherent program of study within a particular area of interest. These must include

- 2 or more 200- or 300-level courses on a nonanglophone literature taught in the original language
- 4 or more courses at or above the 300-level in literature or in disciplines related to literary studies (for example, art history, film studies, gender studies, history, philosophy)

Examples of individual concentrations:

- Genres (novel, lyric, epic, etc.)
- Literature and related disciplines (literature and philosophy, literature and art history, literature and intellectual history, literature and film, literature and theater, etc.)
- Periods (Renaissance, Romanticism, Modernism, Postmodernism, etc.)

Third-tier courses (3)

- COMPLIT 398 (fall quarter)
- COMPLIT 399 (winter and spring quarters)

Double Major

Majors in comparative literary studies must show a minimum of 12 courses not double-counted in any other major(s).

Applying to the Major

Students may apply to the CLS major at any time during the sophomore year. To apply, they should submit a short essay describing their interests and background in comparative literary studies to the director of the CLS program. Students will be admitted to the major on the basis of this essay and subsequent discussion with the program director. A maximum of 15 students will be admitted from any one class, so it is wise to apply early in the sophomore year if possible.

Study Abroad

The Program in Comparative Literary Studies encourages all majors who qualify to consider a year of study abroad during the junior year.

Courses Primarily for Freshmen and Sophomores

COMP LIT 201-0 The Epic in Cross-Cultural Perspective Introduction to selected classics of the Western European literary tradition from Homer and Genesis to works from less distant time periods, with modern transformations of traditional themes.

COMP LIT 202-0 Introduction to the Novel: Theory and Practice Exploration of what is particularly novelistic about novels, specifically how they conceive of the human personality, society, ethics, and life's meaning.

COMP LIT 203-0 Introduction to Lyric Poetry Understanding the basic lyric impulse. How lyric is related to music, visual art, and other literary forms. Comparative study of lyrics from a variety of national traditions and time periods.

COMP LIT 204-0 Dramatic Practice Introduction to forms, principles, and practices of the theater.

COMP LIT 205-0 Diaspora/Transnational Literatures and Cultures Exploration of narratives produced by diasporic groups — displaced groups of people who retain a collective sense of identity — and theories of diaspora in relation to other notions of identity (e.g., nation, race, etc.).

COMP LIT 206-0 Literature and Media Examination of the relationship between "literature" and "media" within Western culture, from Plato to the present, with particular focus on strategies of writing and representation and their relationship to problems of authority and power; material changes to the production of literature and technologies of transmission; and the impact of computer writing and imaging technologies 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. How critical theory grounds criticism systematically, disclosing the full range of the crisis to which any critical impulse responds. Investigation of various aspects of critical theory, from abstract concepts and particular works of art to concrete social conditions and current political forms.

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.

COMP LIT 271-1,2,3,4 Japanese Literature in Translation A set of four courses surveying Japanese literature from the eighth century to the present.

COMP LIT 274-1,2,3 Introduction to Chinese Literature Survey of Chinese poetry and fiction from the fifth century B.C. to the present.

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.

COMP LIT 276-0 African Literature in Translation

Continental African literature. Content varies. May be repeated for credit with different topic.

COMP LIT 278-0 Modern Hebrew Literature in Translation

Introduction to the main works of contemporary Israeli writers.

COMP LIT 279-0 Modern Jewish Literature A study of modern European, American, and Israeli Jewish literature in its historical context.

COMP LIT 280-0 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.

Courses Primarily for Juniors and Seniors

Comparative literary studies and language majors will read the texts and be tested in their language or area of expertise whenever the course material allows.

COMP LIT 301-0 Writing in Society Studies in relations between literature and society through a series of theoretical readings in the sociology of literature, juxtaposed with literary examples from different societies.

COMP LIT 303-0 Literature and History Studies in the historicity of literature, with attention to the development of literary forms over time and to the historical circumstances in which literature is produced.

COMP LIT 310-0 Studies in Literary Genres Selected genres, such as epic, pastoral, autobiography, comedy, satire, the essay. May be repeated for credit with different topic.

COMP LIT 312-0 Studies in Drama Content varies. May be repeated for credit with different topic.

COMP LIT 313-0 Studies in Fiction Content varies. May be repeated for credit with different topic.

COMP LIT 362-1,2,3 Modern Drama 1. Major developments from the late 19th century to the end of World War I. 2. 1920s–1950s. 3. From absurdist theater to the present.

COMP LIT 365-0 The Avant-Garde Nature, origins, and development of the avant-garde movements in Europe, North America, and Latin America since the early 20th century.

COMP LIT 375-0 Literature and the Arts Differences and similarities of literature and the visual arts and/or music. 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 397-1,2,3 Seminar in Critical Theory Yearlong course carrying one unit of credit, organized around a

particular problem in the study of literature; presentations by distinguished visitors and Northwestern faculty. Preparation and follow-up for each presentation. Prerequisite: consent of department.

COMP LIT 398-0 Senior Seminar Variable topics and reading lists to develop work undertaken in earlier courses in a setting that introduces the active give-and-take of current intellectual debates. Required of senior majors in comparative literary studies. Prerequisite: consent of program adviser.

COMP LIT 399-0 Independent Study (1–3 units)

Related Courses in Other Departments

For descriptions of the following courses in literature in translation, consult the relevant department listings.

CLASSICS 240-1,2

GERMAN 210-1,2, 212, 220, 240, 261,262, 314

ITALIAN 275,380

SLAVIC 210-1,2,3, 310, 311, 314, 318

SPANISH 323, 397

Computing and Information Systems Program

The Program in Computing and Information Systems offers students in Weinberg College the opportunity to study computer science within the context of the college's focus on liberal arts and sciences, as distinct from the engineering context offered by the Department of Computer Science in the McCormick School of Engineering and Applied Science. Faculty and courses for the program are drawn from the McCormick department. Courses and research in the department address the underlying theories, enabling technologies, and applications of modern computer science. There is a strong focus on the design, implementation, and evaluation of software systems, including interactive distributed multimedia, artificial intelligence, robotics, and database systems. Research in the department is highly interdisciplinary, including important links with the Cognitive Science Program and the Department of Psychology in Weinberg College as well as the Department of Learning Sciences in the School of Education and Social Policy. Undergraduates are encouraged to join ongoing research projects within the department. For more information on the Department of Computer Science and its course offerings, see the McCormick School section of this catalog.

The major in computing and information systems is highly flexible, emphasizing the interdisciplinary study and project work that are critical in a field as rapidly changing as computer science. The specific courses to be taken are largely determined by the goals and interests of individual students. The major includes a two-quarter capstone project that helps integrate the skills and knowledge acquired in course work.

Computing facilities available to students in the program are extensive. The campus, including all dormitories, is completely networked. All students have full Internet access. E-mail, Web sites, and other computer-based communication resources are extensively used within the program to foster a sense of community and facilitate communication among students and faculty beyond the classroom.

Major in Computing and Information Systems

For requirements in mathematics, see related courses below.

Program courses

Introductory sequence: COMP SCI 111, 211, 311; students without prior programming experience may wish to take 110 before 111

Intermediate and advanced courses: COMP SCI courses at or above the 200 level (excluding 317)

Additional advanced technical courses: courses chosen from the advanced computer science list, the computer science mathematics list, and/or the computer science external technical elective list. See the program director for up-to-date information on suitable courses in this category.

Advanced electives: 2 courses chosen with the consent of the student's adviser. Examples of appropriate courses include advanced courses in computer science; social sciences such as psychology, economics, or learning sciences; mathematics; natural sciences such as biological sciences, chemistry, or physics; and other disciplines such as radio/television/film, journalism, or music.

Project courses: 2 courses requiring substantial project work (e.g., COMP SCI 394 or 399). The project or projects developed in these courses must be approved by the student's adviser as well as the course instructor in order to fulfill the program requirements.

Related courses: MATH 214-1,2,3, 219, and 330-1 or equivalent

Computing and Information Systems Second Major for ISP Students

The Integrated Science Program (ISP) is a highly selective program in Weinberg College. Students majoring in ISP may complete a second major in computing and information systems through a curriculum tailored specifically to their needs.

Program courses

Introductory sequence: COMP SCI 111, 211, 311

Intermediate and advanced courses: COMP SCI courses at or above the 200 level (excluding 317)

Project courses: 2 quarters of ISP 398 or 2 quarters of COMP SCI 399. Projects developed in these courses must be approved by the student's advisers in both ISP and the Computing and Information Systems Program in order to fulfill the program requirements.

Minor in Computing and Information Systems

The program offers a minor in computing and information systems for students who wish to develop a strong competence in computer science while majoring in another area. Students choosing this minor are expected to have completed MATH 214-1,2,3 and 219, which are prerequisites for most computer science courses.

Minor course requirements (9 units)

- **Introductory sequence:** COMP SCI 111, 211, 311.
Students without prior programming experience may wish to take 110 before 111.
- **Intermediate and advanced courses:** COMP SCI courses at or above the 200 level (excluding 317)

Critical Theory Program

Over the past three decades the term "critical theory" has come to designate — particularly in the United States — a type of study that cuts across disciplines to examine the premises, concepts, and categories that structure academic discourse in areas such as literary studies, art history, film studies, history, philosophy, and political theory, to name just a few. 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.

Minor in Critical Theory

Minor course requirements (6 units)

- COMPLIT 207
- 5 interdisciplinary 300-level courses approved by the program, including at least 1 course, usually COMPLIT 390, taught by a visiting professor in critical theory; and at least 1 course in each of the following areas: literary theory, political theory, and philosophy. A list of approved courses may be found on the Critical Theory Program Web site at www.complit.northwestern.edu. Examples from this list include PHIL 390, FRENCH 396, GERMAN 314, and POLISCI 390.

Drama Program

The Program in Drama offers undergraduates the opportunity to combine the study of dramatic literature in classics, comparative literary studies, English, and modern languages with performance studies and theater courses in the School of Communication. Recognizing the uniqueness of drama among literary genres as a performing art, the program seeks to develop an understanding and appreciation of dramatic literature informed by the study of acting, interpretation, design, playwriting, and/or directing. Major

requirements ensure a balance of historical, literary, and theatrical approaches to drama; they are flexible enough to allow for special interests and concentrations, including study abroad and the study of non-English drama in the original language. All students electing this major must work out a long-range plan of study with the program's director.

Major in Drama

Program courses

Introductory courses: 2 units from the following sets of courses, 1 from Weinberg College and 1 from the School of Communication:

- Weinberg College: ENGLISH 212, 234
- Communication: GEN CMN 103, PERF ST 210-3, THEATRE 140-1,2, 143

Major courses: 12 courses, with a minimum of 9 300-level courses; to maintain a balance between literary and theatrical approaches to the study of drama, no more than 7 courses should be from one school, and they must be distributed as follows:

- At least 6 units in the history and criticism of drama, including 3 units in drama before 1850 (but not all in Shakespeare) and 2 units in drama after 1850. Eligible courses include the following:

AF AM ST 259, 379

CLASSICS 345

COMP LIT 362-1,2,3

ENGLISH 312, 332, 334-1,2, 339, 342

FRENCH 272, 279

GERMAN 324

ITALIAN 202

SLAVIC 318,369

SPANISH 321

THEATRE 307, 345-1,2,3, 365-1,2, 366, 367, 368

- At least 3 units in performance practices:

PERF ST 216, 224, 307-1,2, 309-1,2,3, 318, 324-1,2, 326-1,2, 330

THEATRE 241-1,2,3, 243-1,2, 340-1,2, 341-1,2,3, 346-1,2, 348-1,2

- 1 unit in an advanced seminar, normally a 400-level course approved by the program director

Related courses: 4 units at the 200 or 300 level in subjects related to the study of drama, approved by the program director. Applicable areas include aesthetics, art history, criticism, film, history, humanities, music, literature, and sociology of culture.

Honors in Drama

Seniors with distinguished records in major courses who wish to be candidates for honors in the program do so by completing an independent project. Interested students should consult with the program director in the spring quarter of the junior year. See also Honors under Academic Policies earlier in this section of this catalog.

Course

DRAMA 399-0 Independent Study in Drama For senior drama majors who have completed the required seminar and wish to undertake a project in candidacy for honors in drama. Prerequisite: approval of program director.

Economics

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, or a career 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 214-1 should also be taken early in the program; the former is a prerequisite for ECON 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 214-1 is required, some 300-level field courses may require MATH 214-2, 214-3, or 214-4, all of which majors are strongly urged to take. 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.

Departmental courses

Introductory courses: 201, 202, 281

Intermediate theory courses: 310-1,2, 311

Field courses: 6 additional 300-level courses

Related courses: MATH 214-1, STAT 210, and 3 additional courses in the social sciences, mathematics, or statistics, no more than 1 at the 100 level. ECON 260 may be taken in partial fulfillment of this requirement.

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 two of the intermediate theory courses are required (310-1 and -2 or 311). As in the major, MATH 214-1 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 course requirements (8 units)

- **Introductory courses (3)** 201, 202, 281
- **Intermediate theory courses (2)** 10-1; 310-2 or 311
- **Field courses (3)** 3 additional 300-level courses

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 their sophomore year and should see Accelerated Master's Programs in the Undergraduate Education section of this catalog.

Honors in Economics

By invitation only, superior students in economics may pursue departmental honors by completing, in addition to the regular requirements of the major, one of the following three options: 398-1,2; two quarters of 399; or two 400-level field courses in economics. Under each option, candidates must submit an honors thesis presenting original research. Interested students should consult with the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section 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 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. Special emphasis on the modern structure of government regulation with attention to remote origins. Prerequisite: 202.

ECON 260-0 Accounting and Business Finance Accounting and managerial finance, including the principles of accounting, the elementary concepts of the theory of capital and its relationship to the objectives and problems of managing the firm. Prerequisites: 201, 202, or consent of instructor.

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. Prerequisite: STAT 210 or equivalent.

ECON 310-1,2 Microeconomics 1. Consumer behavior and the theory of demand; production, cost, supply functions; choices under uncertainty, insurance; competitive equilibrium; subsidies, taxes, price controls; monopoly and monopsony. Prerequisites: 201, 202, MATH 214-1. **2.** Price discrimination and public utility pricing; monopolistic competition, oligopoly, duopoly models; game theory; factor demands; general equilibrium theory and welfare economics; information theory; externalities and public goods. Prerequisite: 310-1.

ECON 311-0 Macroeconomics Macroeconomics and monetary policy. Behavior of economy as a whole. Income, inflation, unemployment, and growth; consumption, investment, and rate of interest; monetary and fiscal policy. Prerequisites: 201, 202, MATH 214-1.

Courses Primarily for Sophomores, Juniors, and Seniors

ECON 305-0 Comparative Economic Systems Economic structure, policy, and performance in advanced industrialized nations; examination of economies in transition from socialism to capitalism in central and Eastern Europe. Prerequisites: 281, 310-1, 311.

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, 311.

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 317-0 Topics in Economic Demography The economics of fertility, migration, population growth, and demographic changes. Topics may include immigration, illegal migration, the baby boom, aging, retirement, and female labor force participation. Prerequisites: 281, 310-1, 311.

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 321-0 African American Economic History Economic experiences of African Americans as slaves and free people in the pre-Civil War period and in post-Civil War agriculture. South-North migration, urbanization, civil rights movements, and global economic competition. Prerequisites: 281, 310-1, 311.

ECON 322-0 Evolution of the Global Economy Global integration and growth in the 19th and 20th centuries: historical perspectives and current controversies. Topics include international capital movements; mass migration; commercial policy and the growth of trade; evolution of the payments system; instability and war; comparative economic growth; development and underdevelopment. Prerequisites: 281, 310-1, 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 The 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 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 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 360-0 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.

ECON 361-0 International Trade International and inter-regional 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 macro-economic 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 Introduction to Mathematical Economics

1. Noncooperative game theory, with applications to industrial organization, auctions, and theories of the firm. Prerequisites: 310-1,2; 311; MATH 214-2,3 or 214-4.

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: STAT 210 or equivalent, 310-1, 311; MATH 214-2,3 or 214-4. **2.** Hypothesis testing, estimation with deficient data, distributed lags, panel data, simultaneous equation systems, limited dependent variables. Prerequisite: 381-1.

ECON 383-0 Economic Forecasting Techniques for making and evaluating economic and business forecasts, including univariate regressions, autoregressive and ARMA models, vector autoregressive models, and structural econometric models. Prerequisites: 281, 310-1, 311.

ECON 395-0 Junior Seminar Small seminars led by different department members on their special interests. Advanced work through supervised reading, research, or discussion. Prerequisites: 281; 310-1,2; 311; MATH 214-2,3 or 214-4.

ECON 398-1,2 Senior Honors Seminar For students of superior ability. Original research on a topic of interest to the student, culminating in a senior honors thesis. By department invitation only. Grade of K given in 398-1. Prerequisites: 281; 310-1,2; 311; MATH 214-2,3 or 214-4; at least four 300-level economics electives.

ECON 399-0 Independent Study Advanced work through reading, research, and discussion in areas of particular interest to the student. Project to be decided by mutual agreement with a faculty member.

Related Course

ANTHRO 341-0 Economic Anthropology

This course may be taken in partial fulfillment of the six elective requirements in economics. See Anthropology.

English

Perhaps the most striking thing about the study of English literature today is how varied it is. While some scholars and teachers emphasize the formal qualities of literary works, others address such questions as what counts as “literary” and the relationship of literature to society. The particular kinds of texts they examine also vary a good deal, as do their assumptions, methods, and emphases. The unity underlying this variety is a common emphasis on close reading and careful analysis of the written word. The English department’s curriculum reflects this variety and unity, and it offers a major that enables each student to pursue a particular area of interest within a broader understanding of the sweep of literary history and the range of literary study. The department also offers students disciplined training in the writing of verse and fiction. Virtually all of its 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 that an undergraduate may ultimately pursue and makes English an attractive major for students preparing for careers in medicine, law, and business as well as in the teaching of English at all levels.

The department takes pride in the diversity of perspectives afforded by its courses. In addition to teaching classes in the department, English faculty contribute substantially to the course offerings in theater and drama, comparative literature, and American, African American, Asian American, and gender studies.

University Library is a valuable resource for the advanced study of British and American literature, maintaining notable collections and databases in 19th- and 20th-century materials, especially modern “little” magazines. English majors also often profit from University programs for foreign study, particularly at the University of Sussex in England.

Majors in English

A complete description of undergraduate English major programs may be obtained from the department office and from the department’s Web page at www.english.northwestern.edu. Detailed descriptions of courses offered each quarter are published in “English Notes,” available from the department office three times a year in advance of registration. In addition, a tentative list of course offerings for the following year is available each spring. Writing courses (206, 207) and other courses whose content varies (e.g., 313, 348, 378) may be repeated, but only with the consent of the department.

English and American Literature

Departmental courses

Introductory course 210-1,2 or 270-1,2; 298

Major courses (10)

- 5 courses within a designated concentration:
 1. new world and postcolonial literature
 2. medieval literature
 3. British literature, 1500–1660 plus Milton
 4. Restoration and 18th-century British literature
 5. 19th-century British literature, including Romantic literature
 6. 20th-century literature in English
 7. American literature
 8. literary criticism and theory
 9. literature and culture
 10. literature and gender
 11. poetry
 12. drama
 13. fiction
- 5 courses outside the concentration
- 9 courses at the 300 level or above
- At least 8 English departmental courses, literature courses offered by related departments, or courses taught by members of the English department through other departments or programs and that deal substantially with literary works originally written in English (i.e., not in English translation)
- At least 3 of these courses must deal substantially with texts written before 1798 and at least 3 with texts written after 1798
- At least 1 course in American literature
- At least 1 course in literary criticism or theory

Related courses: At least 2 quarter-courses in fields outside of literature and related to the student's concentration. Specific listings are available in the department office and on the department's Web page at www.english.northwestern.edu.

Note: Requirements for different concentrations vary. For more information, consult with the department office, University Hall, room 215, or the department's Web page.

English Major in Writing

Students in English may also apply to major in writing. Admission to the writing major is competitive, based on a manuscript of creative work from English 206 and 207. The major offers an apprenticeship in the writing of poetry and fiction, but it is not restricted to "creative" writing alone. A required course in prose style and argument encourages students to focus on discursive forms, while a strong literature component and a course in the culture of writing further anchor the writing done in the practical workshop courses in poetry and fiction within a context of general literacy.

Students may apply for admission to the writing major through the department in early May of each year.

Departmental courses

Introductory course 206 and 207

Major courses (11 courses)

- 1 yearlong theory and practice sequence: 393-FW, TS or 394-FW, TS
- 392 and 395
- 6 literature courses, at least 2 of which must deal with works written before 1798 and at least 2 with works written after 1798

Note: Both 393 and 394 will also satisfy the literature major requirement for a course in literary criticism or theory.

Related courses: 2 courses in fields outside of literature selected with the advice and consent of the student's writing major adviser. Courses that provide a broad historical background for the study of literature are recommended.

Minors in English

The department offers both a minor in literature and a minor in writing; both offer experience in reading literary texts and writing critical analysis. Students pursuing either minor will be permitted to preregister in the department after declared English majors do so.

Minor in Literature (7 or 8 units)

- 3 or 4 200-level courses: either 210-1,2 or 270-1,2, followed by 298 or 206 and 207
- 4 300-level courses, 2 of which must deal with literature written before 1798 and 2 with literature written after 1798. One of these 4 courses may be in comparative literary studies.

Minor in Writing (7 units)

- 206 and 207
- 1 advanced writing sequence, either 393 or 394 (counting as 3 units); and 2 300-level literature courses, 1 on literature before 1798 and the other on literature after 1798. Admission to advanced writing sequences is by application only.

Honors in English

Literature majors who wish to earn honors may apply during the spring of their junior year for admission to the two-quarter senior honors sequence, 398-1,2, which meets the following fall and winter quarters. All students admitted are expected to produce an honors essay. The sequence is under the general direction of the departmental honors coordinator, while individual students work directly under the guidance of a faculty specialist of their own choosing. A number of collective meetings are held in the fall and winter, first for training in research methods and later for presenting works in progress and discussing common problems. (When special circumstances make participation in the fall-winter sequence impossible, the department may offer several alternative routes, in compliance with

Weinberg College guidelines. See the director of undergraduate studies.) Admission to honors candidacy is competitive; candidates should be reasonably certain of attaining at least a 3.4 departmental average by the end of winter quarter of senior year.

Students interested in honors through the writing major should consult with the director of that program. See also Honors under Academic Policies earlier in this section.

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 (SESP) and complete all requirements as outlined in the SESP section 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

Department of English courses appear in the curricula of African American studies, American studies, Asian American studies, comparative literary studies, drama, and gender studies. Students also may pursue creative writing in courses offered by the writing arts program.

Courses in Composition

See also the Writing Program in this section of the catalog.

ENGLISH 105-0 Expository Writing Emphasizes all phases of the composition process, research methods, and critical thinking. Careful review of student papers and reports.

ENGLISH 106-1,2 Writing in Special Contexts 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.

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.

Literature Courses Primarily for Freshmen and Sophomores

Prospective writing majors take both 206 and 207.

ENGLISH 206-0 Reading and Writing Poetry Forms and techniques of verse.

ENGLISH 207-0 Reading and Writing Fiction Forms and techniques of fiction.

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.

AF AM ST 210-1,2 Survey of African American Literature See African American Studies.

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 the present, creates and communicates meaning.

ENGLISH 234-0 Introduction to Shakespeare Representative Shakespearean plays.

AF AM ST 259-0 Introduction to African American Drama See African American Studies.

ENGLISH 260-0 Introduction to 20th-Century British Literature Principal writers and works from 1900 to World War II.

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.

ENGLISH 298-0 Introductory Seminar in Reading and Interpretation Close reading of literary works in the light of various perspectives in literary study. Prerequisites: 210-1,2 or 270-1,2 (may be taken concurrently with either 210-2 or 270-2).

Literature 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 Expository Prose

ENGLISH 307-0 Advanced Creative Writing For nonwriting majors with previous formal training in creative writing. May be repeated for credit with different topic. Admission by consent of department.

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 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 Johnson, Swift, Gibbon, Burke, Wollstonecraft, and other nonfiction prose writers.

ENGLISH 344-0 18th-Century Fiction 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 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 Important and 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.

COMP LIT 362-1,2,3 Modern Drama See Comparative Literary Studies.

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 Bradstreet, Freneau, Bryant, Poe, Whitman, Dickinson, Robinson, and Frost.

ENGLISH 375-0 Topics in Asian American Literature Content varies.

ENGLISH 378-0 Studies in American Literature Content varies.

COMP LIT 383-0 Special Topics in Theory

See Comparative Literary Studies.

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.

ENGLISH 393-FW,TS Theory and Practice of Poetry (1.5 units each) Sequence of two 15-week courses.

1. Theory of prosody, including the major form 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-FW,TS Theory and Practice of Fiction

(1.5 units each) Sequence of two 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 395-0 Style in Literature English prose style and how it works: syntax, diction, figures of speech, irony, rhythm.

ENGLISH 398-1,2 Senior Honors Sequence For seniors preparing an honors essay in the literature major. Students pursue individual topics under the careful guidance of a faculty adviser and the general supervision of the departmental honors coordinator. Admission by application. K grade given 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 three times, but only one unit at a time. Prerequisite: consent of department or director of writing major.

Environmental Sciences Program

A major challenge facing our species is to learn to understand and coexist with the natural environment. The environmental sciences major is designed to provide students with an understanding of the physical environment and the relations of humans to it. Environmental sciences necessarily differs from the more traditional divisions of scientific inquiry. The intellectual approach is that of synthesis, where the focus is concentrated on the integration of knowledge rather than on further refinement of knowledge within a particular scientific field. Also, the concern for translating theory into practice requires a strong association with engineering. With this approach, environmental sciences provides a mechanism for motivated students to work in a multidisciplinary framework with a common theme.

The major gives students the expertise to address issues of environmental concern, such as energy options, environmental law, the relation of society and resources, and health problems of air and water pollution, from a scientific basis. It provides a background for employment in environmentally oriented firms or for graduate study in any of several different environmental sciences disciplines as well as an exceptional preprofessional experience for students interested in law or business.

Major in Environmental Sciences

The major is rigorous but reasonably flexible. It requires a basic grounding in the sciences and mathematics, a core curriculum to introduce environmental problems, courses

that consider society's impact on the environment, and a series of advanced courses tailored to each student's interest. This is capped by a senior seminar where students conduct environmental research and present their results.

For a double major and to determine the grade point average in the environmental sciences major, the Foundations in Science and Mathematics courses are not considered major courses but rather courses related to the major.

Foundations in Science and Mathematics

Basic science and mathematics courses are necessary to understand the environmental sciences; all the courses in chemistry, mathematics, physics, and biological sciences are required for the major.

Foundations in science (6 or 7 courses)

- CHEM 101; 102; 103 or 171; 172; 210-1
- PHYSICS 130-1,2 or 135-1,2
- BIOL SCI 110-1 or 210-1

Foundations in mathematics (3 courses)

- MATH 214-1,2,3

Core curriculum (3 courses)

Physical systems of the environment are emphasized in core courses; any 3 of the following are required for the major:

- BIOL SCI 204
- CHEM 204
- ENVR SCI 235
- GEOL SCI 201

Environment and society (2 courses)

Society's place in and interaction with the environment are treated in social science courses; any 2 of the following are required for the major:

- ANTHRO 302 or 383
- ECON 370
- GEOG 328
- POLI SCI 204, 371
- SOCIOL 312

Advanced studies (4 courses)

Choose from the following:

- ANTHRO 306, 312, 315
- BIOL SCI 341, 343, 344, 345, 346, 347
- CHEM 329, 342-1, 343
- CIV ENG 358, 359, 360, 361, 363, 364, 366, 367, 368, 370
- ENVR SCI 390 (maximum of 1 credit may be applied toward the major)
- GEOG 341, 343
- GEOL SCI 301, 313, 316, 317, 318, 319

Students who wish to concentrate their course selections within a single science field may pursue an established track in biology, chemistry, or geology. Each track requires 4 courses that are counted as the advanced studies portion of the major. For a detailed description of individual tracks and sample curricula, see the Environmental Sciences Program adviser.

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 ISP 398 or ENVR SCI 398 for the ISP-required course MATH 391-2 and must take the following additional courses:

- GEOL SCI 201
- BIOL SCI 210-1
- 2 of the following courses: BIOL SCI 204; ENVR SCI 235; GEOL SCI 202
- 2 courses listed under Environment and Society above
- 2 courses, not in the same department, from those listed under Advanced Studies above, except CHEM 342-1
- Students may take the 2 quarters of ENVR SCI 398 instead of ISP 398

Advising and Course Selection

As soon as students have declared a major in environmental sciences, they should consult with the environmental sciences adviser to plan their programs. They should try to complete the foundations in science and mathematics courses by the end of their sophomore year.

Premedical students and students interested in advanced study in environmental biology are advised to take the 200-level sequence in biological sciences and one or two additional quarters of organic chemistry.

Core Course

ENVR SCI 235-0 Atmosphere and Climate Nature and composition of the atmosphere, principles of atmospheric motion; frontogenesis; precipitation processes; global patterns of climate and climatic change. Prerequisite: MATH 214-3 or equivalent.

Other Courses

ENVR SCI 390-0 Internship in Environmental Sciences (1–2 units) Participation in off-campus research activities of public and private environmental organizations under the supervision of faculty. Prerequisite: junior or senior standing and consent of program director.

ENVR SCI 398-1,2 Environmental Research Seminar Independent research directed by environmental sciences faculty. Research design and scientific communication. Prerequisite: senior standing. Open only to majors.

European Studies Program

The origins of Europe as a geopolitical and cultural entity are not easy to define. Did a distinctively European culture and identity first come into being with the coronation of Charlemagne in 800? With the conversion of the Slavic

and Scandinavian peoples to Christianity? Or, conversely, with the shattering of Christendom in the wake of the 16th-century Reformation? In our own day, particularly since the fall of the Soviet Union in 1989, the rapidly accelerating economic and political unification of Europe casts an intense new light on such questions. The major in European studies is an interdisciplinary program that gives attention to both humanities and social sciences and can readily accommodate a focus on either history or current affairs. Students apply for the major in the spring quarter of their freshman or sophomore year in a selection process that will include submission of a writing sample and an interview with members of the steering committee. The European studies major culminates with the writing of a senior thesis, involving students in an intensive, focused research experience that will help them integrate their studies and bring the perspectives of varied disciplines to bear on a topic of interest to them.

Major in European Studies

The history of European civilization sequence HISTORY 201-1,2 is prerequisite for all European studies majors. Majors also are expected to achieve proficiency in a European language other than English. To this end, requirements for the major include two 300-level courses in a foreign language or its literature taught in the foreign language. These courses may be taken during a period of study abroad. Students who demonstrate exceptional linguistic competence may take them in two different languages. Those who complete a double major or minor in a language department will have automatically met this requirement.

Students who enter the major as freshmen will be encouraged to spend either their whole junior year or the fall term of that year in the European country of their choice. In cooperation with the Institut d'Etudes Politiques de Paris (Sciences Po), Northwestern sponsors a study abroad program on the European Union in Paris, accepting 12 to 18 students a year. This is only one of several study abroad programs that are appropriate for European studies majors. Those who enter the major at the end of their sophomore year will be encouraged to complete a summer study abroad program between their junior and senior years. Ideally, majors study in non-English-speaking countries, though selected programs in Great Britain (e.g., at the London School of Economics or the University of Edinburgh) are also appropriate.

Prerequisites

- HISTORY 201-1,2

Major course requirements

- EUR ST 301-1,2,3
- 6 additional courses dealing with Europe, at least 4 at the 300 level
- 2 300-level language/literature courses taught in a continental European language
- EUR ST 390-1,2,3

With the exception of the two 300-level language courses, none of the above courses may be double-counted toward the European studies major and another major.

Courses

EURST 301-1,2,3 Sequence for Majors

Yearlong sequence sharing a broad theme, integrating methods and materials from different disciplines. Limited to 20 students (majors only).

EURST 390-1,2,3 Senior Thesis Seminar

Guided independent research leading to preparation of the thesis, under the direction of a faculty adviser and honors coordinator. K grade given pending thesis completion.

French and Italian

Studies in French or Italian provide insight 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. As the merging of domestic and international events increasingly affects the material and intellectual life of every individual, the ability to communicate with other peoples assumes vital importance. Whether a student is planning a career in teaching, government, science, the professions, or business, the study of a foreign language, literature, and culture is a wise option in a university education.

Programs in the department are varied. Language courses, from the elementary through the graduate levels, develop communication skills that allow students to function 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, they also train students to think independently, to organize and analyze materials thoughtfully, and to discuss ideas effectively.

There is 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 foreign study, 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. An excellent library, modern audiovisual resources, and a learned faculty (of which nearly one-half are native speakers) further strengthen studies in French and Italian.

French

Major in French

The program for majors in French studies consists of 17 quarter-courses; at least 12 must be at the 300 level. Courses at the 100 level do not count toward the major. Students may count up to 5 200-level courses toward the major. Of the 17 courses, up to 2 may be French department courses taught in English. All majors must take 2

courses in the 310, 312, 314, 316 sequence (one pre-1800, one post-1800). At least 1 additional 300-level course must be on literature and culture before 1800. All majors must take 396 and 397 during their senior year.

Students returning from a study abroad program in France or any other francophone country may receive up to 8 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 returning majors must take 2 units of senior seminar.

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. Together these accomplishments will enable students 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 also engaged in another major with requirements that preclude pursuing a second major. Except for one possible course at the 300 level, all courses are conducted in French, with class discussion and papers also in French.

Students choosing to minor in French are assumed to have completed either 121 or 123 or the equivalent.

Minor course requirements (9 units)

- Up to 4 200-level courses: 2 chosen from 201, 202, 203; 2 chosen from 210, 271, 272, 280, 282
- At least 5 300-level courses: 2 or 3 chosen from 302-1,2, 303, 305, 309, or 391-1,2; 2 or 3 other courses in literature or civilization, 1 of which may be a French department course taught in English. 309 may be counted either as a language course or as a literature/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 consult with the department chair and should refer to Accelerated Master's Programs in the Undergraduate Education section of this catalog.

Honors in French

Students who have a grade point average of 3.4 or higher in the major and are interested in writing an honors thesis should declare their intention of doing honors work no later than the spring quarter of their junior year. They should also consult with the director of undergraduate studies. The honors project is produced through one or

two quarters of 399. It can build on previous work done in a 300-level course or, with consent of the instructor, in a graduate seminar. These courses will count toward the 17 required credits for the major. See Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section 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 Undergraduates

FRENCH 111-1,2,3 First-Year French Conversation, grammar, reading, and writing for beginners. Five class meetings a week.

FRENCH 115-1,2 Accelerated First-Year 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 Second-Year French Grammar review, conversation, reading, writing. Four class meetings a week. Prerequisite: 111 or 115.

FRENCH 123-0 Second-Year French: Individualized Instruction Intermediate French in a format allowing students a choice of skill concentrations and learning paces. Credit possible for up to three quarters. Prerequisite: department placement.

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. May not be repeated for credit. Prerequisite: 121-3 or 123-3, or AP score of 3.

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 210-0 Introduction to French and Francophone Literature Study of texts illustrating various genres from the Middle Ages to the present such as poetry, drama, fairy tale, novel, autobiography. Prerequisite: 202, AP score of 5, or consent of instructor.

FRENCH 211-0 Introduction to French and Francophone Cultures Introduction to French and/or francophone cultures through study and analysis of major themes, issues, and debates. Prerequisite: 202, AP score of 5, or consent of instructor.

FRENCH 271-0 Introduction to the French and Francophone Novel Fundamental concepts and significant achievements of the novel in French. Prerequisite: 210, 211, AP score of 5 in literature, or consent of instructor.

FRENCH 272-0 Introduction to French and Francophone Theater Basic concepts and representative works of French and/or francophone theater. Principles of tragedy and comedy; contemporary developments. Prerequisite: 210, 211, AP score of 5 in literature, or consent of instructor.

Courses with Reading and Discussion in English

No prerequisite in French; readings, discussions, papers, and examinations in English.

FRENCH 277-0 Literature of Existentialism Existentialism in its literary, philosophical, and cultural manifestations.

FRENCH 279-0 Introduction to French and Francophone Theater 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 372-0 Medieval Movies Films representing medieval and Renaissance culture; films that a medieval viewer would have understood.

FRENCH 375-0 French and Francophone Film Topics in French cinema: for example, French classical cinema, the New Wave, postcolonial French film, the cinema of Marguerite Duras.

FRENCH 376-0 Topics in Gender and Sexuality Major trends and perspectives in gender studies such as first- and second-wave feminisms, lesbian writers, AIDS literature, and queer theory. Content varies; topics covered previously include gender and orientalism, cross-cultural feminisms.

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.

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: 302 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 The 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 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 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 consent of instructor.

FRENCH 316-0 The Contemporary Francophone World Study of literary texts from the 20th and 21st centuries with emphasis on their philosophical, literary, and cultural contexts. Prerequisite: 271, 272, or consent of instructor.

FRENCH 320-0 Medieval French Song Songs of the troubadours; songs of courtly love, social and political songs, women's songs. Study of musical setting and performance. No musical training required. Prerequisite: 271, 272, or consent of instructor.

FRENCH 322-0 Medieval French Narratives Major narrative works of the French Middle Ages in historical context. Content varies; topics covered previously 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 consent of instructor.

FRENCH 335-0 Topics in 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 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 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 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 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 consent of instructor.

FRENCH 350-0 The Novel in French Content varies. Topics covered previously include the novel of the Ancien Régime, the psychological novel, and the Bildungsroman in France. Prerequisite: 271, 272, 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 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 consent of instructor.

FRENCH 362-0 Popular Fictions Popular genres such as the detective novel, fairy tales, utopian novels, science fiction, and *la bande dessinée* considered in historical context. Prerequisite: 271, 272, or consent of instructor.

FRENCH 364-0 African Literatures and Cultures

Major issues, trends, and authors from francophone Africa, including North African and Sub-Saharan African writers. Content varies; topics covered previously include *Shahrazade*, narratives of gender relations in francophone African fiction, and mysticism and francophone African fiction. Prerequisite: 271, 272, or consent of instructor.

FRENCH 365-0 Caribbean/African Literatures and

Cultures Major issues, trends, and authors from the francophone Caribbean and its diasporas. Content varies; topics covered previously include creolization in Caribbean women writers; slavery, history, and memory; Caribbean identities. Prerequisite: 271, 272, or consent of instructor.

FRENCH 366-0 Southeast Asian Literatures and Cultures

Major issues, trends, and authors from francophone Southeast Asia and its diasporas. Content varies; topics covered previously include francophone Vietnamese literature and Vietnam/Indochine in fiction and film. Prerequisite: 271, 272, or consent of instructor.

FRENCH 367-0 French and Francophone Theater Major figures and movements in French and francophone theater. Prerequisite: 271, 272, 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 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 consent of instructor.

FRENCH 384-0 Women Writing in French Female-authored texts analyzed in relation to their respective social, cultural, political, and historical contexts. Prerequisite: 271, 272, 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 consent of instructor.

FRENCH 390-0 Topics in Culture Topics, issues, and questions in French and francophone culture. Content varies: for example, French and francophone cinema, the intellectual in France. May be repeated for credit with different topic. Prerequisite: 271, 272, or consent of instructor.

FRENCH 391-1,2 Theory and Practice of Translation Intensive, advanced, two-quarter course integrates previously acquired skills through the comparative study and translation of English and French. Culminates in individual translation project in second half of second quarter. Prerequisite: 301, 302, study abroad, or consent of instructor.

FRENCH 396-0 Contemporary French and Francophone Thought 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

The program for majors in Italian literature and culture consists of 14 courses, of which at least 10 must be offered by the Italian department; up to 4 others may be courses dealing with Italian culture offered by other departments, including one or more courses on literary theory. Courses taken outside the department must be approved by the director of undergraduate studies. Of the 10 courses taken in the Italian department, no more than 5 may be courses taught in English. Of the 14 courses required for the major,

at least 8 must be at the 300 level; 100-level courses do not count towards the major.

Students returning from a study abroad program in Italy may receive up to 8 credits (depending on program length) if the content of the courses taken abroad relates in a substantive way to some aspect of Italian culture. All returning students must take 2 300-level courses in Italian in their senior year.

Minor in Italian

Minor course requirements (7 units)

The minor in Italian consists of seven courses, of which at least four are at the 300 level. No more than three courses may be Italian courses taught in English. Students returning from study abroad must take at least one 300-level course in Italian in their senior year.

Honors in Italian

Students who have a grade point average of 3.4 or higher in the major and are interested in writing an honors thesis should declare their intention to do honors work no later than the spring quarter of their junior year. They should also consult the director of undergraduate studies. The honors project is produced during one or two quarters of 399. It may build on previous work completed in a 300-level course or, with consent of the instructor, in a graduate seminar. These courses will count toward the 17 credits required for the major. See Honors under Academic Policies earlier in this section of the catalog.

Courses Taught in Italian

Prerequisite for all 300-level courses taught in Italian: two 200-level courses in Italian or equivalent.

ITALIAN 101-1,2,3 Elementary Italian Pronunciation, grammar, composition, reading, and conversation. Drill in language laboratory. Five class meetings a week.

ITALIAN 102-1,2,3 Intermediate Italian Grammar review, conversation, composition, and readings in modern prose and drama. Four class meetings a week. Prerequisite: 101-1,2,3 or equivalent.

ITALIAN 133/134-1,2,3 Intensive Italian Beginning course designed to complete the work of 101 and 102 in one year. Students must enroll concurrently in 133 and 134, for which they receive two credits per quarter. Five class meetings a week.

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 133/134-3 or equivalent.

ITALIAN 202-0 Italian through Performance Practice in spoken Italian through a survey of various performance arts in Italian culture. Content may vary: for example, Italian

theater, Italian opera, commedia dell'arte. Prerequisite: 102-3 or 133/134-3 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 133/134-3 or equivalent.

ITALIAN 301-0 Italian through Cinema An analytic approach to the language of cinema through a detailed reading of selected films and their scripts. Emphasis on colloquial and dialectal Italian. Students produce script or film treatment at the end of the quarter.

ITALIAN 302-0 Italian through Translation An intensive workshop meant to improve spoken and written Italian through the practice of translation.

ITALIAN 303-0 Reading Italian Cities An approach to Italian culture and civilization through an exploration of representative Italian cities.

ITALIAN 304-0 Modern Italian Cultural Studies Culture of Italy from World War II to the present. Novels, films, popular culture.

ITALIAN 399-0 Independent Study Independent reading under supervision. Consult director of undergraduate studies.

Courses with Reading and Discussion in English

No prerequisite in Italian.

ITALIAN 270-0 The Arts in Italian Culture A multidisciplinary survey exploring the development of a wide variety of artistic traditions in Italian culture, including painting, sculpture, architecture, music, opera, fashion, and design.

ITALIAN 275-0 Dante's Divine Comedy Introduction to the Divine Comedy's artistic and intellectual achievement, and its cultural and historical context.

ITALIAN 290-0 Memory, Exile, and the Italian Diaspora The theme of exile in Italian culture; the memory of Italy as it survives in the Italian diaspora, inside and outside Italy.

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, intellectuals and politics from D'Annunzio to Pasolini, feminist Italian fiction, Calvino, Eco, and the postmodern.

ITALIAN 370-0 Mapping Italian Literature Major texts of Italian literature read in the context of European and world literature. Content varies: for example, Leopardi and European romanticism; Calvino, Borges, and Pynchon; the Theater of Memory; Svevo and Joyce; futurism.

ITALIAN 375-0 Topics in Italian Culture Content varies: for example, perspectives in the Renaissance, Leonardo's method, the Baroque imagination, body and sexuality in Italian culture, Italian women writers, fascism and culture, philosophy and literature.

ITALIAN 380-0 Topics in Italian Cinema Introduction to major Italian filmmakers and cinematic trends.

Gender Studies Program

The Gender Studies Program embraces a conceptual framework that includes the study of gender and sexuality from an interdisciplinary perspective. It addresses the complex ways in which women and men, femininity and masculinity, female and male are constructed in specific social, cultural, and historical contexts.

The rich and varied curriculum offers students a range of academic experience, including seminars, fieldwork, performance, and opportunities for original research. Consistently emphasized are the ways in which attention to women's and men's lives and experiences has altered scholarly preconceptions and research methods.

Adjunct Major in Gender Studies

The gender studies major is an adjunct major. Students majoring in gender studies must also fulfill the requirements of another major in Weinberg College or in any other school in the University. The major in gender studies must show a minimum of nine courses not double-counted in any other major.

Program courses (at least 11 units)

Core courses (33) courses selected from 210, 230, 231, 240, 250, and SOCIOL 216

Electives (8): 1 theory course, such as 395 or 397; 6 other courses including 4 at the 300 level and no more than 2 cross-listed courses offered by other departments; and completion of either a senior thesis (in 398 and 399) or 1 additional 300-level course. Students who complete a senior thesis may be nominated for departmental honors.

Examples of courses that fulfill the elective requirement include but are not limited to the following:

- AF AM ST 332
- ANTHRO 354
- ECON 213
- LING 318
- R/TV/F 325 (see the School of Communication section of this catalog)

Minor in Gender Studies

Students may earn a minor in gender studies while simultaneously pursuing a departmental major in any undergraduate school. Students qualify for the minor by satisfactorily completing the requirements listed below and presenting a minimum of five courses not double-counted in their majors.

Minor course requirements (7 units)

- 2 core courses chosen from 210, 230, 231, 240, 250, and SOCIOL 216
- 5 electives chosen in consultation with an adviser in the Gender Studies Program. At least 3 courses must be at the 300 level; 3 must be gender studies courses; the remaining 2 may be gender studies courses or courses

from any department cross-listed under gender studies. For sample electives, see the list under Adjunct Major in Gender Studies.

Courses

GNDR ST 210-0 Gender, Power, and Culture in America Theoretical, personal, and political issues; connections between gender, race, class, and sexual orientation.

GNDR ST 230-0 The 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: Voices and Visions Representations in art and literature within their historical, social, and political contexts. Theories of spectatorship, resistance, and revision.

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 A focus on aspects of gender in the cultures of science and medicine.

GNDR ST 375-0 Internship in Gender Studies Field research and practical work experience in activist organizations; biweekly meeting with the instructor and other interns for discussions of their internship experiences and common readings. Prerequisite: consent of instructor.

GNDR ST 390-0 Topics in Gender 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.

GNDR ST 391-0 Writing Women's Lives Seminar launching each student on a research project that illuminates the life of a woman or group of women. Exploration of archives, theories of the self, and historical contexts. Prerequisite: consent of instructor.

GNDR ST 392-0 Gender and Autobiography Investigations of women and men as readers and producers of autobiography. Exploration of memory and construction of self in relation to gender, culture, and ethics. Prerequisite: introductory course in gender studies or consent of instructor.

GNDR ST 395-0 Sexuality and Its Discontents Social and historical constructions of sexuality; emergence of lesbianism and homosexuality as categories; issues of sexuality, race, and class; problems of sexual domination and violence. Prerequisite: introductory course in gender studies or consent of instructor.

GNDR ST 396-0 Feminist Therapy Theoretical basis for the feminist critique of traditional psychotherapy. Exploration of problems presented by female clients; gender-related causes and feminist strategies for resolution. Prerequisites: one course in gender studies or psychology; junior/senior standing.

GNDR ST 397-0 Gender Theory Survey of gender and feminist theory.

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 Program

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 a 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.

Major in Geography

Program courses: GEOG 210, 211, or ENVR SCI 235; GEOG 341; and 4 additional geography courses, at least 3 of which must be at the 300 level, including 1 unit of research (399)

Related courses: ECON 201, 202; MATH 214-1,2; 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. In addition to the courses listed below, students choosing to minor in geography must complete MATH 214-1,2 or equivalent.

Minor course requirements (7 units)

- STAT 210
- GEOG 210 or 211 or ENVR SCI 235
- GEOG 341
- 4 additional courses, at least 3 at the 300 level; 1 may be taken in a department or program other than geography on the recommendation of the geography program adviser

Introductory Courses

GEOG 210-0 The Natural Environment Introduction to the physical elements of geography. Major local and global atmospheric processes producing weather and climate.

Study of the earth-shaping forces that give rise to the geography of landform features.

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.

Regional Geography

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. Prerequisite: MATH 214-1.

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.

Geological Sciences

The geological sciences use diverse and interdisciplinary approaches to the study of complex physical, chemical, and biological processes occurring on and within the earth. The undergraduate program combines fundamental background in mathematics, physics, and chemistry with courses applying these techniques to geological problems. Undergraduates are encouraged to select individual programs reflecting their scientific interests and career goals, whether graduate study in the earth sciences, professional employment, or advanced study in areas such as management or law.

Undergraduates are involved in the full spectrum of departmental activities beyond class work: research, seminars, field trips, and social functions. The resulting educational environment offers unusual opportunities for motivated and interested students.

Major in Geological Sciences

Departmental courses: 201, 202, and 4 300-level courses

Related courses

- CHEM 101, 102, 103 or 171, 172
- MATH 214-1,2,3, 215, 219, 221
- PHYSICS 135-1,2,3

Chemistry, mathematics, and physics are prerequisites for 200- and 300-level courses and should be taken at the earliest opportunity.

Minor in Geological Sciences

The minor in geological sciences offers students in any major a flexible path to improved knowledge of earth, its processes, and, more generally, earth system science. With advice from faculty, students select paths that emphasize such fields as physical geology, geochemistry, geophysics, or a combination of these.

Minor course requirements (6 units)

- 201, 202
- 4 other geological sciences courses at the 200 or 300 level; 3 of the 4 must be at the 300 level. 398 and 399 will not be credited toward the minor.

Note: Most 200- and 300-level courses in geological sciences have prerequisites in other disciplines and/or in geological sciences. Students should consult the course descriptions in this catalog for details.

Honors in Geological Sciences

Graduation with honors in geological sciences requires completion of a research project. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

Four-Year BA/MS

Students with a professional interest in the earth sciences and a grade point average of 3.5 or above may be eligible for the four-year BA/MS honors program offered by the Department of Geological Sciences. The department only recommends students for this program; final approval is made by the Graduate School. Students may apply in the spring quarter of their junior year; by the end of that year, applicants should complete all courses required for the major in geological sciences and all (or nearly all) the Weinberg College BA requirements. See Accelerated Master's Programs in the Undergraduate Education section of this catalog and consult with a department adviser.

- To fulfill the MS requirements, students must complete
- 12 courses approved by the student's advisory committee and bearing graduate credit in science or engineering (MATH 221, CHEM 342-1, and the 4 300-level courses taken for the BA may be counted)
 - a final independent research report (not necessarily a formal thesis)

Geological Sciences Second Major for ISP Students

The Integrated Science Program (ISP) is a highly selective BA program within Weinberg College. Students majoring in ISP who wish also to complete a major in geological sciences must take 201 and 3 300-level courses in addition to 315. These requirements replace the usual major requirements noted above.

Courses Primarily for Freshmen and Sophomores

GEOL SCI 101-0 Earth Processes and Products Minerals, rocks, and structures of the earth's crust, changes wrought through geologic time. Lectures, laboratory; weekend field trip.

GEOL SCI 106-0 The Ocean, the Atmosphere, and Our Climate The role of the world ocean in the Earth's climate. Properties of the oceans and marine life. Interaction of oceans, atmosphere, and land. Lectures and discussion.

GEOL SCI 107-0 Plate Tectonics Drift of continents and spreading of sea floor; pattern of motions; relation to earthquakes, volcanism, mountains, and the Earth's interior. Lectures and discussion.

GEOL SCI 110-0 Exploration of the Solar System Origin of the solar system, accretion and differentiation of the Earth, early history of the moon, abundance of elements, geologic time. Lectures and discussion.

GEOL SCI 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.

GEOL SCI 114-0 Uniformity, Catastrophe, and the Meaning of Evolution Development, application, and impact of uniformitarianism, catastrophism, and evolutionary theory.

GEOL SCI 201-0 Surface Processes Mountain building, deformational features, tectonic forces, glaciation, weathering, sedimentation, metamorphism, and volcanism. Field trip. Prerequisite: CHEM 103, MATH 214-1, or equivalent.

GEOL SCI 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. Prerequisite: MATH 214-2, PHYSICS 135-1, CHEM 103, or equivalent.

GEOL SCI 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 equivalent.

GEOL SCI 204-0 Environmental Geology Hazardous earth processes, human interaction with the environment, problems of resource availability and use. Laboratory and one-day field trip. Prerequisites: MATH 214-2, CHEM 103.

GEOL SCI 288-0 Earth in Science and Art Major ideas and

discoveries behind our understanding of the Earth and its environment. Similarities and differences between the views of the Earth in science and pictorial art. Prerequisite: one college-level course in physics, chemistry, or geological sciences, or consent of instructor.

Courses Primarily for Juniors and Seniors

GEOL SCI 301-0 Geochemistry of Global Environment

Surficial processes and their geological and biological driving forces (atmosphere-land-water interactions, weathering, geochemical transport, sedimentation). Biogeochemical cycles and their role in the global environment. Prerequisite: 201 or 204.

GEOL SCI 302-0 Petrology and Mineralogy Formation and evolution of igneous, sedimentary, and metamorphic rocks. Rock textures, compositions, tectonic settings, and other properties. Characteristic mineral assemblages, properties, processes, and reactions. Prerequisites: 201 or CHEM 103; MATH 214-1; PHYSICS 135-1.

GEOL SCI 303-0 Hydrogeology Transport and storage of water on the Earth. Hydrostatics, hydrodynamics, flow models, infiltration, permeability, erosion, sediment transport, sediment dewatering, climate and sea-level changes, resource limitations, and pollution. Prerequisites: 201, MATH 214-3, PHYSICS 135-1, or consent of instructor.

GEOL SCI 304-0 Coastal Processes Competition between motions of water, beach, sediments, and crust. Waves, currents, tides. Sediment transport, beach evolution, cliff erosion, sea-level change, coastline and landform development. Processes in Lake Michigan. Prerequisites: 201; MATH 215; PHYSICS 135-1,2,3; or consent of instructor.

GEOL SCI 307-0 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 217, PHYSICS 135-1, or equivalent.

GEOL SCI 309-0 Reflection Seismology Acquisition, processing, and interpretation of reflection seismograms. Hydrocarbon prospecting, structural geology, tectonics, stratigraphy, and deep continental reflection profiling. Prerequisites: MATH 214-3, PHYSICS 135-1, or consent of instructor.

GEOL SCI 313-0 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 equivalent.

GEOL SCI 315-0 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. Prerequisite: second-year standing in ISP or comparable background in mathematics and physics.

GEOL SCI 316-0 Sedimentary Geochemistry Formation and diagenesis of carbonate, geochemistry of organic matter, petroleum formation, evaporite precipitation, paleo-environmental reconstruction, isotope, organic, and trace and major element geochemistry. Prerequisites: 201, 313; CHEM 103; or equivalent.

GEOL SCI 317-0 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. Prerequisites: 101, 106, or 111; BIOL SCI 103 or 210-1; or consent of instructor.

GEOL SCI 318-0 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. Prerequisites: 201 or 204; 301; 316.

GEOL SCI 319-0 Field Problems in Sedimentary Geology Field methods in stratigraphy and sedimentology; interpretation of depositional systems and development of facies models based on field observations. Continuation of 313; 2½-week field trip to Colorado and Utah in early to mid-September, returning in time for beginning of fall classes. Prerequisite: 313.

GEOL SCI 324-0 Seismology and Earth Structure Elastic theory, seismic waves, seismometers and seismograms, ray paths, travel times; internal structure of the Earth; earthquakes: location, characteristics, mechanism, and relation to plate motions. Prerequisites: MATH 221, PHYSICS 135-2.

GEOL SCI 325-0 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, MATH 217, PHYSICS 135-2.

GEOL SCI 326-0 Terrestrial Gravity and Magnetism Introduction to theory and applications of potential fields to the study of the Earth; includes Laplace's equation, Newtonian potential, magnetostatic and electrostatic fields, spherical harmonic analysis; applications to calculation and interpretation of gravity and magnetic anomalies, regional and global fields, forward and inverse methods, analytical continuation, and spectral analysis. Prerequisites: 325, MATH 221, PHYSICS 135-1,2.

GEOL SCI 327-0 Radiogenic Isotope Geochemistry Use of chemical and isotopic abundances of elements in understanding processes and fluxes that govern chemical evolution of the Earth and the solar system. Prerequisite: 202, CHEM 103, or consent of instructor.

GEOL SCI 328-0 Geophysical Data Processing Analysis of seismic and other geophysical data. Sampling, windowing, discrete and fast Fourier transforms, z-transforms, deconvolution, filtering, and inverse methods. Prerequisite: MATH 221.

GEOL SCI 329-0 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 221 and PHYSICS 135-2, or consent of instructor.

GEOL SCI 350-0 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. Prerequisites: CHEM 103, MATH 214-3, PHYSICS 135-1.

GEOL SCI 398-0 Undergraduate Seminar Opportunity for advanced work through supervised reading, research, and discussion. Open only by invitation of the department.

GEOL SCI 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.

German

The Department of German offers courses in three separate tracks, giving students a choice in satisfying their educational needs or interests. Courses are designed to

- Offer students who wish to acquire basic knowledge of the German language (either to fulfill the college language requirement or to continue their German studies in the department) an opportunity to use materials such as video, film, audio material, cultural readings, and literary short stories to gain exposure to different styles of written and spoken language and to the culture and people of German-speaking countries
- Provide German majors and minors with a course of study in language, literature, and culture that forms the basis from which they can pursue their interests in specific areas of concentration; the program emphasizes the modern period (18th century to the present)
- Provide a basis for the understanding of the intellectual and cultural life of Germany for students who are not proficient in German

Major in German

The major in German consists of 17 courses: 12 core courses and 5 in a concentration. Students choose one of five concentrations: business studies, critical thought, German-Jewish studies, history, or language and literature.

Courses indicated as a prerequisite for an advanced course may not be taken for credit after the advanced course has been completed. Students returning from a study abroad program in their junior year must enroll in one 300-level quarter-course in the department.

Departmental courses

Core courses (12)

- Language (4 units):
205 (may be repeated for credit with different topic); 208

or 280; 2 quarter-courses of 391, 1 on advanced grammar and composition and 1 on advanced conversation

- Literature (3 units): 3 quarter-courses chosen from 201-1,2,3,4; 204; 215
- Culture (4 units): 4 quarter-courses chosen from 301; 310-1,2,3,4; 329; 332
- History (1 unit): Chosen from 233-1, HISTORY 344-2, HISTORY 349

Concentrations (5)

Business studies

- German: 1 quarter-course of 280 and 2 quarter-courses of 380 (380 may be repeated for credit with different topics)
- Economics: 2 quarter-courses chosen from ECON 201, 202, 311

Critical thought

- German: 301
- Philosophy: 1 quarter-course at the 200 level
- Comparative literature: 3 quarter-courses including COMP LIT 202 or 280; and 2 chosen from COMP LIT 302, 383, 397-1,2,3; and a graduate seminar

German-Jewish studies

- German: 241-1,2
- History: 1 quarter-course chosen from HISTORY 344-1,2 or 349
- Political science: appropriate courses to be determined in consultation with an adviser
- Religion: 2 quarter-courses chosen from RELIGION 224, 306, 331, 335, 352

History

- German: 3 quarter-courses including 2 chosen from 233-1,2 or 250 and either 314 (when it addresses German intellectual history) or 332
- History: HISTORY 338 and 344-1

Language and literature

- German: 2 quarter-courses including 1 chosen from 201, 205, 208 and 1 chosen from 324, 329, 332
- Linguistics: 3 quarter-courses including 2 at the 200 level and 1 at the 300 level

Minors in German

The Department of German offers two minors: a minor in German and a minor in business German. Each minor consists of nine courses. The minor in German is designed to give students solid language proficiency at the upper level and significant knowledge of German culture. The minor in business German is designed to prepare students for careers in government service or international business or for graduate study in international economics, management, trade, or law.

Prerequisites for advanced courses may not be taken for credit after the advanced course has been completed. Students returning from a study abroad program in their

junior year must enroll in one 300-level quarter-course in the department.

Minor in German (9 units)

• Language (4 units):

205 (may be repeated for credit with different topic)
203, 208, or 280

2 quarter-courses of 391, 1 on advanced grammar and composition and 1 on advanced conversation

• Literature/culture (4 units):

2 quarter-courses chosen from 201-1,2,3,4; 204; 215

2 quarter-courses chosen from 301; 310-1,2,3,4; 329; 332

• History (1 unit): 233-1, HISTORY 344-2 or 349

Minor in Business German (9 units)

• Language (4 units)

205 (may be repeated for credit with different topic)

2 quarter-courses chosen from 203 or 208

2 quarter-courses of 391, 1 on advanced grammar and composition and 1 on advanced conversation

• Business German (3 units): 1 quarter-course of 280 and 2 quarter-courses of 380 (380 may be repeated for credit with different topic)

• Economics (1 unit): ECON 201 or 202

• Literature/culture (1 unit): 1 quarter-course chosen from 201-1,2,3,4; 204; 215

Business German Examinations

Students completing a major with a concentration in business studies 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 affiliations in the United States that employ nearly 600,000 Americans.

Students successfully completing one quarter of 280 may take the *Zertifikat Deutsch für den Beruf*, an examination developed jointly by the Goethe-Institut and the Deutscher Volkshochschulverband. Students successfully completing two quarters of 380 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 more information on these examinations, see the German department's Web page at www.german.northwestern.edu.

Honors in German

Superior students majoring in German may qualify for departmental honors by completing two quarters of 398 or 399; two quarters of 400-level courses; or one quarter of 398 or 399 and one quarter of a 400-level course. In addition, they must present a research paper at the end of their

second quarter of honors study. Interested students should consult with the department's director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section of this catalog. Students are urged to contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Language Courses

GERMAN 101-1,2,3 Elementary German German language and culture. Understanding, speaking, reading, and writing of German.

GERMAN 102-1,2,3 Intermediate German German language and culture. Understanding, speaking, reading, and writing of German continued. Prerequisite: 101-3 or equivalent.

GERMAN 105-0 German for Research (0 units) Introduction to the translation of scholarly and scientific German texts. No prerequisites in the language.

GERMAN 203-0 Intermediate Conversation Practical training in communication skills with sole emphasis on listening comprehension and speaking. May be repeated for credit with different materials. Prerequisite: 102-2 or equivalent.

GERMAN 204-0 Foundations of Literary Study Bridges the gap between intermediate language courses and 200- or 300-level literary and cultural offerings. Emphasizes skills needed to work with literary, philosophical, and historical texts. Prerequisite: 102-3 or AP score of 3.

GERMAN 205-0 Intermediate Grammar and Composition Practice in the writing of short essays; German grammar and structure. May be repeated for credit with different materials. Prerequisite: 102-3 or equivalent or AP score of 3.

GERMAN 208-0 German through Reading News Periodicals Readings, discussions, and short writing assignments on current events reported in German newspapers and periodicals. Topics are generally chosen by the instructor in consultation with students. May be repeated for credit with different materials. Prerequisite: 102-3 or equivalent.

GERMAN 280-0 German in Commerce and Industry German language study oriented toward business. Emphasizes business-related communicative situations such as social interactions, business travel, oral and written contact with customers, basic sales dialogues, and basic business letters. Prepares students for the Zertifikat Deutsch für den Beruf exam. Prerequisite: one 200-level course in German or very strong performance in 102-3.

GERMAN 380-0 Advanced German in Commerce and Industry German language study oriented toward business and economics. Emphasizes review of specialized vocabulary in business and economics and practice of complex communicative situations in international trade, advertising, banking, and management. Other topics include economic geography, retailing, distribution, energy, and transportation. Prepares students for the Prüfung Wirtschaftsdeutsch International exam. May be repeated for credit with different materials. Prerequisite: 280 and a second 200-level German course; a 200-level course in economics is helpful.

GERMAN 391-0 Topics in Language Special topics in German language: for example, advanced grammar and composition; translation; advanced translation; stylistics; advanced conversation. May be repeated for credit with different topic.

Courses in Literature and Culture with Prerequisites in German

GERMAN 201-1,2,3,4 Introduction to German Literature Works from the 18th century to the present. Readings, lectures, discussions, and papers in German. Prerequisite: one 200-level course in German or very strong performance in 102-3.

GERMAN 215-0 Special Studies 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: 102-3 or equivalent.

GERMAN 301-0 The Dialectics of German Cultural Criticism German cultural life and the nation's political development is marked by the confrontation between proponents of a specifically "German culture" and advocates of an enlightened cosmopolitanism. This course traces this dialectic in German cultural and political life from the 1770s to 1918.

GERMAN 310-1,2,3,4 Epochs of German Culture Thought, literature, arts, and music of four epochs of German history in their sociopolitical contexts. **1.** Age of reason and revolution. **2.** Myths and monumentalism. **3.** German literature and politics, 1900–45. **4.** German literature and politics after 1945.

GERMAN 329-0 Topics in Literature Readings and discussions of topics in German literature, as announced annually. May be repeated for credit with different topic.

GERMAN 332-0 Topics in German Studies In-depth study of pivotal periods in German culture, as announced annually. May be repeated for credit with different topic.

GERMAN 398-0 Undergraduate Seminar (1–3 units) Advanced work through supervised reading, research, and discussion.

GERMAN 399-0 Independent Study Open to outstanding German majors with senior standing.

Courses with Reading and Discussion in English

No prerequisite in German required.

GERMAN 210-1,2,3 German Literature in Translation

1. Drama 2. The novella. 3. The novel.

GERMAN 212-0 Introduction to German Culture and Literature

Topics vary: for example, the fairy tale, Germanic mythology. May be repeated for credit with different topic.

GERMAN 220-0 The German Film Topics vary: for example, the pioneer film, “new” German cinema. May be repeated for credit with different topic.

GERMAN 233-1,2 German History and Culture German cultural, political, and intellectual history, from its origins to the present. 1. Reformation to founding of the Empire. 2. Imperial Germany to the present.

GERMAN 240-0 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 241-1,2 Jews and Germans: An Intercultural History 1. Jewish encounter 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. 2. Jewish culture–German culture: German-speaking Jewry from the late-19th century to 1935.

GERMAN 250-0 Introduction to Contemporary Germany German political, social, and cultural scene after 1945. May be repeated for credit with different readings.

GERMAN 261-0 Turn-of-the-Century Vienna: In Search of New Values Literature and thought of fin de siècle Vienna and their impact on the modern consciousness. Fiction, poetry, essays, plays by Freud, Schnitzler, Wittgenstein, Hofmannsthal, Musil, Karl Kraus, Schoenberg.

GERMAN 262-0 Berlin: The Golden '20s Literature, philosophy, fine arts, and architecture of the Weimar Republic (1918–33) as expressions of its intellectual debates and social upheavals. Remarque, Piscator, Mann, Spengler, the Bauhaus.

GERMAN 314-0 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.

Greek

See Classics.

History

The Department of History is distinguished by the breadth of its faculty’s expertise. The faculty includes nationally distinguished scholars in United States, European, Latin American, African, and Asian history. These 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.

As 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 purpose of the major is to help students understand themselves as products and makers of history by introducing them to historical patterns and problems in a variety of areas and periods as well as to different historical materials and techniques of analysis. It encourages students to learn to think critically and to search deeply in at least one area of concentration. Achievement of these goals depends heavily on effective use of faculty advice, and each student should see his or her adviser as soon as one is assigned. Thereafter, each student should confer with the adviser at least once each quarter to ensure smooth progress through the program of study.

Students majoring in history select one of four concentrations:

- History of the Americas
- English/European history
- African/Middle Eastern history
- Asian/Middle Eastern history

Students may arrange to emphasize certain special fields within the context of one of these four areas.

The program for majors consists of 11 graded quarter-courses in history and 5 graded quarter-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.

Departmental courses (11 units)

- 2 undergraduate seminars: 395 plus 1 chosen from 101, 102, 103, 392, 393
- 9 200- or 300-level quarter-courses: 5 in one of the four areas of concentration listed above and 4 that lie outside

the area of concentration and are distributed to provide both geographical and chronological variety

- 2 of the 11 courses must be a trailer seminar, preferably taken in the junior or senior year. (The trailer seminar consists of 2 courses: a lecture course plus a linked 395 seminar in a subsequent quarter. The trailer seminar need not be within the student's concentration.)
- At least 2 of the 11 courses must be in fields other than modern European or United States history. Such courses might be in the history of Europe before 1800 or in African, Asian, or Latin American history in any period.

Related courses (5 units)

- 5 quarter-courses of related subjects at the 200 or 300 levels, at least 2 of which must be at the 300 level and must be chosen from at least two programs or departments in the social sciences and humanities. The 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 course requirements (7 units)

- 7 history courses at the 100, 200, or 300 level; at least 3 must be at the 300 level
- 4 of those 7 courses must be in one of the following areas of concentration:
Europe, including Britain
United States
Latin America
Asia
Middle East
Africa
- At least 2 of those 4 courses must be at the 300 level
- 3 of the 7 courses must be outside the area of concentration

Honors in History

Superior students may qualify for departmental honors by enrolling in the honors seminar (398-1,2,3) during their senior year and completing a senior thesis judged to be of honors quality. See Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section 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 three 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 and sophomores only.

HISTORY 101-0 Introduction to Historical Analysis: European History

HISTORY 102-0 Introduction to Historical Analysis: American History

HISTORY 103-0 Introduction to Historical Analysis: Non-Western History

Africa

HISTORY 255-1,2,3 Background to African Civilization and Culture Historical approach to society, economy, polity, and culture in Africa. **1.** Origins of humankind to the mid-18th century. **2.** Mid-18th century to 1900. **3.** 1900 to the present.

HISTORY 355-0 Islam in Africa The spread of Islam in Africa, 7th century–present: a thematic approach emphasizing African Muslim scholars and reformers.

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 the history of Kenya, Uganda, and Tanzania.

HISTORY 358-1,2 West Africa Selected topics in West African history: economy, society, and government.

Asia

HISTORY 281-0 Chinese Civilization Chinese history from antiquity to the 18th century, emphasizing cultural and intellectual history.

HISTORY 284-0 Japanese Civilization Japanese history from antiquity to the 19th century. Integrates economic, political, intellectual, social, and cultural trends.

HISTORY 285-0 Indian Civilization History of Hindu culture from antiquity to the 20th century. Change and continuity in religious ideas, practices, institutions, caste, and family life.

HISTORY 381-1,2 History of Modern China **1.** Late Imperial China, 1600–1911. **2.** 20th-century China, 1911–present.

HISTORY 384-1,2 History of Modern Japan **1.** Japan: the modern state, 1860–1943. **2.** Postwar Japan, 1943–present.

HISTORY 385-0 History of India India since the mid-18th century. Focus on Hindu and Islamic cultural renovation movements, the politics of nation-building, and socio-economic change.

England and the British Isles

HISTORY 260-1,2 British History, 1066 to the Present

1. The British Isles from the Norman Conquest to the Glorious Revolution. **2.** Britain from the Glorious Revolution to the 21st century.

HISTORY 362-1,2,3 Modern British History **1.** Social, political, and institutional history, 1688–1815. **2.** The age of industrialization and liberalism, 1780–1900. **3.** The welfare state, democracy, and total war, 1900–present.

HISTORY 363-0 Modern Ireland in Historical Perspective History of Ireland from the Celts to the “troubles” in Northern Ireland; emphasis on 19th and 20th centuries.

HISTORY 364-1,2 Social and Intellectual History of Modern Britain **1.** Rise and fall of Victorian culture, 1780–1900. **2.** Main themes in 20th-century society and thought, 1900–present.

Europe

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 332-1,2,3 The Development of Medieval Europe **1.** Early Middle Ages, 300–1000. **2.** High Middle Ages, 1000–1300. **3.** Late Middle Ages, 1300–1500.

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 337-0 History of Modern Europe Survey of the political and social history of Europe between 1815 and 1945, with special 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 342-1,2,3 History of Modern France

1. The ancien régime and the French revolution, 1715–99. **2.** 19th-century France. **3.** 20th-century France.

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 344-1,2 Modern Germany German social, economic, political, and cultural developments since 1815. **1.** 1815–1918. **2.** 1918–present.

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 since 1945 The history of East-Central Europe from the World War II to the collapse of Soviet rule and beyond.

HISTORY 349-0 History of the Holocaust Origins and development of the massacre of European Jewry during World War II.

HISTORY 350-1,2,3,4 The Intellectual History of Europe **1.** Heritage from antiquity and the Middle Ages. **2.** From the Renaissance to the end of the 18th century. **3.** 19th century. **4.** 20th century.

HISTORY 351-0 History of Communism Marx’s Marxism and movements and regimes that have claimed to be Marxist. Specific content varies.

Latin America

HISTORY 291-0 Core Seminar in Latin American–Caribbean Studies Option for core seminar requirement in Latin American and Caribbean studies program. Also open to other students, but a reading knowledge of Spanish or Portuguese is desirable. Prerequisite: consent of instructor.

HISTORY 365-0 The Formation of Latin American Society Development of Latin American socioeconomic structures, political institutions, and cultural tendencies 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 Politics and Development in Latin America Political, economic, and social problems since 1880, with emphasis on the period since 1930. Interaction between economic change and politics of rapidly urbanizing societies.

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 East

HISTORY 270-0 Islam in History Influence of Islam on the components of Middle Eastern societies (nomads, agrarian and urban populations) from the inception of the faith (7th century A.D.) to the modern period.

HISTORY 274-0 History of Ancient Egypt (3100–30 B.C.) 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 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 374-0 Historical Background of Jewish-Muslim Relations Formation of Jewish-Muslim relations in the medieval Near East; process by which a common heritage became a basis for contention as well as mutual understanding.

United States

HISTORY 210-1,2 History of the United States
 Interpretative survey from the 17th century to the present. **1.** Colonial settlements to the Civil War. **2.** Reconstruction to the present. Lectures, discussion sections.

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.

HISTORY 215-0 Western Hemisphere Environments from 1492 to the Present Environmental change in the history of North and South America. Conquest, exploitation, and restoration of common resources. Human activity in the shaping of Western Hemisphere environments. Emergence of environmental movements. Emphasis on hemispheric aspects of environmental change.

HISTORY 301-1,2 Survey of African American History
1. Early migrations from the 16th century through the Civil War. **2.** Since the Civil War.

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 1890. **2.** Since 1890.

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 306-1,2 History of the American South From colonial settlement in the 17th century to the civil rights movements of the 1950s and '60s. **1.** The rise of slavery and the plantation system, formation of slave family and culture, sectional conflict, the Civil War, and emancipation. **2.** Reconstruction, segregation, and civil rights movements.

HISTORY 310-1,2 Early American History **1.** Cultural and social development of England's mainland colonies from the reign of Queen Elizabeth to 1750. **2.** Creation of a new republic: from revolution to the Constitutional Convention.

HISTORY 314-0 The 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 in the 20th Century America's domestic history and role in world affairs since 1900. **1.** 1900–29. **2.** 1929–60. **3.** 1960–present.

HISTORY 316-0 The Sixties Examination of one of the most tumultuous eras in U.S. 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 317-1,2,3 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.** 1607–1820. **2.** 1820–90. **3.** 1890–present.

HISTORY 318-1,2 Legal and Constitutional History of the United States **1.** Development of legal institutions, constitutionalism, law and social change, law and economic development, colonial period–1857. **2.** Law in industrial society: administration, race relations, corporations, environmental protection, civil liberties, 1857–present.

HISTORY 319-1,2,3 History of American Foreign Relations Evolution of American foreign policy, emphasizing domestic and international background and constitutional and military problems involved in planning policy. **1.** 1763–1900. **2.** 1900–45. **3.** 1945–present.

HISTORY 321-1,2 A History of American Society
 Organization and development of American society from the 18th century to the present. **1.** Problems of cultural diversity and social consolidation, 1760–1880. **2.** Problems of class and power, 1880–1970.

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. Prerequisite for 322-2: 322-1 or consent of instructor.

HISTORY 324-0 American Lesbian and Gay History
 Gender, sexuality, and the rise of modern lesbian and gay identities. Lecture and discussion.

HISTORY 326-0 American Intellectual History Central questions in America's intellectual past: inquiries into human nature and the self; 19th-century debates about freedom, race, and slavery; the emergence of pragmatism and the social sciences in the progressive era; and intellectual and scientific debates emerging from and contributing to social and economic practices.

History of Science and Technology

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 375-1,2 Technology:History, Society, and Economy Economic, cultural, and intellectual aspects of the history of technological change, including non-Western technologies, from medieval Europe to America. Students must enroll in both quarters; they receive a grade of K for work completed in the first quarter, and letter grades for both quarters that are determined by the second-quarter final research project. Prerequisites: 201 and 202 or ECON 201 and 202 or consent of instructor.

HISTORY 376-1,2 Science and Modern Society 1. Rise of science in early modern Europe and colonial America; relationship with philosophy, theology, and Enlightenment culture; science, society, and utopian thought. **2.** Science in Europe and America, 1800–present: physical sciences and the power to transform the world; biological and medical sciences and changing social values.

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.

Courses Primarily for Majors in History

HISTORY 391-0 Special Lectures Lecture courses given on special topics not covered in regular course offerings. Content varies. May be repeated for credit with consent of department.

HISTORY 392-0 Topics in History Advanced work through reading, research, and discussion in area of special significance. Graduate students permitted in some courses. Prerequisite: consent of instructor.

HISTORY 393-0 Seminar in Historical Writing Advanced work in the research, organization, and writing of selected subjects. Prerequisite: consent of instructor.

GEN LA 393-0 Chicago Field Studies Internship See General Studies in the beginning of the Weinberg course listings.

HISTORY 395-0 300-Trailer Seminar Research seminar linked to and following a designated 200- or 300-level history course; students research and complete a term paper on topic of choice related to prerequisite. Prerequisite: completion of a designated 200- or 300-level lecture course.

HISTORY 398-1,2,3 Honors 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 student's adviser and instructor.

Undergraduate Leadership Program Course

HISTORY 295-0 Leaders in History Emphasis on the historical context within which leadership is exercised. Figures, periods, and cultures vary from year to year.

History Courses in Other Departments

A history major may take no more than two quarter-courses listed below to satisfy the 11-course history requirement.

AF AM ST 214-1,2

CLASSICS 211, 212, 321-1,2,3

ECON 315, 318, 321, 323-1,2, 324

Humanities

Kaplan Center for the Humanities

The humanities are those branches of knowledge that are concerned with human thought and culture, including the traditional liberal arts such as philosophy, literature, and art. They can also include fields of study that are classified as social sciences, in particular history and art history, as well as some aspects of anthropology, sociology, and psychology.

The Alice Berline Kaplan Center for the Humanities fosters interdisciplinary conversation among humanists working with different materials and texts. Each year the center announces one or more interpretive themes designed to spark wide-ranging interdisciplinary debate among faculty and students and to be addressed in public lectures and an undergraduate seminar. The center also offers a number of interdisciplinary courses unrelated to the theme. It administers an internship program that places undergraduates in Chicago humanities and arts institutions. The center offers a minor in advanced interdisciplinary studies in the humanities.

For more information, visit the center Web site at www.northwestern.edu/humanities, call 847/491-7946, e-mail hum@northwestern.edu, or visit the center at 2010 Sheridan Road, Evanston, Illinois.

Minor in Humanities

The minor in advanced interdisciplinary studies in the humanities trains humanities and social science majors in interdisciplinary methods, topics, and theories and exposes them to contemporary developments and debates in disciplines other than their own.

The minor complements existing majors in small departments, which are often restricted in the diversity and range of their seminar offerings, and in large departments, which may find it difficult to make special provision for their students planning to continue graduate studies.

Minor course requirements (7 units)

- 395; may be repeated up to four times with change of topic for up to 4 units of credit
- 3 quarter-courses chosen from 301 and/or 302 (3 units)
- Balance of required credit may be earned by taking center courses, such as 390 or 399, or interdisciplinary courses offered by other departments, subject to approval by the associate director of the Kaplan Center. Students applying for the minor must present records showing that at least 5 courses have not been double-counted in their major. Students pursuing a minor in advanced interdisciplinary studies in the humanities must consult with the associate director of the center to establish their program.

Sample program: 3 seminars (395) on themes such as arts and publics or literature, gender, and racial respectability; 3 units of 301 and/or 302; and 1 internship (390).

Courses

HUM 301-0 Topics in the Humanities Interdisciplinary issues and current research in the humanities, such as politics of commemoration and arts of remembrance; Western visions of maternity, sexuality, and family; Freud and psychoanalytic theory. May be repeated for credit with change in topic.

HUM 302-0 New Perspectives in the Humanities New issues in the humanities and current innovative research, for example, philosophy and time; imagining other worlds (readings in early science and science fiction); fairy tales, theories, and rewritings. May be repeated for credit with change in topic.

HUM 390-0 Humanities Internship Placement at a Chicago cultural institution or theater, such as the Chicago Humanities Festival, Art Institute, Lyric Opera, or Newberry Library, for approximately 10 hours per week; entails a research project supervised by a Northwestern faculty mentor. Prerequisites: grade point average of 3.0 or higher and consent of center director.

HUM 395-0 Humanities Seminar Interdisciplinary course developed around visits by eminent humanists from various fields who address the Kaplan Center's yearly theme or themes — e.g., literature, gender, and racial respectability; Asia as point of departure: off-setting the West; or gender,

science, and anatomy: imagining the early modern body. Prerequisite: consent of center director.

HUM 399-0 Independent Study

Integrated Science Program

The Integrated Science Program (ISP) is a highly selective curriculum of natural sciences and mathematics presented predominantly in small classes at an accelerated pace. ISP courses emphasize the common base and interrelationships of the sciences, including the importance of mathematics and the development of first principles, leading to advanced 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 for permanent employment. The curriculum is composed of 23 quarter-courses as well as a regular seminar series. Most students take advantage of the opportunity to pursue research. ISP may lead to a three-year bachelor of arts degree if, by the end of the third year, the student has completed 36 or more quarter-courses and satisfied all other college requirements.

Admission is by special application to the director of ISP. For more information on admission procedures, see the description of ISP under Academic Options in the Undergraduate Education section of this catalog. Also see the Admission section for achievement tests required.

The ISP curriculum consists of specially designed courses taught by faculty members of science and mathematics departments. Course descriptions are found with 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. Specific second major requirements for ISP students can be found under individual departments in this catalog. For more information, see the ISP Web page at www.isp.northwestern.edu.

Major in Integrated Science

• First year

INTGSCI 101-1,2,3
CHEM 171, 172
MATH 291-1,2,3
PHYSICS 125-1,2,3

• Second year

BIOL SCI 212-1, 212-2
CHEM 212-1, 348
GEOL SCI 315
MATH 391-1, 391-3
PHYSICS 339-1,2

• Third year

ASTRON 331
BIOL SCI 310, 311
MATH 391-2
PHYSICS 339-3

INTGSCI 398 may substitute for up to 3 of the following courses: ASTRON 331; BIOL SCI 310 or 311; MATH 391-2 or -3; PHYSICS 339-3.

Courses

INTG SCI 101-1,2,3 Computing Applications Introduction to formulation and solution of scientific problems on the computer. One-third credit each quarter.

INTG SCI 398-0 Undergraduate Research Advanced work for superior students through reading, research, and independent study. Consent of ISP director required.

International Studies Program

International studies, an undergraduate interschool adjunct major that is taken in conjunction with a departmental major, is open to Weinberg College students. (See International Studies Program in the Other Undergraduate Programs section of this catalog.)

Italian

See French and Italian.

Jewish Studies Program

The Jewish Studies Program focuses on Judaism, not only in its narrow sense as a religious phenomenon but also in its broader sense as a phenomenon of 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.

Minor in Jewish Studies

The minor in Jewish studies requires completion of seven courses in three areas: history, literature, and religion. Courses chosen to meet the requirements must be approved by the director of undergraduate studies.

Minor course requirements (7 units)

- RELIGION 210 or equivalent course on the history of ancient Israel
- 1 course on the history or culture of the Jewish people in the Middle Ages
- 1 course on the history or culture of the Jewish people in the modern period
- 2 courses on Jewish literature from any period
- 2 courses on religion chosen from RELIGION 224, 306, 331, 332, 334, 335, 352, or equivalent

For students who also satisfactorily complete two years of language study in Hebrew, requirements for the minor consist of 5 courses: 3 in history and 1 each in literature and religion.

Students applying for the minor in Jewish studies must present records showing a minimum of 5 courses not double-counted in their major.

Course

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.

Latin

See Classics.

Latin American and Caribbean Studies Program

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 are encouraged to study in a Latin American or Caribbean country through the programs offered by the Study Abroad Office or to get to know the Latin American and Caribbean communities of Chicago through LATIN AM 389, 390, or 391, or the interdivisional course GEN LA 393 Chicago Field Studies Internship.

Minor in Latin American and Caribbean Studies

Eight courses are required for the minor in Latin American and Caribbean studies, including two core courses, three courses to fulfill requirements, and three elective courses. All students in the program are expected to have an effective reading knowledge of Spanish, Portuguese, or another language spoken in the region. To qualify for the minor, students must present a minimum of five courses not double-counted in their majors. Students who would like more information about the minor should contact the program director.

Core courses: Students must take a minimum of 1 course each on the history, literature, and politics of Latin America or the Caribbean, as follows:

- POLI SCI 356
- SPANISH 260, 261, 361, or 390 or 395 (when relevant to Latin America, the Caribbean, and/or U.S. Latinos)
- ANTHRO 390 or 490 (when relevant to Latin America, the Caribbean, and/or U.S. Latinos)
- HISTORY 365 or 366

Elective courses: Students should take an additional 4 courses on Latin America and the Caribbean chosen from the course list below. Many departments, especially anthropology, history, political science, and Spanish and Portuguese, regularly offer courses on Latin America, the Caribbean, and/or U.S. Latinos; these may be counted towards the minor with the consent of the program director. Students are advised to consult the University Web site for the most up-to-date course catalog listings.

Courses

LATIN AM 251-0 Introduction to Latino Studies

Introduction to major material and historical themes that have shaped U.S. Latina/o communities, with focus on parallels of colonization, assimilation and cultural resistance, mestizaje, and contemporary expressions of cultural innovation. The course will primarily address Mexican American and mainland Puerto Rican communities, histories, and experiences, stressing commonalities and distinctness of latinidad in the United States, discussing Cuban Americans and Central Americans, and examining the role of race, gender, sexuality and sexual orientation in the shaping of Latina/o histories and identities past and present.

LATIN AM 351-0 Topics in Latino Studies Topics may include Latino literature, Latino art, immigration issues, Latinos and the law, borderlands ethnography; Latinos and Latinas (gender issues), Latino drama and theater, Latino history, and sociology of Latinos and Hispanics in the United States.

LATIN AM 389-0 Introduction to Urban Field Research Theory and methods of ethnographic field research; preparation for field research projects with community-based organizations serving Latin American and Caribbean communities in Chicago; introduction to creative ways of communicating research, such as exhibitions, forums, or related public education programs.

LATIN AM 390-0 Urban Field Research Program

Advanced, intensive field research and seminar program for variable course credit (2–4 credits; if taken for 4 credits, the course comprises the student's entire course load for the quarter); open to advanced undergraduate students in the social sciences. Students conduct original ethnographic research on Latin American and Caribbean communities in Chicago and receive training in creative strategies of public education.

LATIN AM 391-0 Human Rights and Migration in the Americas Introduction to the fundamental tenets of international human rights law, their counterparts in U.S. asylum law and immigration policy, and evolving strategies for addressing human rights violations.

LATIN AM 396-0 Gender in Latin America Examination of the intersections of feminism, class, and social activism in Central and South America as well as in the context of Latina/o experiences in the United States; role of competing notions and expressions of masculinity, femininity, and sexuality in the construction of public discourses and social movements.

Related Courses in Other Departments

- AF AM ST 245, 345
- ANTHRO 328, 330 (when relevant to Latin America, the Caribbean, and/or U.S. Latinos), 390 (when relevant)
- ART HIST 235
- HISTORY 291, 365, 366, 367, 368-1,2, 369, 392 (when relevant)

- POLI SCI 353, 356, 390 (when relevant)
- SPANISH 211, 230, 231, 260, 261, 301, 340, 341, 342, 343, 344, 345, 346, 347, 361, 380, 390 (when relevant)

Legal Studies Program

Legal studies, an undergraduate adjunct major that is taken in conjunction with a departmental major, is open to Weinberg College students. (See Legal Studies Program in the Other Undergraduate Programs section of this catalog.)

Linguistics

Linguistics is the scientific study of language, aimed primarily at determining the mental structures that support linguistic knowledge, acquisition, and 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, 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 actively 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 eligible to apply for the four-year BA/MA program in linguistics.

Major in Linguistics

Departmental courses

Introductory courses 250, 260, 270

Advanced courses 9 courses beyond the 200 level, including 350, 360, and 370. (A methods course chosen from LING 330, 331, 332, 333, or 334 may be substituted for one 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 undergraduate adviser.

Related courses: 4 courses selected from other departments in consultation with the linguistics undergraduate adviser.

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 course requirements

- 250, 260, 270
- 5 courses beyond the 200 level, including 2 chosen from 350, 360, 370 (A methods course chosen from LING 330, 331, 332, 333, or 334 may be substituted for one of these courses.)

Honors in Linguistics

At the invitation of the department, an outstanding senior majoring in linguistics may be eligible for departmental honors by successfully completing a self-designed, faculty-supervised research project on a topic of his or her choice. The research project culminates in a senior thesis that, in conjunction with the student's record in linguistics and related courses, forms the basis for the awarding of honors. For more information about guidelines and requirements for earning honors, consult the department.

Four-Year BA/MA Program

Students with a strong record in their major courses and an interest in pursuing linguistics at the graduate level are eligible to apply for the four-year BA/MA program in linguistics. Applications should be made no later than spring quarter of the junior year. To be considered for this program, students must demonstrate that they will be able to complete by the end of their senior year all Weinberg College requirements for the BA degree plus the department's requirements for the MA degree. See Accelerated Master's Programs in the Undergraduate Education section of this catalog.

Courses Primarily for Undergraduates

All 200-level linguistics courses have an experimental requirement. Students may fulfill this requirement by either participating in two experiments of one hour each or by attending two designated lectures of one hour each. The experiments will be part of ongoing research in the department and will illustrate features of language structure and use that are relevant to topics covered in the core linguistics curriculum. The lectures will be part of the regular speaker series organized by the Language and Cognition Program.

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. Speech codes, the balance between rules of civility and freedom of speech, "politically correct" language, the language policies of schools and governments, and the imposition of language standards.

LING 222-0 Language, Politics, and Identity The role of language in constructing, preserving, and manipulating political and national identities. Topics include linguistic nationalism, language laws, rights of minority languages, language discrimination, language and religion, alphabet issues, language and dialect as ethnic identity, standard language, and others. Regional content varies depending on interests and expertise of instructor.

LING 240-0 Languages of the World Survey of the world's major language families. Varying and universal features of human language. Topics include human versus nonhuman systems of communication, the sounds and gestures of human language, writing systems, word formation and inflection, sentence structure, and word order variation.

LING 250-0 Sound Patterns in Human Language

Introduction to the formal and instrumental analysis of the sound structure of language. The description of speech sounds in terms of articulation in the human vocal tract, physical acoustic output, and human perception. Cross-linguistic similarities and differences. The patterning of speech sounds to convey meaning. Introduction to contemporary 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 Introduction to and formal analysis of core issues in semantics and pragmatics, including inference types (entailment, implicature, presupposition), sense and reference, quantification, and anaphora; acquisition and processing of linguistic meaning; linguistic issues in the philosophy of language.

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 310-0 Psycholinguistics Introduction to experimental and developmental psycholinguistics. Mental processes underlying the comprehension, production, and acquisition of language. Structure of the human lexicon and parser. Innateness versus learning in acquisition.

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 312-0 Second Language Acquisition Major theories of second language acquisition and current issues in the field. Cognitive, linguistic, and sociocultural variables affecting second language learning.

LING 320-0 Sociolinguistics Linguistic diversity in multi-dialectal and multilingual societies. Correlations between

linguistic variables and social categories. Language planning and policy; diglossia.

LING 321-0 Bilingualism Social and linguistic factors in the acquisition of two or more languages. Effects of bilingualism on phonology, syntax, the lexicon, and cognition.

LING 322-0 Language Variation Differences in language that correlate with historical periods, geographic regions, and societal groupings (e.g., age, race, ethnicity, gender, social class).

LING 323-0 Language and Gender Differences in the language used by and about men and women. Cross-cultural gender differences in language and language attitudes.

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 325-0 Language and Medicine Analysis of language patterns used in medical settings, including doctor-patient interaction and technical language use. Prerequisite: 200-level course or senior standing.

LING 326-0 Language and the Law Survey of contemporary social science research on the interaction of language variables and our legal system; application of linguistics to the resolution of legal cases. Prerequisite: 200-level course 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 331-0 Formal Foundations of Linguistic Theory An overview of the formal foundations of linguistic theory. Topics include set theory, trees and lattices, feature structures and unification, formal languages, complexity, and probabilistic grammars. Prerequisite: 250, 260, or 270.

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 333-0 Methods in Developmental Linguistics Methods of investigating children's knowledge of grammatical structure. Experimental design; review and application of statistics; executing developmental linguistic research and reporting of results. Prerequisite: 311.

LING 334-0 Introduction to Computational Linguistics Hands-on introduction to computational methods in empirical linguistic analysis and natural language processing. Topics include the use of text corpora and other sources of linguistic data; morphological analysis, parsing and language modeling; and applications in areas such as information retrieval and machine translation.

LING 340-0 Historical Linguistics Principles of the comparative method and the method of internal reconstruction. Historical syntax. Quantitative methods in historical linguistics.

LING 341-0 Language Typology A comparison of varying and universal features of the world's languages. Topics include word order, case systems, relative clauses, and grammatical relations. Prerequisite: 260 or consent of instructor.

LING 342-0 Structure of Various Languages Phonological, morphological, and syntactic structure of a particular language. May be repeated for credit with change in language.

LING 350-0 Fundamentals of Laboratory Phonology Articulatory 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: consent of instructor.

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, speech acts, inference types (e.g., entailment, implicature, presupposition), and the semantics-pragmatics interface. Prerequisite: 270 or consent of instructor.

LING 371-0 Reference Philosophical and linguistic approaches to the study of reference.

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

Mathematical Methods in the Social Sciences Program

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. However, most undergraduate programs in the social sciences do not incorporate mathematical approaches in an organized and consistent manner. Consequently, undergraduate students in traditional

programs do not receive systematic preparation in mathematics. The Mathematical Methods in the Social Sciences (MMSS) Program was created to give students an opportunity to acquire these skills and to become acquainted with modern analysis of social systems.

Major in Mathematical Methods in the Social Sciences

MMSS enables students to combine the study of social sciences with training in formal analytical methods. The program is for students with high mathematical aptitude and strong interest in social problems and issues, including their policy and research implications. It provides excellent preparation for graduate study in social or managerial sciences as well as for careers that require both quantitative skills and a solid background in the social sciences.

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.) In the first two years of the program, students enroll in a coordinated sequence of 12 one-quarter courses (two courses per quarter) covering mathematical methods and their applications in the social sciences. These courses are open only to MMSS students and are taught at an advanced level that is appropriate for this select group of students. In their 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 also fulfill the requirements of their joint major.

Required courses

- First year: MMSS 211-1,2,3; MATH 292-1,2,3
- Second year: MATH 308; MMSS 311-1,2; MATH 392-1,2,3
- Senior year: MMSS 398-1 and either MMSS 398-2 or MMSS 398-3

Admission to the MMSS program is very selective; it is limited to entering freshmen and to Northwestern sophomores with superior academic records and a demonstrated strong aptitude in mathematics.

Prerequisite for admission consideration is a full-year course in calculus. High school students fulfilling this prerequisite are encouraged to enter the program as freshmen. Students lacking calculus but planning to enter the program as sophomores should complete at least two quarters of calculus (MATH 214-1,2) in their freshman year.

Applicants who wish to enter the program as freshmen must apply both to Northwestern and to the MMSS program. Students who plan to apply as sophomores are advised to register for a 200-level calculus/linear algebra sequence such as MATH 290-1,2,3 or ES APPM 252-1,2,3 in their freshman year. Students with less preparation in mathematics will be considered for admission but may be required to take all or part of the first-year MMSS math sequence.

Applicants or current students who wish to be considered for the program may request an application from the MMSS director, Walter Annenberg Hall, Room G26, Evanston, Illinois 60208-2630.

Honors in Mathematical Methods in the Social Sciences

MMSS students who write an outstanding senior thesis may be nominated by the faculty to graduate with program honors. A Weinberg College committee awards honors after reviewing recommendations. Typically, more than half of all MMSS students graduate with program honors.

Minor in Mathematics for MMSS Students

MMSS students wishing to develop a more sophisticated understanding of mathematics and formal analysis of models are encouraged to take MATH 310-1,2,3. MMSS students successfully completing this sequence and the other required MMSS courses (including MATH 292-1,2,3, MATH 392-1,2,3, and MATH 308) will receive a minor in mathematics.

Courses

MMSS 211-1,2,3 Quantitative Social Science for MMSS:

First Year 1. Introduction to formal models in the social sciences. **2.** Individual decision making and microeconomics. **3.** Collective decision making and political economy.

MATH 292-1,2,3 Accelerated Mathematics for MMSS:

First Year See Mathematics.

MATH 308-0 Foundations of Higher Mathematics See Mathematics.

MMSS 311-1,2 Quantitative Social Science for MMSS:

Second Year 1. Game theory. **2.** Formal models of political decision making.

MATH 392-1,2,3 Statistical Methods for MMSS: Second Year See Mathematics.

MMSS 351-0 Financial Markets and Investments

Economic analysis of financial markets and investment theory. Portfolio theory and its implications for security pricing (CAPM and APT), mutual fund performance evaluation and asset allocation, and derivative securities.

MMSS 356-0 Business Strategy and Organization

Economic analysis of the design of organizations, including the relationship between organizational structure and corporate and competitive strategy. Incentive pay, internal labor markets, cooperation and coordination between divisions, strategic commitment, horizontal diversification, vertical integration, and vertical relationships such as franchising and licensing.

MMSS 394-0 Special Topics Advanced work for investigating topics of current interest. Offered in different quarters; may be repeated for credit with different topic. Prerequisite: third-year standing in MMSS or consent of instructor.

MMSS 398-1,2,3 Senior Thesis Seminar

Mathematics

Mathematics, often celebrated as the “Queen of the Sciences,” has long been a basic 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 explore both the foundations and the frontiers of the discipline.

The department offers majors in mathematics and applied mathematics and a minor in mathematics. The mathematics major emphasizes the foundations of the modern mathematical sciences while also permitting exploration of applications. The applied mathematics major is intended for students whose primary interest is the application of mathematics in the biological, social, and behavioral sciences, management, or engineering.

Students with sufficiently strong preparation who are interested in a more rigorous approach to the subject are encouraged to enter the Mathematical Experience for Northwestern Undergraduates Program (MENU). The department also encourages properly prepared students to enroll in its graduate courses.

MENU Program

The Mathematical Experience for Northwestern Undergraduates Program (MENU) is designed for students who have a passion for mathematics and a solid background in calculus. It is ideal for mathematically talented students who are considering a major in mathematics, the physical sciences, or economics, though it is by no means restricted to them.

MENU course work consists of 290 and 340, two specially designed yearlong courses normally taken in the freshman and sophomore years. Since admission to 290 is based on results of the CEEB Advanced Placement Examination (preferably the BC exam), it is strongly recommended that high school students with a keen interest in mathematics prepare for and take this exam. Students who have a solid grasp of calculus of one variable (including both differentiation and integration) and who have not taken an AP examination are encouraged to speak to the MENU director to determine if enrolling in 290 instead of 214-3 is appropriate for them. The director of MENU is available as an adviser for all MENU students, regardless of their major, during their time at Northwestern.

Further information on MENU is available on the Department of Mathematics Web site.

Placement in Calculus

Students who have never taken calculus should enroll in 214-1. Students who have taken calculus in high school should enroll in the most advanced course appropriate to their background. The following guidelines apply:

- Students who have completed a semester of calculus and received a grade of B or higher should ordinarily register for 214-2.

- Students who have completed a year's course in calculus and received a grade of B or higher should ordinarily register for 214-3.
- Students who have studied multivariable calculus and/or linear algebra should consult the department's calculus coordinator.

To help determine the appropriate placement, students may take the department's online Self-Placement Examination. The calculus coordinator is also available to advise students who are unsure about their correct placement.

General Course Recommendations

Students who have mastered the elements of single-variable calculus and are seeking an early introduction to theoretical mathematics should consider enrolling in MENU.

Other students who are interested in mathematics, the natural sciences, economics, or engineering, including premedical students, should begin in the standard calculus sequence 214-1,2,3. Those interested in economics may replace 214-2,3 with 214-4.

Students who intend to major in the behavioral sciences and students in the Medill School of Journalism often take 210 and 211 rather than 214-1,2,3, especially if they are concerned about the level of their math skills.

Students seeking to fulfill the Area II distribution requirement by taking mathematics courses who do not intend to do more advanced work in mathematics may choose from the 100-level courses, 210, and 211.

Material from 214-3, 215, 219, and 221 is also covered in 291-1,2,3. Other sequences such as 290-1,2,3, 292-1,2,3, and ES APPM 252-1,2,3 cover substantial parts of this material. For further information about equivalences, students may consult the director of undergraduate studies. Students should not mix and match courses from different sequences without prior consultation with the director of undergraduate studies; credit may be disallowed for course work that shows excessive duplication of subject matter.

Major in Mathematics

Departmental courses

Basic courses 214-1,2,3; 215; 219 or 290-1,2,3 or equivalent

Required major courses 9 300-level courses offered by the department, including 334 or 337-1, as well as one of the complete sequences 310-1,2,3 or 330-1,2,3 or 337-1,2,3. Students may not count both 334 and 337-1 toward the major without departmental consent (though both may count toward the 45 courses required for graduation). With prior departmental consent, as many as 3 of the 9 courses may be 300-level courses offered by other departments that focus on serious applications of mathematics or have substantial mathematical content.

While 221 is not required for mathematics majors, it is strongly recommended. Most majors should take 308 as early as possible in their course of study. Those with a bent

for abstraction may be able to skip this course and should consult with the director of undergraduate studies. Students considering graduate work in mathematics should take all of 310 and 337 as well as 328.

Major in Applied Mathematics

Departmental courses

Basic courses: 214-1,2,3; 215; 219; 221 or 290-1,2,3 or equivalent

Required major courses: 300 300-level courses distributed as follows:

- 334
- 2 course groups chosen from the following 4 combinations (substitution of substantially equivalent courses requires prior departmental consent):
301-1,2
303 or 316; 305; 313-1
310-1,2
330-1,2,3 or 330-1 together with IEMS 303, 304
- A coherent set of 3 or more additional courses in an area making substantial use of mathematics, such as computer science, economics, applied mathematics, geology, industrial engineering, physics, and statistics; coherent sets of courses in other areas may also qualify. Advance approval of this part of the program by the department's director of undergraduate studies is required.

General Advice for Majors

A course in computer science is valuable for students majoring in mathematics or applied mathematics. Students in either major who are interested in probability and statistics or in a career as an actuary should take 330-1,2,3 and one or more courses in statistics (e.g., STAT 350, 351, 352, or 355). They should complete their major requirements by taking courses chosen from 310, computer science courses, and courses that apply probability and statistics. Students interested in economics should take 310 and 330 as well as ECON 380 and/or 381.

Minor in Mathematics

Basic courses: 214-1,2,3; 215; 219 or 290-1,2,3 or 292-1,2,3 or equivalent

Required courses: a total of 6 300-level courses offered by the department, including at least 1 2-quarter sequence chosen from 310-1,2, 330-1,2, or 337-1,2. With prior consent from the director of undergraduate studies, students may fulfill the 2-quarter sequence requirement by taking 310-2,3, 330-2,3, 337-2,3 or another 2-quarter sequence regularly offered by the department that provides a focused, in-depth introduction to a subfield of mathematics.

With prior consent from the director of undergraduate studies, students may count toward the major up to 2 courses with a substantial mathematical component offered by departments other than mathematics. No such course,

however, may be simultaneously counted toward the student's major requirements or, if the course is offered in a school other than Weinberg College, toward the student's school requirements.

Mathematics Second Major for ISP Students

The Integrated Science Program (ISP) 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 mathematics may not substitute ISP 398 for any mathematics course in the ISP curriculum and must also complete one of the full-year sequences 310-1,2,3 or 337-1,2,3 in lieu of all major requirements listed above. It is recommended (but not required) that ISP students planning graduate work in mathematics take both of these sequences.

Honors in Mathematics

Majors in mathematics or applied mathematics with outstanding records may be nominated for graduation with departmental honors. Those graduating under the regular mathematics option must have completed both 310-1,2,3 and 337-1,2,3. Those graduating under the applied mathematics option must have completed 310-1,2,3. In exceptional cases, students who have not completed these courses may also be considered for honors.

To be nominated for departmental honors, a student must also complete with distinction two quarters of independent study or two quarters of a graduate course, as well as an acceptable project that culminates in an honors thesis. Finally, the student must have a grade point average of 3.5 or above in courses counted toward major requirements. (Calculation of the grade point average in the major excludes grades for basic courses.)

For more information on honors, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete the relevant requirements as outlined in the SESP section of this catalog. Students should contact the Office of Student Affairs in SESP as early as possible in their academic careers.

Courses Primarily for Undergraduates

Prerequisites for mathematics courses may be waived with the consent of the director of undergraduate studies; after such a course has been completed, such waived prerequisites may no longer be taken for credit. No 100-level course may be taken for credit after a 200- or higher level course has been completed. See individual course descriptions for other restrictions.

MATH 104-0 Games and Fallacies Number puzzles and games; conceptualizing numbers; common fallacies. For non-science students who wish to understand the charm of pure mathematical play or the spirit of mathematical applications.

MATH 110-0 Survey of Modern Mathematics I Set theory, probability and statistics, matrices, number theory.

MATH 111-0 Survey of Modern Mathematics II
Additional topics in modern mathematics. 110 is not a prerequisite.

MATH 210-0 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 211-0 and 214-1. Course is not suitable for those planning to major in mathematics, the natural sciences, or economics, and does not prepare for 214-3. 210 is not a prerequisite.

MATH 213-0 Review of Calculus of One Variable
Elements of differential and integral calculus with an emphasis on problem solving, for entering students who have had calculus in high school. As a prerequisite for other courses, 213 is equivalent to 214-2. Students may not receive credit for both 213 and 214-2, for both 213 and 211, or for 214-1 if taken after 213. Prerequisite: one year of high school calculus.

MATH 214-1,2,3 Calculus 1,2. Differential and integral calculus of one-variable functions. **3.** Vector algebra, vector functions, partial derivatives. Students may not receive credit for both 214-1 and 211 or for 214-3 and any of the following: 290-2, 291-1, or 292-2.

MATH 214-4 Calculus Integration, vector algebra, vector functions, partial derivatives, optimization. Covers material from 214-2 and 214-3 specific to the social sciences, especially economics; not recommended for students studying the natural sciences. Acceptable as preparation for 219, 221, and certain 300-level mathematics courses (see individual course descriptions). Students may not receive credit for both 214-4 and 214-3 or any course equivalent to 214-3. Prerequisite: 214-1.

MATH 215-0 Multiple Integration and Vector Calculus
Double and triple integrals. Line and surface integrals. Cylindrical and spherical coordinate systems. Change of variable in multiple integrals; Jacobians, gradient, divergence, and curl. Theorems of Green, Gauss, and Stokes. Students may not receive credit for both 215 and any of the following: 290-3, 291-1, or 292-3. Prerequisite: 214-3.

MATH 219-0 Linear Algebra with Economics Applications
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 219 and any of the following: 290-1, 291-3, or 292-1. Prerequisite: 214-3 or 214-4.

MATH 221-0 Elementary Differential Equations Applications of calculus and linear algebra to the solution of ordinary differential equations. Students may not receive credit for both 221 and 291-2. Prerequisite: 214-3 or 214-4 plus 219 or concurrent registration in 219.

MATH 290-1,2,3 MENU: First Year 1. Linear algebra. Similar to 219 but in greater depth. **2,3.** Multidimensional calculus. Similar to 214-3 and 215 but in greater depth. Students may not receive credit for both 219 and 290-1, for both 214-3 and 290-2, or for both 215 and 290-3. Prerequisites: 1 year of calculus (usually in high school) and consent of department.

MATH 291-1,2,3 Accelerated Mathematics for ISP: First Year 1. Vector differential calculus and multidimensional calculus. **2.** Vector integral calculus, differential equations, infinite series. **3.** Linear algebra, differential equations. Open only to students in ISP.

MATH 292-1,2,3 Accelerated Mathematics for MMSS: First Year 1. Linear algebra. **2.** Continuation of linear algebra; multidimensional calculus. **3.** Multidimensional calculus. Prerequisite: first-year standing in MMSS.

MATH 301-1,2 Mathematical Models in Finance Analytic modeling of financial problems. Theory of interests. Basic financial concepts (stocks, bonds, options, arbitrage, hedging). Introductory ordinary and partial differential equations. Elementary probability theory (normal distribution, law of large numbers, central limit theory). Random walk and Brownian motion as a tool of modeling fluctuations. Option pricing. The Black-Scholes formula. Method of discrete approximation (finite difference and finite sampling). Prerequisite: 221 or equivalent. Acquaintance with basic differential equations and probability theory is desirable.

MATH 303-0 Differential Equations Intermediate course. Qualitative theory of ordinary differential equations. Linear systems, phase portraits, periodic solutions, stability theory, Lyapunov functions, chaotic differential equations. Prerequisite: 221 or equivalent.

MATH 304-0 Game Theory Selected topics in game theory: noncooperative games, matrix games, optimal strategies, cooperative games. Prerequisite: 219.

MATH 305-0 Complex Variables for Applications Complex numbers, functions of a complex variable, theory of analytic functions, series development, analytic continuation, contour integration, conformal mapping. Students may not receive credit for both 305 and ES APPM 311-3 without departmental consent. Prerequisite: 221.

MATH 308-0 Foundations of Higher Mathematics Introduction to fundamental mathematical ideas — such as sets, functions, equivalence relations, and cardinal numbers — and basic techniques of writing proofs. May not be taken

for credit after 310-1 or 337-1 without prior departmental consent. Prerequisite: 219.

MATH 310-1,2,3 Introduction to Real Analysis Sets, functions, limits, properties of the real number system. Metric spaces. Foundations of differential and integral calculus, including Riemann integral and infinite series. Lebesgue integration. Fourier series. Primarily for undergraduates; may be taken by graduate students only with prior departmental consent. Prerequisites: 215, 219, 308.

MATH 313-1,2 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: 219.

MATH 316-0 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 316 and 391-1, or for 316 and ES APPM 311-2. Prerequisite: 221.

MATH 320-0 Combinatorics and Discrete Mathematics Discrete mathematics emphasizing relations with calculus. Summation, difference equations, floors and ceilings, divisibility and primes, binomial coefficients, partitions, and generating functions. Prerequisites: 214-2 and 219 or consent of instructor.

MATH 326-0 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: 214-3 or 214-4.

MATH 328-0 Introduction to Topology Point-set topology. Prerequisites: 308; 310-1 (may be taken concurrently).

MATH 329-0 Introduction to Differential Geometry Curves and surfaces in three-dimensional space. Prerequisites: 215, 219.

MATH 330-1,2,3 Probability and Statistics **1.** Discrete probability spaces. Random variables. Expected value. Combinatorial problems. Special distributions. Independence. Conditional probability. Introduction to continuous case. **2.** Integrating density functions. Convolutions. Law of large numbers. Central limit theorem. Random walk. Stochastic processes. **3.** Elementary decision theory. Estimation. Testing hypotheses. Bayes procedures. Linear models. Nonparametric procedures. Students may not receive credit for both 330 and 392. Prerequisites: 215, 219.

MATH 334-0 Linear Algebra for Applications Linear functions, complex vector spaces, unitary and Hermitian matrices. Jordan canonical form. Selected applications from networks and incidence matrices, least squares approximation, systems of differential equations, fast

Fourier transform, finite element method, linear programming. Students may not take both 334 and 337-1 for credit toward the major without departmental consent. Prerequisite: 219.

MATH 335-1,2 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: 214-3.

MATH 337-1,2,3 Introduction to Modern Algebra

1. Abstract theory of vector spaces and linear transformations, including canonical forms. Prerequisites: 219 and 308 or consent of instructor. Students may not take both 337-1 and 334 for credit toward the major without departmental consent. **2.** Groups and their structure; elementary ring theory. Prerequisite: 337-1. **3.** Rings, modules, and fields with applications to the impossibility of certain ruler and compass constructions. Prerequisite: 337-2.

MATH 338-1,2,3 MENU:Algebra **1.** Groups and their structure, including the Sylow theorems; elementary ring theory; polynomial rings. **2.** Basic field theory; Galois theory. **3.** Module theory, including application to canonical form theorems of linear algebra. Prerequisites: 308 and 340-1,2,3 or consent of instructor.

MATH 340-1,2,3 MENU:Second Year **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. Both 340-1 and 340-2 have a significant computer component. **3.** Topics in analysis and differential equations. Prerequisites: 290-1,2,3.

MATH 375-0 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 376-0 Theory of Computability and Turing Machines Algorithms, computability, decidability, enumerability; formal replacements and Church's thesis. Turing machines, primitive recursive functions, mu-recursive functions, recursive functions. Undecidability predicates; the undecidability and incompleteness of arithmetics. Prerequisite: consent of instructor.

MATH 391-1,2,3 Accelerated Mathematics for ISP: Second Year **1.** Fourier series and boundary value problems. **2.** Probability and statistics. **3.** Complex analysis, elements of group theory. Students may not receive credit for both 316 and 391-1 or both 305 and 391-3. Ordinarily taken only by students in ISP. Prerequisites: 291-1,2,3; PHYSICS 125-1,2,3.

MATH 392-1,2,3 Accelerated Mathematics for MMSS: Second Year **1.** Probability theory and its social science applications. **2,3.** Econometric methods. Students may not

receive credit for both 330 and 392. Prerequisite: second-year standing in MMSS.

MATH 395-0 Undergraduate Seminar (1–4 units) Topics of modern mathematics and relationships among different branches of mathematics. Open only to superior students by consent of department. 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 study and have a definite plan of study. Students who wish to enroll in 399 must file a plan of study with the department before registration.

Neurobiology and Physiology

The Department of Neurobiology and Physiology does not offer a major to incoming students. See Biological Sciences Undergraduate Program for a description of the major in biological sciences.

Philosophy

Perhaps the most notable feature of the Department of Philosophy is its pluralism — its commitment to exposing students to a broad range of philosophical traditions and issues. The department, with strengths in both Anglo-American and contemporary continental philosophy, 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 a double 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 can tailor a program that meets most fully their particular interests. Full descriptions of the courses offered each quarter are available in the department office two weeks before advance registration.

Departmental courses (12 units)

Students should complete these required courses, especially 210-1 and -3, as early as possible, since material covered is a prerequisite to more advanced work.

- Logic: 150
- History of philosophy: 210-1, -3, 313, and 1 chosen from 210-2, 263, or 264

- Of the remaining 7 courses, at least 4 must be at the 300 level; none may be at the 100 level.

Of the 12 courses required for majors, 1 may be a course offered outside the department that 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 students to be familiar with contemporary logic, at least up to the level of the first-order predicate calculus. Beyond this foundational requirement, students take four courses tailored to their individual interests and, typically, to complement work being done in their major. To provide the greatest latitude for this, only three of the four remaining courses need be at the 300 level.

Minor course requirements (8 units)

- 4 foundation courses: 150, 210-1, -3; 263 or 264
- 4 philosophy electives: no 100-level courses, at least 3 300-level courses

Honors in Philosophy

To receive honors, a student must have a grade point average of 3.5 or above in the philosophy major and declare candidacy before the spring quarter of the junior year. Declaration of candidacy involves approval of an honors project by a faculty adviser. The candidate then takes 398 in three successive quarters beginning in the spring quarter of junior year and submits a paper demonstrating an appropriate level of research or reflection. The paper is read by the adviser and another faculty member. Their comments are submitted to the Committee on Undergraduate Studies, which recommends approved nominations to the Weinberg College Committee on Superior Students and Honors. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 -3 in their first year.

PHIL 109-6 Introductory Seminar in Philosophy

Introduction to philosophy: special topics or a general survey. Offered in small discussion-oriented classes.

PHIL 110-0 Introduction to Philosophy

Fundamental problems and methods of philosophy.

PHIL 150-0 Elementary Logic I

Study of argument through the use of elementary formal systems of deductive

inference. Informal fallacies and nondeductive modes of inference. First quarter of 150-250-350 sequence.

PHIL 205-0 Introduction to Asian Philosophy Main philosophical themes, methods, and developmental histories of four major Asian traditions of thought: Hinduism, Buddhism, Taoism, and Confucianism.

PHIL 216-0 Introduction to Pragmatism Introduction to classical and contemporary literature in pragmatist philosophy: Peirce, James, Mead, Dewey, and 20th-century neo-pragmatist authors (Quine, Rorty, Putnam, et al.).

PHIL 210-1,2,3 Introduction to Existentialism

1. Ancient philosophy. 2. Medieval philosophy. 3. Early modern philosophy.

PHIL 219-0 The History of Philosophy Principal sources of existential philosophy: Kierkegaard, Jaspers, Marcel, Nietzsche, Sartre, Heidegger, Merleau Ponty, and others.

PHIL 250-0 Elementary Logic II Formal systems of deductive inference and their properties. Translation from ordinary language to formal languages, including first-order quantification and identity and related philosophical problems. Second quarter of 150-250-350 sequence. Prerequisite: 150.

PHIL 254-0 Scientific Method in 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. Prerequisite: 1 course in the natural sciences.

PHIL 255-0 Theory of Knowledge Basic philosophical questions about human knowledge, focusing on skepticism; competing theories of knowledge.

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 263-0 Classics of Ethical Theory Classical works of moral philosophy from the ancient through the modern periods. Intended primarily for students who are or may become philosophy majors or minors.

PHIL 264-0 Classics of Political Theory Classical works of political philosophy from the ancient through the modern periods. Intended primarily for students who are or may become philosophy majors or minors.

PHIL 265-0 Introduction to the Philosophy of Law Ethical and conceptual issues arising in connection with

the law, such as the nature of law, the nature of liberty and of justice, and the theory of punishment.

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.

Courses Primarily for Juniors and Seniors

PHIL 310-0 Studies in Ancient Philosophy Works of one or more important philosophers or philosophical movements before A.D. 500. May be repeated for credit with change of topics.

PHIL 311-0 Studies in Medieval Philosophy Works of one or more important philosophers or philosophical movements between A.D. 500 and 1500. May be repeated for credit with change of topics.

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 topics.

PHIL 313-0 Kant's Critique of Pure Reason Close examination of Kant's masterwork.

PHIL 314-0 Studies in German Philosophy Study of one or more key themes, figures, or historical developments in German philosophy from the 18th to the 21st century. May be repeated for credit with change of topics.

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 topics.

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 topics.

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 topics.

PHIL 318-0 Studies in Contemporary Philosophy Selected philosophical works of the later part of the 20th century or the 21st century. May be repeated for credit with change of topics.

PHIL 319-0 Existentialism and Its Sources Intensive study of one or a small number of major contributions to the existentialist tradition.

PHIL 324-0 Phenomenology Major works contributing to the phenomenological movement: texts by Husserl, Heidegger, Sartre, and Merleau-Ponty. Questions of methodology, together with problems in theory of knowledge and ontology.

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 different 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 Explanations for decisions, what it is to decide, possible constraints on decisions, how and why deliberation occurs, how to understand preference reversals and actions taken against one's better judgment.

PHIL 350-0 Systematic Logic Formal systems of deductive inference. Metatheory, formal semantics, completeness, and set theory. 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.

PHIL 354-0 Advanced Topics in the Philosophy of Natural Science Discovery, conceptual change and the growth of scientific knowledge, explanation, relation of theory to observation, confirmation theory, space and time, causality, and philosophical implications of relativistic and quantum mechanics. Prerequisite: 250 or consent of instructor.

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 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, currently refractory to empirical investigation, 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 topics.

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 topics.

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 topics.

PHIL 363-0 Philosophy of History Theories of history and historiography, examining issues such as historical memory, the objectivity of interpretation, narrative structures, freedom and causal determinism, teleological purpose, and the social responsibility of the historian.

PHIL 365-0 Advanced Studies in the Philosophy of Law Normative and conceptual issues arising in legal contexts.

PHIL 366-0 Advanced Studies in the Philosophy of Religion Central problems in the philosophy of religion.

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 topics.

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 372-0 Philosophy of Education Educational theories of representative philosophers as related to their culture and the problems of their times.

PHIL 380-0 Philosophy of Art 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 topics.

PHIL 398-1,2,3 Senior Tutorial Undergraduate honors thesis. Grade of K given in 398-1 and -2. Prerequisite: Consent of instructor.

PHIL 399-0 Independent Study Open to properly qualified students with consent of instructor.

Physics and Astronomy

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.

Students who major in physics and astronomy normally take PHYSICS 135-1,2,3 in their freshman year. Exceptionally qualified students may take PHYSICS 125-1,2,3 with consent of the department. Depending on their high school preparation, majors in physics and astronomy normally study mathematics in their freshman and sophomore years, starting with one quarter in the sequence MATH 214-1,2,3 and continuing with MATH 215, 219, 221, and 316. (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 291-1,2,3.)

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, 120, 130. PHYSICS 103, 105, and the five astronomy courses allow students who have taken only high school mathematics to explore important ideas in the physical sciences.

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.

Physics and astronomy courses

Basic courses (6 units)

- MATH 214-1,2,3, or equivalent
- PHYSICS 125-1,2,3 or 135-1,2,3

Core sequence (9 units)

- MATH 215, 219, 221, or 291-1,2,3; 316
- PHYSICS 330-1, 332, 333-1, 339-1, 359-3

(Note: Taking MATH 214-1,2,3 in combination with MATH 215, 219, and 221 is equivalent to the combination of MATH 221 with MATH 290-1,2,3.)

Concentrations

Majors must choose one or more of the following areas:

- Advanced physics (6 units)
PHYSICS 330-2, 333-2, 339-2, 359-1
Two other 300-level physics or astronomy courses except PHYSICS 301, 335, 398, and 399 and ASTRON 399
- Astronomy (6 units)
PHYSICS 330-2, 333-2, 339-2
ASTRON 220
Two other 300-level astronomy classes except 398 or 399
- Biomedical Physics (8 units)
CHEM 101 and 102 or 171 and 172
PHYSICS 359-1
BME 301, 302, 320, and 2 courses selected from 321, 323, or 327
- Computational Physics (7 units)
Prerequisite: knowledge of Fortran, C, or C++
ES APPM 311-1 or 346
MATH 330-1
PHYSICS 252, 359-1
Three electives chosen from the following:
at least 1 300-level physics or astronomy course (excluding 335, 398, and 399)
ES APPM 311-2,3, 322
COMP SCI 310, 336
MATH 313-1,2, 317-1,2, 330-2,3
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, or 380
Students intending to go to graduate school to continue their study of physics and/or astronomy should also 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 305, 334
• Selected introductory graduate courses such as PHYSICS 412-1,2,3

Students should discuss specific options in undertaking this advanced program of study with the director of undergraduate studies before the end of the sophomore year.

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 two physics electives. Students choosing the minor in physics must also complete the following six prerequisites or their equivalent.

Prerequisites: MATH 214-1,2,3; PHYSICS 125-1,2,3 or 135-1,2,3

Minor sequence (8 units)

- MATH 215, 219, and 221; or 221 and 290-1,2,3; or 291-1,2,3
- PHYSICS 330-1; 333-1; 335 or 339-1
- 2 other 300-level physics or astronomy courses except 398 or 399

Physics Second Major for ISP Students

The Integrated Science Program (ISP) is a highly selective BA program in Weinberg College that includes PHYSICS 125-1,2,3 and 339-1,2 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 both ISP and physics by taking 6 additional upper-level courses in physics and astronomy:

- PHYSICS 359-1 or 359-3
- PHYSICS 330-1,2 or PHYSICS 333-1,2 and 3 courses chosen from 300-level physics or astronomy courses other than PHYSICS 301, 335, 398, 399, or ASTRON 399.

Students pursuing an ISP/physics double major may not substitute ISP 398 for any physics or math course in the ISP curriculum.

Honors in Physics or Astronomy

The honors program in physics or astronomy provides outstanding physics or astronomy majors with the opportunity to participate in research under the supervision of a faculty adviser selected by the student. The program culminates in a written report that, in conjunction with the student's academic record, forms the basis for faculty decisions on the award of departmental honors. (Note: Students may participate in research without being in the honors program. Students are welcome to initiate research projects by enrolling in 399 at any point in their undergraduate studies.)

The honors program is administered by the department's Undergraduate Curriculum Committee. This committee consists of the director of undergraduate studies, the assistant chair, and three other faculty members appointed by the chair of the department. The director of undergraduate studies serves as the departmental honors coordinator.

Physics and astronomy majors are eligible to participate in the honors program when they maintain an overall grade point average of 3.3 or higher and a grade point average of 3.3 or higher in all physics, astronomy, and mathematics courses. These criteria also apply to all classes taken after the student has formally entered the honors program. Students who do not satisfy these requirements at graduation cannot be granted departmental honors.

Students who meet the above criteria and wish to participate in the honors program must notify the director of undergraduate studies. If students have not yet selected

an honors research adviser, the director can assist them in finding an appropriate faculty mentor.

Further details on completing the honors program and writing the honors thesis can be obtained from the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section 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 4 or 5 on the College Board Advanced Placement Physics C1 examination (Mechanics) and/or the C2 examination (Electricity and Magnetism) will give the student full credit for PHYSICS 135-1 and/or 135-2, respectively.
- A score of 4 or 5 on the College Board Advanced Placement Physics B exam (algebra-based physics) will give the student full credit for PHYSICS 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 course.)
- 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 Primarily for Undergraduates

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 291-1,2,3, 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. 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 214-1,2; concurrent registration in MATH 214-3. **2. Electricity and magnetism.** Prerequisite: 135-1. **3. Introduction to modern physics; wave phenomena.** Prerequisite: 135-2.

PHYSICS 252-0 Introduction to Computational Physics Computing and its application to physics: Monte Carlo simulation, numerical integration of equations of motion, discrete element methods in electromagnetism. Prerequisite: 135-3.

PHYSICS 301-0 Radiation in the Environment In-depth look at radioactivity in the environment, including physical descriptions of radiation and the biological basis for radioactive standards. Nuclear power generation, nuclear waste, techniques for detecting radioactive contamination, and the effects of electromagnetic radiation. Does not fulfill 300-level requirement for majors.

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 bodies, systems with many degrees of freedom. Prerequisites: 135-1 or equivalent; MATH 215, 219, 221, or equivalent.

PHYSICS 331-0 Thermodynamics Equations of state, the three laws of thermodynamics, entropy, phase changes, ideal gas, applications. Prerequisites: 135-1,2,3 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 215, 219, 221, 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 215, 219, 221, 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 316.

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 359-1,3 Physics Laboratory 1. Introduction to modern electronics, construction of elementary analog and digital circuits. **3.** Classic experiments in atomic, nuclear, and solid-state physics using modern electronics and microcomputers. Independent work. Prerequisites: 333-1,2 or consent of instructor; 359-1 is not a prerequisite for 359-3.

PHYSICS 398-0 Honors Independent Study 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

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 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. Three lectures, one computer lab.

ASTRON 220-0 Highlights of 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 16-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 by 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

A knowledge of political science is central to any occupation or profession that needs an understanding of human behavior, to the relationships between people and governments, or to the analysis and communication of information about public problems. A background in political science is virtually indispensable for people in politics and government, lawyers, journalists, scientists, business managers, or people working in medicine. Such professionals are in constant need of information on and understanding of the political, legal, governmental, and public implications of their fields.

The Department of Political Science is internationally recognized for excellence at both the undergraduate and graduate levels. The department is especially strong in American politics and government; the politics of foreign countries, especially in Europe, Latin America, Asia, and Africa; law and politics; political economy; international studies; and political theory. Much of the department's work is associated closely with the activities of the Program of African Studies, the Center for International and Comparative Studies, and the Institute for Policy Research, all of which are outstanding in their respective specialties.

Major in Political Science

As soon as students declare a major in political science, they meet with members of the departmental advising team. Students who intend to study abroad should discuss their options early in their sophomore year. Students planning to major in political science are advised to complete the 200-level prerequisites and at least one 300-level course in political science by the end of their sophomore year.

To prepare for research, students normally take the required 395 in the junior year. They should take at least one of the following before taking 395: 310, 311, 312. All majors also are urged to acquire mastery of a foreign language.

Departmental courses

Basic courses 3 courses chosen from 201, 204, 220, 221, 230, 240, 250

Major courses 7 300-level courses in political science, 1 of which must be 310, 311, or 312 and another of which must be 395

Related courses 5 quarter-courses in anthropology, economics, history, philosophy, psychology, or sociology, of which at least 2 must be at the 300 level; no more than 1 may be at the 100 level

Minor in Political Science

The minor in political science offers students the opportunity to acquire a solid foundation in the discipline as well as significant exposure to advanced courses. It also is designed to allow students to develop specialized competencies.

Minor course requirements (6 units)

- At least 2 200-level courses chosen from 201, 204, 220, 221, 230, 240, 250
- 4 additional political science courses, at least 3 at the 300 level

Students should begin pursuing the minor with 200-level courses, which provide a general introduction to major subfields of political science as well as background for 300-level courses. They may pursue specialized interests in the minor. For example, for students who aspire to a legal career, an appropriate minor might concentrate on law and politics and could include 230, 330, 331, 332, or 333. Minors may follow similar pathways for concentrations in political philosophy, urban politics and policy, international relations, comparative politics, and American political processes, or they may choose an array of courses that cut across subfields rather than concentrate on one or two areas. To develop an individual program of study for a minor in political science, students must consult with a member of the departmental advising team.

Four-Year BA/MA

The department offers a four-year BA/MA program in political science for exceptionally talented and highly motivated undergraduate majors. Interested students should contact both the director of undergraduate studies and the

director of graduate studies no later than the winter quarter of the junior year. Participation in the BA/MA program requires admission to the graduate program by the department. For other important information, see Accelerated Master's Programs in the Undergraduate Education section of this catalog.

Honors in Political Science

Majors with outstanding records both overall and within the department may apply for graduation with departmental honors. The primary route to earning the departmental recommendation for honors involves enrolling in 398, a two-quarter course that requires writing a senior thesis. Students interested in exploring an alternate route to honors should meet with the director of undergraduate studies in the junior year. Departmental honors requires outstanding work in connection with a research project. See also Honors under Academic Policies earlier in this section of the catalog.

Certificate of Achievement in a Foreign Language

Mastery of a foreign language has become increasingly indispensable to the understanding of politics, at home as well as abroad. To encourage students to study language, the Department of Political Science offers a certificate of achievement in a foreign language that can be earned by meeting one of the following three requirements (or through some combination thereof approved by the director of undergraduate studies):

- 3 courses in a foreign language beyond the relevant school language requirement, 2 of which may be counted toward the major's "allied field" requirement
- 3 courses in a foreign language through study abroad
- course work in a foreign language (research, reading, and/or writing) in 3 political science classes as approved by the course instructor and 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 (SESP) and complete all requirements as outlined in the SESP section 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 Undergraduates

American Politics

These courses deal with the dynamics of behavior within and between domestic political institutions. Although focusing on American politics, the courses usually involve comparisons with behavior and institutions in foreign countries.

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 social and economic structure of community.

POLI SCI 320-0 The Presidency Contemporary presidency in terms of recruitment, presidential character, public opinion, institutional constraints, and foreign versus domestic policy making. 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. Relationships between political structure and community needs and demands. Prerequisite: 221.

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 but 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 U.S. Congress. Prerequisite: 220 or equivalent.

POLI SCI 327-0 African American Politics in the United States Historical survey of black politics and relationship of blacks to the government. Relevance of reformist and revolutionary strategies in the struggle for black liberation.

POLI SCI 328-0 State Politics of the United States Political process at the state level in the United States. Variety of institutional forms and decision-making processes attached to different kinds of issues existing in the several states. Prerequisite: 220.

Comparative Politics

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; socialist and/or capitalist states. Major issues include regime-society relations, revolution, and policy making.

POLI SCI 351-0 Peasant Politics Characteristics of agrarian economic structures, social organizations, and peasant politics, movements, and revolutions; elite responses to and interactions with rural society through public policy, clientelist mobilization, etc.

POLI SCI 352-0 Politics of East Asia Examines East Asia as a site for studying various concepts in comparative politics: war, revolution, imperialism, modernization, dependency, development, authoritarianism, party politics, and democratization.

POLI SCI 353-0 Politics in 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 Southeast Asian Politics Exploration of the political economy of Indonesia, Singapore, Burma, the Philippines, Thailand, Malaysia, and Vietnam, as well as the smaller states of Laos, Cambodia, East Timor, and Brunei. Focus on the post-World War II period; colonial influences and the Japanese invasion. Important themes include industrialization, human rights, and democracy.

POLI SCI 356-0 United States and Latin America Interactions between U.S. foreign policy and Latin American politics. The evolving importance of Latin America in U.S. geostrategic objectives from the turn of the century through the Cold War and during the emerging post-Cold War period. How the projection of U.S. power and influence shapes the domestic politics of selected countries.

POLI SCI 357-0 Politics of Postcolonial States Problems and political behavior in underdeveloped areas in regard to their internal affairs and international relations. Interplay between economic conditions and political patterns.

POLI SCI 358-0 Nationalism Social, linguistic, religious, and political bases of the rise of modern nationalism in Europe, Asia, and Africa; wars of national liberation in relation to imperialism and colonialism.

POLI SCI 359-0 Politics in Africa Political structures and relation of cultural factors to political stability and change; development of modern political systems.

POLI SCI 360-0 Comparative Racial Politics The interplay of racial, socioeconomic, and cultural tensions in Germany, Trinidad, and Britain. Methods of comparative analysis used to identify and distinguish patterns of racial politics between and within multiracial nation-states. Theories and concepts of race and ethnicity and their relationship to issues of state power, national identity, and social policy.

POLI SCI 361-0 Democratic Transitions Causes for emergence and breakdown of democracy in cases from Europe, Latin America, Africa, and Asia. Focus on relationship between capitalist economic development, international forces, and timing of democratization across the globe.

POLI SCI 362-0 Politics of Western Europe Historical development, mass behavior, interest groups and parties, policy making, and social and economic policy.

International Politics

This field includes the study of major actors and arenas in the world scene, major 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. Issues in international security, international political economy, and international cooperation.

POLI SCI 340-0 International Relations Theory Theoretical underpinnings of international relations. Systematic comparison of contemporary competing theories including realism, liberalism, Marxism, and postmodernism, and concepts such as power, hegemony, interest, identity, and rationality.

POLI SCI 341-0 International Political Economy Introduction to the politics of international economic relations. The roots and evolution of the international political economy since World War II; current debates over trade, finance, and development.

POLI SCI 342-0 International Organizations Examination of the role of international organizations in facilitating cooperation between states. Study of selected international organizations that may include the United Nations, World Trade Organization, International Monetary Fund, and European Union; issues such as environmental protection, international security, and economic cooperation.

POLI SCI 343-0 International Law Introduction to the politics of international law. Influence of politics on formation and interpretation of international law; influence of international law on international politics.

POLI SCI 344-1 Foreign Policy Comparative study of foreign policy formulation and implementation. Determinants and consequences of foreign policies made by countries with different characteristics. Students undertake case studies of foreign policy issues in the country of their choice. Prerequisite: 240.

POLI SCI 344-2 U.S. Foreign Policy Foreign policy processes and issues in the United States. Economic, military, and diplomatic dimensions of policy; internal and external influences on policy; theories of foreign policy decision making in the United States and other nations.

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 ethical conduct and self-interested behavior on the part 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.

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.

Law and Politics

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 The Politics of Local Justice Local justice systems, with emphasis on trial courts, civil and criminal litigation, and the political consequences of the involvement of the law in social conflicts.

POLI SCI 331-0 Appellate Processes Operation of appellate courts, with emphasis on the United States Supreme Court. Decision making by appellate courts and the development of public policy.

POLI SCI 332-0 Constitutional Law I Introduction to interpretation of the United States Constitution by the Supreme Court. Judicial review, federalism, separation of powers, economic and religious liberty, and personal privacy. Prerequisite: 220 or 230.

POLI SCI 333-0 Constitutional Law II: Civil and Political Rights Consideration of decisions of the United States Supreme Court dealing with civil and political rights, including equality, freedom of expression, and criminal procedures. Prerequisite: 220 or 230.

Political Theory

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 201-1,2 History of Political Thought An introduction to political theory by way of consideration of major figures and topics from the classical period through the 19th century. Topics include justice, the Greek polis, the

modern state, individualism, representative democracy.

1. Philosophy and democracy in Ancient Greece. 2. Politics and theory in modern Europe and early America.

POLI SCI 301-0 Moral Dilemmas and Political Theory Study of the political implications of moral theory.

Consideration of how traditional moral theories deal with dilemmas of citizenship, nationality, and abortion. Texts include *Antigone*, the Book of Ruth, Kant's *Groundwork*, Mill's *Utilitarianism* and others.

POLI SCI 302-0 Critics of Modernity 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.

POLI SCI 303-0 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: 201-1, 201-2, or equivalent.

Public Policy and Political Economy

The consequences of governmental action on political, social, and economic activity are analyzed in these courses. Other courses concerned with public policy and political economy are listed under the law and politics and international politics subfields.

POLI SCI 204-0 Politics and Nature Introduction to the study of environmental policy. Consideration of some fundamental issues and concepts concerning the maintenance of a livable planet, such as sustainable development, common property regimes, transformation of the environmental movement from a primary emphasis upon nature conservation to a complex set of foci concerning biodiversity, possible climate change.

POLI SCI 371-0 Environmental Politics Political problems associated with human impact on natural environment; pollution, natural resources, public lands, land use, energy, and population.

POLI SCI 374-0 Politics and Markets How democratic politics and markets interact. Examines the politics of policy choices democratic governments make and the economic impact those choices have. Explores some of the most significant ways in which the United States, Western Europe, and Japan differ.

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.

Research Methodology

Courses in this field prepare students to do 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 Elementary Statistics for Political Research Measuring political data, summarizing observations, analyzing contingency tables. Parametric and nonparametric tests of hypotheses. Basics of multiple regression. SPSS computer usage.

POLI SCI 311-0 Methods of Political Research Introduction to methods and techniques of political research: research design, experimentation, comparative inquiry, measurement, data collection, and data analysis. Application of these methods to political phenomena.

POLI SCI 312-0 Logic of Political Inquiry Political science as "science." Identity sources, construction, functions, and validation of social science theory and explanation from varied perspectives.

POLI SCI 315-0 Introduction to Positive Political Theory Rational-choice modeling: developing underlying principles through central theoretical topics as applied to particular empirical issues.

Seminars, Independent Study, and Special Opportunities

Political Research Seminar (395) is required of all political science majors, who will be notified of scheduling arrangements in advance. 395 is ordinarily taken in the spring quarter of the junior year or the fall quarter of the senior year. With consent of the department, students may receive full credit for more than one quarter of 395 provided that, if 398 and 399 are also taken, 395 with 398 and 399 do not exceed a total of four course credits.

POLI SCI 390-0 Special Topics in Political Science Designed for investigation of topics that are of current interest to students and faculty but are not adequately covered by other course offerings. No prerequisites. Offered in different quarters as announced.

GEN LA 393-0 Chicago Field Studies Internship See General Studies in the beginning of the Weinberg course listings.

POLI SCI 395-0 Political Research Seminar Led by different members of the department, small seminars in research topics, providing students the chance to conduct research.

POLI SCI 398-1,2 Honors Tutorial For seniors with excellent records, by department invitation. First quarter taken fall or winter for K grade; final grades given after research paper at end of second quarter. Two consecutive quarters. Prerequisite: 395.

POLI SCI 399-0 Independent Study Study and research programs for unusual needs of political science majors. A written proposal, signed by the professor with whom the student will study, to be submitted to the department.

Portuguese

See Spanish and Portuguese.

Psychology

The study of psychology covers a wide range of topics in the natural and social sciences. It provides students a unique 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 can lead in various directions after graduation. Graduate study can prepare students for a career as an academic, clinical, industrial, or other kind of psychologist. Since the department is strong in cognitive science, psychobiology, psychopathology, and social psychology, psychology is a useful major for students planning careers in 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 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

Departmental courses

Basic course110

Major courses201, 205, and at least 7 additional psychology courses, including

- At least 1 upper-level research course chosen from 301, 316, 321, 326, 333, 334, 335, 351, 357, 358, 359, 360, 362, 363, 386, 392, 397-2, 398 (any course listed both here and in one of the following two categories may be counted toward that category as well)
- At least 2 personality, clinical, or social psychology courses chosen from 204, 215, 301, 303, 306, 316, 326, 357, 384, 385, 386
- At least 2 cognitive psychology or neuroscience courses chosen from 212, 228, 312-1,2, 321, 324, 333, 334, 335, 358, 360, 361, 362, 363, 364; COGSCI 210,211
- At least 3 300-level courses
- No more than 1 quarter of 397-1 and 399 may be counted toward the requirements; a student may not count both courses toward the major.
- No more than 1 quarter of 397-2 may be counted toward the requirements

- No more than 2 total credits of 397 and 399 may be taken in any quarter
- No more than 9 total credits of 397, 398, and 399 may be counted toward Weinberg College graduation requirements

Related courses

2 200-level mathematics courses plus 3 additional courses chosen from the following: any 200-level mathematics course; any 300-level statistics course; any biological sciences, chemistry, computer science, or physics course at any level; ANTHRO 213; COGSCI 207; COMMSCI 202, 203, 301, or 302. With department permission, PSYCH 351 may also be counted 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 general prerequisite (110), the two central methods courses (201 and 205), and at least one course from each of the two main content areas defined for the major.

Minor course requirements (7 units)

- 110, 201, and 205
- 4 additional psychology courses, including
 - At least 1 personality, clinical, or social psychology course chosen from 204, 215, 303, 326
 - At least 1 cognitive psychology or neuroscience course chosen from 212, 228, 312-1, 324, 361, 362; COG SCI 210, 211
 - At least 2 300-level psychology department courses
- No more than 1 quarter of 397-1 and 399 may be counted toward the requirements; a student may not count both courses toward the major.

Psychology Second Major for ISP Students

The Integrated Science Program is a highly selective BA program within Weinberg College (see Integrated Science Program). Students in ISP who also wish to complete a major in psychology should consult with the program director and the director of undergraduate studies in psychology as early as possible to determine their specific additional major requirements.

Honors in Psychology

Each spring quarter, juniors with outstanding academic records are encouraged to apply for the honors program for the following academic year. Those who are accepted enroll in 398 in the fall and carry out a yearlong research project. The honors thesis is a report of the findings of this project. Completion of the project and department approval of the final paper typically lead to departmental honors in psychology. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

Courses Primarily for Freshmen and Sophomores

PSYCH 110-0 Introduction to Psychology Basic psychological facts and principles of normal behavior. Laboratory experience is included and provides an introduction 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 in social behavior, including thinking about and interacting with other people and 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.

Courses Primarily for Juniors and Seniors

PSYCH 301-0 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 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 Neurobiology and Behavior 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 316-0 Experimental Social Psychology Social psychological research techniques, including laboratory experiments, field experiments, and quasi-experiments. Students conduct original research. Prerequisites: 204, 205.

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 324-0 Perception Human perception, particularly vision. 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. Prerequisite: consent of instructor. Prerequisites: 205; 204, 215, or 218.

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 COGSCI 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 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 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 360-0 Human Memory and Cognition In-depth survey of recent work in human memory and cognition. Prerequisite: 205 and 228 or consent of instructor.

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; or consent of instructor.

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; COGSCI 210) or consent of instructor.

PSYCH 364-0 Topics in Cognitive Neuroscience Topics spanning cognitive, computational, and systems-level neuroscience and cellular approaches to understanding the human mind/brain. Prerequisite: a course in cognition and/or neuroscience (e.g., 212, 228, 312-1, 361; BIOL SCI 306, 326; COG SCI 210; CSD 303) or consent of instructor.

PSYCH 384-0 Interpersonal Relations Psychological processes in social perception and interaction; focus on attraction and relationships, aggression, and conflict. 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 projects. Prerequisites: 204, 205.

PSYCH 392-0 Practicum in Child Development Direct contact with children and a site supervisor, under the direction of a faculty member. Weekly seminar. Integration of current developmental research with practicum experience. Prerequisites: 205, 218.

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 with the same professor as 397-1.

PSYCH 398-1,2,3 Undergraduate Honors Seminar (1–4 units) Senior honors research. Students must apply for admission in the spring quarter of their junior year.

PSYCH 399-0 Independent Study Consent of instructor required.

Religion

Because religion is a multifaceted phenomenon, the academic study of religion and the religious is a multidisciplinary field. The undergraduate major in religion is designed to develop an understanding of several major religions through study of their historical development, sacred literature, and social manifestations. The faculty's training and the course offerings concentrate on the traditions of Hinduism, Buddhism, Judaism, Christianity, and Islam, as well as on American and Chinese religion, though courses in other areas are presented occasionally. Study of the interaction of two or more traditions constitutes a regular part of the curriculum and the extracurricular seminars, lectures, and discussions. Undergraduate majors and minors enjoy a wide range of extracurricular events, informal social gatherings, and daily association with the faculty, staff, and graduate students.

The major and minor in religion provide a coherent and balanced set of departmental courses with work on general theories of religion and on Western and Eastern religious traditions. 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. Students submit their proposed programs for approval to the department director of undergraduate studies. Majors and minors are permitted to preregister for up to two courses per quarter.

Major in Religion

The major consists of 12 courses in the department:

- 110
- 395
- 10 other religion courses

Of the 12 required courses, 10 must be beyond the 100 level, with at least 6 at the 300 or 400 level. Further, of these 10, at least 2 must be in Eastern religions (Buddhism, Hinduism, Chinese religions) and at least 2 in Western religions (Christianity, Judaism, Islam). In satisfying the requirement for these 10 courses, students may substitute up to 2 courses on religion from outside the

department. These must be chosen from the list of related courses below or approved in advance by the director of undergraduate studies.

Related courses

ANTHRO 350

HISTORY 270, 374

PHIL 266

SOCIOL 314

Minor in Religion

The minor consists of 6 courses in the department:

- 110 or 395
- 5 other religion courses beyond the 100 level, with at least 3 at the 300 or 400 level. Further, of these 5, at least 1 must be in Western religions (Christianity, Islam, or Judaism) and at least 1 in Eastern religions (Buddhism, Hinduism, Chinese religions).

Honors in Religion

Superior students in the department become eligible for departmental honors by writing a senior thesis in addition to completing the 12 courses required for the major. This is usually accomplished by enrolling in two quarters of 396 during the fall and winter quarters of their senior year. Students who intend to qualify for honors should notify the undergraduate adviser in writing by the end of the spring quarter of the junior year. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

Courses Primarily for Freshmen and Sophomores

RELIGION 110-0 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 111-0 Varieties of Religious Tradition Introduction to a variety of the major religious traditions of the world.

RELIGION 210-0 Introduction to the Hebrew Bible Major genres of Old Testament literature. Basic theological views and the social-political history of ancient Israel.

RELIGION 211-0 New Testament Origins The beginning, development, and content of the New Testament. Its Jewish and Hellenistic environment.

RELIGION 220-0 Introduction to Hinduism Unity and diversity of Hindu mythology, beliefs, and practices from ancient times to the present.

RELIGION 222-0 Introduction to Buddhism The Buddha's life and teachings, the traditions that developed from this teaching, and the systems of meditation, rituals, and ethics.

RELIGION 223-0 Religion in China Historical development of religious traditions in China from ancient to modern times; Confucianism, Taoism, and Buddhism.

RELIGION 224-0 Introduction to Judaism Main concepts in the theology of Judaism, main rituals and customs, and main institutions.

RELIGION 225-0 Religion in Japan Introduction to the religions in Japan from ancient to modern times, including Shinto, Confucianism, Taoism, and Buddhism.

RELIGION 226-0 Introduction to Christianity Doctrine, worship, and institutions in the various branches of Christianity.

RELIGION 227-0 Introduction to Medieval Jewish Philosophy Medieval Jewish philosophy, focusing on the thought of Moses Maimonides (1138–1204).

RELIGION 228-0 Introduction to Islam Principal beliefs and practices of Muslims set against the historic development of the faith.

RELIGION 229-0 Introduction to Native American Religions Diversity and common elements of Native American religious traditions; comparative study of myth, ritual, spiritual philosophy, and practice.

Courses Primarily for Juniors and Seniors

Buddhism

RELIGION 323-0 Buddhist Scripture Origins, development, and content of Buddhist sacred literature.

RELIGION 324-0 Buddhism in the Contemporary World: Traditional and Reform Buddhism's reinterpretation of its thought and practice in response to postcolonial modernizations.

RELIGION 325-0 Theravada Buddhism and Culture Theravada Buddhism in interaction with its culture.

RELIGION 348-0 Zen Buddhism Historical development of Zen Buddhist theory and practice.

RELIGION 355-0 Topics in Buddhism May be repeated for credit with different topic.

Christianity

RELIGION 302-0 Christian Ethics Four contemporary moral issues viewed from a variety of Christian approaches.

RELIGION 351-0 Topics in Christianity May be repeated for credit with different topic.

RELIGION 360-0 Medieval Christianity Christian thought, institutions, and figures of medieval Christianity, c. 500–1500.

RELIGION 361-1,2 Foundations of Christian Thought Survey of the development of Christian thought. **1.** Early or traditional Christianity. **2.** Christian thought since the Reformation.

RELIGION 364-0 The Idea of Sainthood in Christianity Historical and contemporary conceptions of sanctity, especially in Roman Catholicism and Eastern Orthodoxy.

RELIGION 365-0 Christian Mystical Theology Writings of mystics (e.g., Meister Eckhart, Cloud of Unknowing, Julian of Norwich, Teresa of Avila) in their cultural context.

Islam

HISTORY 355-0 Islam in Africa See History.

RELIGION 357-0 Topics in Islam Selected topics in Islamic history and thought. May be repeated for credit with different topic.

RELIGION 371-0 Muhammad, the Jews, and the Origins of Islam The rise of Islam, including a broad discussion of pre-Islamic Arabia.

RELIGION 377-0 Trends in Islamic Thought Quranic, medieval, and modern approaches to problems in faith and social action.

Judaism

RELIGION 306-0 Judaism in the Modern World Radical changes that emancipation and modernity have brought to the religious expression of Judaism.

RELIGION 307-0 Judaism in the Perspective of Christianity 19th- and 20th-century Christian thinkers' perceptions of Judaism in relation to Christianity.

RELIGION 308-0 Christianity in the Perspective of Judaism 19th- and 20th-century Jewish thinkers' perceptions of Christianity in relation to Judaism.

RELIGION 313-0 Varieties in Ancient Judaism Introduction to the Judaisms that flourished from the fifth century B.C.E. to the third century C.E.

RELIGION 330-0 Jewish Thought in the 19th Century Review of Jewish religious/national thought from Moses Mendelssohn to Hermann Cohen.

RELIGION 331-0 Jewish Thought in the 20th Century Distinctive themes in the main 20th-century Jewish philosophers.

RELIGION 334-0 Classical Jewish Thought An examination of the forms of expression of Rabbinic Judaism: legal, mystical, philosophical, and poetic.

RELIGION 335-0 The Art of Biblical Narrative Ways in which the religious imagination of ancient Israel expresses itself through literary artistry.

RELIGION 336-0 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, literature.

RELIGION 352-0 Topics in Judaism May be repeated for credit with different topic.

Courses in Method and Comparative Study

RELIGION 350-0 Topics in Religion May be repeated for credit with different topic.

RELIGION 353-0 Studies in American Religion May be repeated for credit with different topic.

RELIGION 390-0 Comparative Study of Religions History and present use of the comparative method of studying religions.

RELIGION 395-0 Theories of Religion Ways of analyzing critically religious experience and its meaning. Phenomenology of religion, history of religions, comparative religions.

RELIGION 396-1,2 Senior Seminar

RELIGION 399-0 Independent Study For advanced students, reading and conferences on special subjects. Consent of instructor required.

Russian

See Slavic Languages and Literatures.

Science in Human Culture Program

Adjunct Major and Minor in Science in Human Culture

The adjunct major and minor in science in human culture prepare students to confront the impact of science, medicine, and technology on society and on their own lives. The program welcomes science majors interested in thinking beyond the problem sets assigned in their specialized courses as well as students in the humanities who wish to surmount the compartmentalization of knowledge that accompanied the rise of modern science. The adjunct major and minor 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 minor, consult the program Web page at www2.mmlc.northwestern.edu/shc.

Adjunct major course requirements (10 units)

The science in human culture major is an adjunct major, meaning that students must also fulfill the requirements of another major. In consultation with their faculty adviser, students in the adjunct major develop a theme based on their particular interests. They then take 10 courses that match their interests from the partial list below. Students must take at least 2 core courses chosen from HISTORY 275-1,2, 325, 376-1,2, and 377. At least 6 of the 10 courses for the adjunct major must be at the 300 level. Course substitutions may be allowed with the permission of the program director.

Adjunct major honors (2 additional requirements)

To graduate with honors, students must also write a senior thesis of high quality as part of the three-quarter sequence SHC 398-1,2,3.

Minor course requirements (7 units)

In consultation with a faculty adviser, students develop a coherent theme that ties together their choice of seven courses selected from the partial list below. Students must take at least one 300-level seminar. Students applying for the minor in science in human culture must show a minimum of five courses not double-counted in any other major(s).

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 (partial list)

ANTHRO 255, 315, 370

CLASSICS 342

COMM ST 229

ECON 307

GNDR ST 250

HISTORY 275-1,2, 325, 350-3,4, 375-1,2, 376-1,2, 377

PHIL 254, 325, 326, 354

POLISCI 204

PSYCH 337

SOCIOL 312, 319, 355

Other eligible courses are available periodically and appear in the online quarterly class schedule from the Office of the Registrar.

Course

SHC 398-1,2,3 Science in Human Culture Senior Seminar
1. Studies science in social context. **2,3.** Continuation for students who wish to qualify for honors by writing a senior thesis.

Slavic Languages and Literatures

The department 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 20th-century experience. Courses in Russian literature open up the artistry and ideas of this intellectual tradition. Russian language study can 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 and 20th centuries. Russian language at all levels is taught by Americans and native speakers. Courses on Slavic linguistics are also offered.

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. Northwestern's library is an excellent resource for undergraduate and graduate study in Russian literature. Qualified advanced students have the opportunity to spend a fall quarter in Russia through a Northwestern study abroad program. 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

Departmental courses

Basic courses102-1,2,3 or equivalent

Electives14 additional courses in Slavic languages and literatures and related fields

Honors2 additional courses

Option A: No Study Abroad

Basic electives (7)203-1,2,3 and 4 courses chosen from 210-1,2,3; 211-1,2; 255

Advanced electives (7)360 or 361 and 5 other 300- or 400-level Slavic languages and literatures courses; 1 course in a related field chosen with the undergraduate adviser

Option B: Study in Russia

Basic electives (4)4 courses chosen from 210-1,2,3; 211-1,2; 255

Study abroad4 or more unitstoward the major

Advanced electives (6)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 Russian and Slavic 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.

Prerequisites: completion of two years of college-level language or equivalent as demonstrated by course work such as 102-3 or equivalent

Minor course requirements (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 course requirements (8 units)

- 4 200-level courses in Slavic languages and literatures
- 4 300-level courses, at least 2 of them 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

The honors program in Slavic languages and literatures gives outstanding senior majors an opportunity to undertake a research project under the supervision of a faculty adviser. This honors thesis, together with the student's record in Slavic courses, forms the basis for faculty decisions on the award of departmental honors. Most honors candidates research and write the thesis in two 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. Students interested in pursuing honors should consult the director of undergraduate studies by the end of their junior year. See also Honors under Academic Policies earlier in this section of the catalog.

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 coordinator.

SLAVIC 102-1,2,3 Intermediate Russian Russian language and culture. Reading, writing, listening, and speaking. Prerequisite: 101-3 or consent of language coordinator.

SLAVIC 106-1,2,3 Elementary Czech Czech language and culture. Basic reading, writing, listening, and speaking. Prerequisite: Must be taken in sequence or consent of language coordinator required.

SLAVIC 107-1,2,3 Introduction to Bosnian/Croatian/Serbian A largely oral approach to the basic grammar and vocabulary necessary for reading, speaking, comprehending, and writing basic Bosnian/Croatian/Serbian (B/C/S). Most material will be presented in the Latin alphabet, but students will be expected to use the Cyrillic alphabet as well and to gain basic knowledge of the similarities and differences among B/C/S. Must be taken in sequence. Prerequisite: consent of language coordinator.

SLAVIC 108-1,2,3 Elementary Polish Polish language and culture. Basic reading, writing, listening, and speaking. Prerequisite: consent of language coordinator. Prerequisite: Must be taken in sequence or consent of language coordinator required.

SLAVIC 203-1,2,3 Russian Language and Culture

Conversation, listening comprehension, reading, and composition. Unabridged contemporary readings on Russian culture and society. Third-year, multiskill course. Prerequisite: 102-3 or consent of language coordinator.

SLAVIC 206-1,2,3 Intermediate Czech: Language and Culture Continuation of 106; reading on topics in Czech culture. Prerequisite: 106-3 or consent of language coordinator.

SLAVIC 207-1,2,3 Intermediate Bosnian/Croatian/Serbian: Language and Culture Continuation of 107; readings on topics in Bosnian/Croatian/Serbian. Continued emphasis on perfecting reading, writing, listening, and speaking skills. Must be taken in sequence. Prerequisites: 107-3 or consent of language coordinator.

SLAVIC 208-1,2,3 Intermediate Polish: Language and Culture Continuation of 108; reading on topics in Polish culture. Prerequisite: 108-3 or consent of language coordinator.

SLAVIC 303-1,2,3 Advanced Russian Language and Culture Conversation, listening comprehension, reading, and composition. Unabridged contemporary reading and media, including television, on Russian culture and society. Fourth-year course. Prerequisite: 203-3 or consent of language coordinator.

SLAVIC 304-1,2,3 Russians: New and Old Values Advanced Russian with stress on oral and aural comprehension and writing; documentary films, newspaper and magazine articles in Russian. Prerequisite: 102-3 or consent of language coordinator.

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, syntax.

SLAVIC 358-1,2 Language in Polish Literature Courses designed for students who already speak Polish but have problems with stylistics and more complex grammatical structures, and/or who wish to improve their knowledge of and abilities in Polish. Students will become familiar with major achievements of Polish artistic prose in the 20th century.

Courses with Reading 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, Leskov, the late Tolstoy, Chekhov, Bunin, Gorky.

SLAVIC 211-1,2 20th-Century Russian Literature Major works in cultural-historical context, from the revolutions of 1917 through the present. **1.** Russian modernism in literature, music, film, and visual art. **2.** Masterpieces of 20th-century Russian prose, including works by Babel, Bulgakov, Pasternak, Solzhenitsyn, and contemporary Russian fiction writers.

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 257-0 Introduction to the Soviet Union and Successor States Broad survey of Russian cultural, social, political, and economic life in the 20th century. Focus on the Soviet period and its aftermath in light of Russia's historical background.

SLAVIC 261-0 Polish Culture 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 Cultural legacy of the Czech nation as represented in various media.

SLAVIC 310-0 Tolstoy Tolstoy's artistic and intellectual development through his major fiction.

SLAVIC 311-0 Dostoevsky Dostoevsky's artistic and intellectual position in Russian literature as revealed in the major novels, shorter fiction, and diaries.

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*, *Invitation to a Beheading*, and *Pale Fire*).

SLAVIC 314-0 Chekhov Introduction to the fiction and plays of Anton Chekhov. Examination of Chekhov's writing in its Russian cultural context and his influence on English-language drama, fiction, and film.

SLAVIC 318-0 19th-Century Russian Comedy and Satire The nature of comedy, the types of satire, and the functions of laughter in the works of Gogol and Chekhov.

SLAVIC 319-0 The Philosophical Story A key form of Russian and East European fiction, the story about abstract philosophical issues; its role in general philosophical debates, how it works as literature, philosophical issues it raises.

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 20th-Century Russian Drama and Theater Modernist dramatic and theatrical traditions of Russia from the rise of the Moscow Art Theater to the advent of Socialist Realism. Dramas by Chekhov, Blok, Khlebnikov, Mayakovsky; productions of Stanislavsky, Diaghilev, Meierkhold; design innovations of Tatlin, Malevich, Exter.

SLAVIC 372-0 Introduction to Eastern European Jewish Culture Cultural heritage of Russian and Eastern European Jewish communities from the 18th to 20th centuries. Works of Sholom Aleichem and Isaac Bashevis Singer; relations of Jewish culture to surrounding European cultures.

SLAVIC 375-0 Eastern European Literature of the Holocaust Novels, short stories, and memoirs by Eastern Europeans who experienced the Nazi occupation or were marked by its aftermath; problems of identity, memory, genre.

SLAVIC 377-0 Theory and Practice of Literary Translation Theoretical and practical problems of literary and cultural translation. Prerequisites: 300-level proficiency in a Romance, Germanic, or Slavic language; consent of instructor.

SLAVIC 378-0 Visual Art in the Context of Russian Culture Survey of major trends in Russian visual art in the dual contexts of Russian culture and European visual art. Works integrated with readings drawn from Russian literature and history.

SLAVIC 390-0 Literature and Politics in Russia More than in any other European tradition, Russian literature has played a central role in defining the nation's political agenda. The interaction of literature with Russian cultural and political history.

SLAVIC 391-0 The Rise and Fall of Yugoslavia Yugoslavia from origins as a dream to existence as a multinational state and collapse in the late 1980s; nationalism, interrelationship of politics and culture; readings from historians, cultural critics, and literary works.

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

Unless otherwise indicated, the prerequisite for 300-level courses is 203-3 or equivalent.

SLAVIC 359-1,2 Russian Prose Selected works of Russian masters. **1.** 19th century. **2.** 20th century. Content varies; may be repeated for credit. All reading in Russian. Prerequisite: 203-3 or consent of language coordinator.

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. Prerequisite: consent of instructor.

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: Blok, Mayakovsky, Khlebnikov, Akhmatova, Tsvetaeva, Mandelstam, Pasternak, Brodsky. Prerequisite: consent of instructor.

SLAVIC 398-0 Senior Honors Seminar Topics vary yearly.

SLAVIC 399-0 Independent Study For Russian majors selected by the department as candidates for departmental honors and for other advanced students with consent of instructor.

Sociology

The Department of Sociology offers preparation for students who want to pursue careers in social research, social policy applications, and teaching. It provides an excellent background for all professions involved in the major structures of modern society, such as business, public administration, law, medicine, journalism, and planning. The department also emphasizes the sociological perspective as a fundamental part of a liberal education and a discipline for developing a humane understanding of the world.

The department is particularly strong in the areas of urban studies, comparative historical sociology, the sociology of art and culture, deviance and social control, organizations, and the sociology of law, education, and science. The department offers a wide variety of approaches to fundamental issues of social inequality, its origins and consequences, including class and economic domination, race, ethnicity, and gender. Unusually good opportunities are available for independent study, field internships, and the use of qualitative historical and comparative methods of research. In addition to the courses listed below, the department offers quarterly seminars on special topics of interest.

Major in Sociology

Departmental courses: 1 sociology quarter-course at the 100 or 200 level (except 226) and 9 additional quarter-courses, distributed as follows:

- 3 courses in methods of social research: 226, 303, 329 (226 should be taken by the sophomore year; 303 and 329 in the junior year)

- 306 (junior or senior year)
- 398-1,2 (fall and winter quarters of the senior year)
- 4 additional 300-level sociology courses; only 1 unit each of 376, 399, and GEN LA 393 Chicago Field Studies Internship may be used to fulfill this requirement

In certain cases, students who are combining a major in sociology with a major in another field that also requires a senior research seminar may arrange to fulfill their seminar requirement in a combined project.

Related courses: 4 300-level quarter-courses in African American studies, anthropology, economics, history, linguistics, philosophy, political science, psychology, or gender studies selected with the approval of the 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 how data are gathered and prepared for analysis and a variety of techniques and methods for presenting information, arguments, and conclusions. Two 300-level courses allow students to see how these methods are used in practice.

Minor course requirements (6 units)

- 110 or a 200-level sociology course
- 226
- 303 or equivalent
- 329
- 2 300-level sociology courses approved by the director of undergraduate studies; although they may be taken more than once, only 1 credit may be counted toward the minor for each of the following courses: 376, 399, GEN LA 393 Chicago Field Studies Internship

Sociological Studies

The minor concentration 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 course requirements (7 units)

- 110 or a 200-level sociology course
- 226
- 5 300-level sociology courses approved by the director of undergraduate studies; although they may be taken more than once, only 1 credit may be counted toward the minor for each of the following courses: 376, 399, GEN LA 393 Chicago Field Studies Internship

Four-Year BA/MA

In rare instances, superior students may petition the department to complete BA and MA degrees in the normal four-year period required for the BA. Only unusually gifted and motivated students are accepted into this rigorous program. Interested students should consult with the undergraduate advisers early in their academic careers. See Accelerated Master's Programs in the Undergraduate Education section of this catalog.

Honors in Sociology

Students who complete all requirements for the major, maintain a grade point average of 3.3 or above in their major courses, and complete an outstanding senior research project in 398-1,2 or its equivalent will be nominated for honors in sociology to the College Committee on Superior Students and Honors, which has final authority to grant the honors degree. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

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 (SESP) and complete all requirements as outlined in the SESP section of this catalog. Students are urged to contact the Office of Student Affairs in SESP at the earliest opportunity.

Courses Primarily for Undergraduates

SOCIOL 110-0 Introduction to Sociology Essential characteristics of group life. Interrelations of society, culture, and personality. Basic 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 in various settings. Black-white relationships in the United States.

SOCIOL 202-0 Social Problems:Norms and Deviance How issues emerge. Rules, rule enforcers, rule breakers; advocates, opponents, and victims of problems. Blame, help, and entitlement. Current problems and systemic contradictions.

SOCIOL 203-0 Revolutions and Social Change Causes and outcomes of large-scale social change. Role of violence and revolution in the development of the modern world.

SOCIOL 204-0 Social Interaction:The Individual and Society Development of individual attitudes and behavior patterns through social interaction. Relation to students' everyday life and problems.

SOCIOL 205-0 American Society How American society works as a whole. How major institutions relate and affect each other and how the different segments and strata of

society experience such institutional processes. Tensions associated with differential experience 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. Patterns of change in major legal institutions: the courts, the legal profession, and legal services for the poor.

SOCIOL 207-0 Problems of Cities Problems of American urban communities and possible solutions. Spatial, economic, and political trends; private and public decision making; class, race, and family needs. Consequences for adequate public services.

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 Social determination of gender-appropriate behavior. Origins, values, and effects of sex-role stereotypes. How stereotypes fit social reality. Socialization (childhood and adult), values, economic opportunities in the United States, now and in the past.

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 301-0 The City: Urbanization and Urbanism Theories of urbanization, housing, jobs, race and class, segregation, social networks, politics, and reform policies. Research projects. Prerequisite: 110 or 207.

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. Prerequisite: 100- or 200-level course.

SOCIOL 303-0 Analysis and Interpretation of Social Data Introduction to quantitative methods: the interpretation of descriptive statistics, relationships between variables, and the logic of inferential statistics. Prerequisite: 226 or consent of instructor.

SOCIOL 305-0 Demography and Population Problems Social causes and consequences of population dynamics (fertility, mortality, marriage, divorce, and migration) and population structures (age, sex, size, density). Possible roles of population changes in environmental and economic development problems. Prerequisite: 100- or 200-level course.

SOCIOL 306-0 Sociological Theory Sociological perspective as developed by classic theorists. Elucidation and testing of sociological principles in contemporary research. Primarily for sociology majors. Open to others with consent of instructor. Prerequisite: 226.

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. Relationship between education and inequality and to problems of contemporary urban education. Prerequisite: 100- or 200-level course.

SOCIOL 308-0 Sociology of Deviance and Crime The social organization of crime and other misdeeds, explanations of crime and deviance, creating criminal law, policing, detection and investigation, prosecution, plea bargaining, the courts, sentencing, punishment, prisons, and alternatives to criminal law. Prerequisite: 110 or 202.

SOCIOL 309-0 Political Sociology Selected topics in political economy and sociology: revolutions, the development of the modern state, third world development, international conflict. Prerequisite: 100- or 200-level course.

SOCIOL 310-0 The Family and Social Learning Influence of socioeconomic and other structural and cultural resources and constraints on family structure and dynamics. Historical and comparative perspectives on the modern family. Prerequisite: 100- or 200-level course.

SOCIOL 312-0 Social Basis of Environmental Change The role of production structures and other social institutions on pollution and depletion. Social support for and resistance to environmental protection policies. Inequalities in use of resources and incidence of environmental hazards. Prerequisite: 100- or 200-level course.

SOCIOL 314-0 Sociology of Religion and Ideology Belief systems in society. Production of ideas. Religion, art, science, political ideology, and folk-knowledge as social products. Prerequisite: 100- or 200-level course.

SOCIOL 315-0 Industrialism and Industrialization Structure and culture of modern industry; consequences for status and class organization. Labor force, formal and informal organization of management and labor. Union-management interaction. Factors affecting industrial morale. Prerequisite: 100- or 200-level course.

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. Prerequisite: 215 or ECON 202 or equivalent.

SOCIOL 318-0 Sociology of Law Sociological analysis of legal institutions such as courts, the police, and lawyers. Law, inequality, and social change. Prerequisite: 110 or 206.

SOCIOL 319-0 Sociology of Science Science as a social system. Personality, social class, and cultural factors in scientific development, creativity, choice of role, simultaneous invention, and priority disputes. Social effects on objectivity and bias.

SOCIOL 321-0 Armed Forces and Society Contemporary military institutions and sociological theory. Dynamics of combat, peacekeeping, race relations, gender, and other social issues. Prerequisite: 100- or 200-level course.

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. Prerequisite: 100- or 200-level course.

SOCIOL 325-0 Sociology of Inequality Bases of social stratification. Effects on life conditions and social organization. Theoretical, methodological, and empirical dimensions. Emphasis on advanced industrial societies. Prerequisite: 226.

SOCIOL 327-0 Youth and Society How young people interact with families, schools, peers, neighborhoods, and workplaces, influencing them and being influenced by them. Prerequisite: 100- or 200-level course.

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. Prerequisite: 226.

SOCIOL 331-0 Markets, Hierarchies, and Democracies The forms and social structures for making economic decisions in modern societies. Prerequisite: 100- or 200-level course.

SOCIOL 332-0 Work and Occupation in Modern Industrialized Societies Sociological perspectives on work. Students view their own occupational futures in the context of the changing social relations of production. Prerequisite: 100- or 200-level course.

SOCIOL 333-0 Law, Norms, and Power How laws and informal social rules are related to the exercise of power by some people over others. Prerequisite: 100- or 200-level course.

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. Prerequisites: 215 and 302 or ECON 202 or consent of instructor.

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. Prerequisite: 100- or 200-level course.

SOCIOL 347-0 Sociology of Time and Space Social construction of time and space. Standardization of time, maps as ideological documents, capitalist time and space, personal and social spaces and memories. Prerequisite: 100- or 200-level course.

SOCIOL 350-0 Sociology of the Arts Art as collective activity. Conventions in art and aesthetics. Professionals and audiences and other aspects of culture. Prerequisite: 100- or 200-level course.

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. Prerequisite: 100- or 200-level course.

SOCIOL 356-0 Sociology of Gender Gender and issues of social reproduction and social change with sexuality and reproduction emphasized. Prerequisite: 216 or 226.

SOCIOL 376-0 Topics in Sociological Analysis Advanced work on special topics in sociological study.

SOCIOL 380-7 Junior Year Tutorial Small seminar group in conjunction with various scheduled 300-level classes.

GEN LA 393-0 Chicago Field Studies Internship See General Studies in the beginning of the Weinberg course listings.

SOCIOL 398-1,2 Senior Research Seminar Independent research projects carried out under faculty supervision. Prerequisite: 303, 329, or equivalent.

SOCIOL 399-0 Independent Study (1 or 2 units) Open with consent of department. Students may reenroll for consecutive quarters.

Spanish and Portuguese

The Department of Spanish and Portuguese (formerly Hispanic Studies) offers courses in language, literature, and culture that speak to a variety of interests, whether focused on Latin America, Spain, or on some aspect of literature, language, or culture that cuts across geographic divides. Instruction in most courses is in Spanish, 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 also encouraged to 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 Argentina or Chile sponsored by Cooperative Programs in the Americas (COPA), the summer programs at the Universidad de Guanajuato in Mexico, or other programs approved by the University's Study Abroad Office. More information about study abroad opportunities for students of Spanish and Portuguese is available on the department's Web site.

Spanish

Major in Spanish

The major in Spanish requires 15 courses taught in Spanish (with exceptions noted below). Each student, in consultation with an adviser, designs a program built around a concentration and representing a coherent pattern of study.

Students may choose to concentrate on the literatures and cultures of Latin America, the literatures and cultures of Spain, or an appropriate combination of both areas. Many students fulfill some of the requirements for the major through courses taken abroad.

Prerequisite: SPANISH 199, an AP score of 5, or a passing score on the oral section of the Spanish Language Placement Exam.

Major course requirements (15)

- 201-1 or -2 (heritage speakers of Spanish must take an appropriate substitute course)
- 202-1 (heritage speakers may take 207 as a substitute)
- 202-2
- 220
- 3 courses chosen from 250, 251, 260, 261
- 6 300-level courses in the department that form an area of concentration, including at least 1 course that deals with a period earlier than 1800
- 2 elective courses at the 200 or 300 level in the department, in another department at Northwestern, or in study abroad programs, on condition that these courses be related to the historical, literary, and/or cultural existence of Hispanic countries. When taken outside the department, these courses must be preapproved by an adviser.

Notes:

- A 300-level COMPLIT course that includes an important component of Latin American and/or Spanish literature and is taught by a member of the Department of Spanish and Portuguese may be substituted for a 300-level course requirement (adviser approval required to ensure non-duplication of courses).
- A study abroad course taught in Spanish on any topic related to the historical and/or cultural existence of a Hispanic country may be substituted for 201-1, -2, or 301, on condition that the course for which it is substituted has not already been taken.

Minor in Spanish

The minor in Spanish is primarily designed to enable students to achieve advanced competence in oral and written Spanish. It also offers the opportunity to explore the literatures and cultures of Latin America and Spain.

Prerequisite: SPANISH 199, an AP score of 5, or a passing score on the oral section of the Spanish Language Placement Exam

Minor course requirements (8): 8 courses at or above the 200 level including at least 2 at the 300 level. Note: Heritage speakers of Spanish must substitute other courses for 201-1 and -2; 201-1 may be replaced by 207.

Honors in Spanish

The honors program in Spanish gives outstanding senior majors the opportunity to design and carry out a research project on the languages and literatures of Latin America

and/or Spain under the close supervision of an adviser. The award of honors is made by a committee of Weinberg College on the recommendation of the department. Students who desire more information about honors should check the department's Web site and contact a faculty adviser.

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 (SESP) and complete all requirements as outlined in the SESP section 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 Pronunciation, grammar, translation, and conversation. Five class meetings a week. Drill in language laboratory.

SPANISH 102-1,2,3 Intermediate Spanish Grammar review, conversation, composition, and readings in modern prose and drama. Four class meetings a week. Prerequisite: 101 or two units of Spanish.

SPANISH 115-1,2 Accelerated First-Year Spanish For students with some previous experience in Spanish. Pronunciation, grammar, and conversation. Four classes per week plus one hour in the language laboratory. Prerequisite: department placement.

SPANISH 199-0 Language Workshop Intensive review of linguistic patterns and development of fluency and grammatical accuracy in speaking and writing. Prerequisite: 102-3, AP score of 4, or Spanish Language Placement Exam.

SPANISH 201-1,2 Reading and Speaking Sequence designed to develop speaking strategies and structures. 1. Accurate informal and formal conversation. 2. Public speaking and further development of specialized vocabularies. Cultural and literary readings. Must be taken in sequence. Prerequisite: 199, AP score of 5, or Spanish Language Placement Exam.

SPANISH 202-1,2 Reading and Writing Sequence designed to develop writing and linguistic skills. 1. Short literary texts. 2. Expository texts. Must be taken in sequence. Prerequisite: 201-1 or 201-2.

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 301-0 Topics in Language Special topics in historical, grammatical, or other linguistic aspects of Spanish. Prerequisites: 201-1 or -2; 202-1 or 207; 202-2.

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. Prerequisites: 201-1 or -2; 202-1 or 207; 202-2 (may be taken concurrently).

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. Prerequisites: 201-1 or -2; 202-1 or 207; 202-2 (may be taken concurrently).

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. Prerequisites: 201-1 or -2; 202-1 or 207; 202-2 (may be taken concurrently).

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: 220 (may be taken concurrently).

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: 220 (may be taken concurrently).

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: 220 (may be taken concurrently).

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: 220 (may be taken concurrently).

SPANISH 310-0 Origins of Spanish Literature Spanish literature from its beginnings to the end of the Middle Ages: epic poems, lyrics, and romances. Prerequisite: 1 course chosen from 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 Quixote*. Prerequisite: 1 course chosen from 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: 1 course chosen from 250, 251, 260, or 261.

SPANISH 323-0 Cervantes Close reading of *Don Quixote*, with attention to its historical and cultural context. Prerequisite: 1 course chosen from 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: 1 course chosen from 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: 1 course chosen from 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: 1 course chosen from 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: 1 course chosen from 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: 1 course chosen from 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: 1 course chosen from 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, and Carlos de Sigüenza y Góngora. Prerequisite: 1 course chosen from 250, 251, 260, or 261.

SPANISH 341-0 Latin American Modernismo 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: 1 course chosen from 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: 1 course chosen from 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 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: 1 course chosen from 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 Guillermo Cabrera Infante, Julio Cortázar, José Donoso, Carlos Fuentes, Gabriel García Márquez, Manuel Puig, Juan Rulfo, and Mario Vargas Llosa. Prerequisite: 1 course chosen from 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: 1 course chosen from 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: 1 course chosen from 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. Prerequisites: 201-1 or -2; 202-1 or 207; 202; and 1 other 200-level literature or culture course.

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: 201-1 or -2; 202-1 or 207; 202; and 1 other 200-level literature or culture course.

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: 201-1 or -2; 202-1 or 207; 202; and 1 other 200-level literature or culture course.

SPANISH 390-0 Undergraduate Seminar Advanced course on topics in literature and culture oriented toward the development of an individual research project. Open to qualified seniors with consent of an adviser. Prerequisite: approval of adviser.

SPANISH 395-0 Special Topics in the Literatures of Latin America and/or Spain 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: 1 course chosen from 250, 251, 260, or 261.

SPANISH 399-0 Independent Study Independent reading under supervision. Consultation with director of undergraduate studies required.

Courses with Reading and Discussion in English

These courses may not be taken for major or minor credit.

SPANISH 223-0 Cervantes Study of Don Quixote 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 397-0 Topics in Hispanic 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

Portuguese Language Courses

PORT 111/112-1,2,3 Intensive Elementary Portuguese Accelerated audiolingual study of the Portuguese language for beginners. The equivalent of two years of unaccelerated language courses.

PORT 303-0 Advanced Portuguese Development of competence in reading, speaking, and writing. Readings focus on Brazilian historical, cultural, and sociopolitical structures. Prerequisite: 112-3 or equivalent.

PORT 399-0 Independent Study Independent study under supervision. Consultation with the director of undergraduate studies required.

Statistics

Statistics is the scientific discipline that deals with the organization, analysis, collection, and interpretation of numerical data. Statistical methods are widely used to design and analyze experiments, sample surveys, censuses, and other observational programs. 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

Departmental courses

- MATH 330-1 or IEMS 202
- STAT 320-1,2
- STAT 325, 350, 351
- 2 of the following courses: MATH 330-2, IEMS 305, 315, STAT 352, 355, 359; students may not apply both MATH 330-2 and IEMS 315 to the major requirement

Related courses: MATH 214-1,2,3, 215, 219, 290-1,2,3, or equivalent

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 assumed to have completed MATH 214-1,2,3 or equivalent.

Minor course requirements (6 units)

- STAT 201, 202, or 210 (1 unit)
- MATH 330-1 or IEMS 202 (1 unit)
- STAT 320-1,2 or IEMS 303 and 304 (2 units)
- STAT 350 or ECON 381-2 (1 unit)
- STAT 325 or 351 (1 unit)

Four-Year BA/MS

The department offers a four-year BA/MS program in statistics for outstanding undergraduate majors. Interested students should contact their adviser or department chair and should see Accelerated Master's Programs in the Undergraduate Education section of this catalog.

Honors in Statistics

Departmental majors with outstanding records both overall and within the department may apply for graduation with departmental honors. A departmental recommendation for honors requires that students take two quarters of 398, through which a research paper is developed. For more information, consult the director of undergraduate studies. See also Honors under Academic Policies earlier in this section of the catalog.

Courses Primarily for Undergraduates

STAT 201-0 Statistics and Public Policy Basic statistical concepts and techniques introduced via case studies of interesting public policy issues. The cases illustrate methods of data collection and analysis.

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.

STAT 206-0 Elementary Statistics for Research Design of experiments, descriptive statistics, correlation and regression, probability, confidence intervals, and significance testing.

STAT 210-0 Introductory Statistics for the Social Sciences Introduction to basic concepts and methods of statistics and probability. Methods of data collection, descriptive statistics, probability, estimation, sampling distributions, confidence intervals, hypothesis testing.

STAT 302-0 Elementary Statistical Methods Tabular and graphical presentation of data, hypothesis tests, confidence intervals, comparisons of means and proportions, regression and correlation. Prerequisite: MATH 214-2 or equivalent.

STAT 320-1,2 Statistical 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. Prerequisite: MATH 330-1 or IEMS 202.

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 330-1,2 Applied Statistics for Research 1. Design of experiments and surveys, numerical and graphical summaries of data, correlation and regression, confidence intervals and tests of significance, one- and two-sample problems. Prerequisite: MATH 214-2 or equivalent.

2. Simple linear regression, inference, diagnostics, multiple regression, diagnostics, autocorrelation, one-way ANOVA, power and sample size determination, two-way ANOVA, ANCOVA, randomized block designs. Prerequisite: 330-1.

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 344-0 Statistical Computing Exploration of the theoretical and practical problems in the development and use of statistical computing systems for numerical and graphical analysis of data. Prerequisites: 2 quarter-courses chosen from STAT 320-2, 350, 351, PSYCH 351, MATH 219, or equivalent.

STAT 345-0 Statistical Demography Self-contained 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 219, or equivalent.

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 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 359-0 Topics in Statistics Topics in theoretical and applied statistics to be chosen by instructor. Prerequisite: consent of instructor.

STAT 398-0 Undergraduate Seminar

Related Courses in Other Departments

MATH 330-1,2,3

IEMS 202, 305, 315 (see McCormick section of this catalog)

Undergraduate Leadership Program

The Undergraduate Leadership Program, a certificate program open to all undergraduates, helps students understand the nature of leadership and prepares them to become leaders. (See Undergraduate Leadership Program in the Other Undergraduate Programs section of this catalog.)

Urban Studies Program

The Program in Urban Studies enables students majoring in anthropology, economics, history, political science, or sociology to master their disciplinary major and to complement it with a second major in urban studies. With special consent of the director of the program, students with other majors in Weinberg College also may elect urban studies as a second major. The purpose of the program is to introduce students to an interdisciplinary perspective on the city and its problems, bringing together faculty and students who share common interests but have different academic backgrounds. 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 the Chicago field studies program.

Major in Urban Studies

Program courses

- Fulfillment of the major requirements in any one of the following undergraduate departments: anthropology, economics, history, political science, sociology; or with consent of the director of the program, fulfillment of the major requirements in another department of Weinberg College. Majors in urban studies must show a minimum of 7 courses not double-counted in any other major(s). Of the courses that are double-counted, 1 may be counted in the the core requirement; another may be counted as an elective.
- Completion of 4 courses chosen from an urban studies core: ECON 354; HISTORY 322-1,2; POLI SCI 221; SOCIOL 207, 301
- Completion of 3 additional courses chosen from the following list, no more than 2 from the same department and no more than 1 from urban field studies or internships: AF AM ST 236-2; ART HIST 379; CIV ENG 371; ECON 337, 354, 355; HISTORY 322-1,2; POLI SCI 221, 327, 330; SOCIOL 207, 301; any approved unit of urban field studies in any relevant department
- Completion of the two-unit 398 seminar during the fall and winter or winter and spring quarters of the student's senior year. Check the online class schedule for the quarters when this seminar is offered.

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 two quarters. Grade of K given in 398-1 changed to letter grade after completion of 398-2.

Writing Program

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 teaches the program's main sequence of basic, intermediate, and advanced expository writing courses. These are listed as ENGLISH 105, 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.

The Writing Program helps to oversee writing requirements — and thus provides writing advising — for undergraduates in Weinberg College, McCormick School of Engineering and Applied Science, and the School of Music. Members of the Writing Program faculty also occasionally teach specialized courses and workshops. In addition, 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. 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 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.

School of Communication

Understanding communication is key to understanding the contemporary world and its problems, and mastery of the arts of communication is one of the best ways to prepare for a successful career and a rich personal life.

The School of Communication's mission is to improve systems and processes used in human communication as well as people's abilities to use communication to achieve their purposes. Our key term is performance: performance is both our primary object of study and a vehicle through which we teach and learn about communication.

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. 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 and the school grew, the faculty added instruction in theatre, speech pathology, audiology, radio, television, film, and other specialties in oral communication. The five departments of instruction indicate the scope of the modern curriculum: performance studies; communication studies; radio/television/film; communication sciences and disorders; and theatre (including dance). In addition to the specialized program presented by each department, the five departments of the School of Communication combine to offer the undergraduate degree program in interdepartmental studies. All

departments offer graduate courses. The School of Communication sponsors six divisions of Northwestern's National High School Institute: dance, debate, media arts, and theatre arts.

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.

For more information, see the school's Web site at www.communication.northwestern.edu.

Academic Policies

Requirements for the Degree of Bachelor of Science 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 Residence Requirement (see Undergraduate Education).

Requirements for the Degree of Bachelor of Arts in Communication

The Departments of Communication Studies, Performance Studies, Radio/Television/Film, and Theatre (including dance) offer the bachelor of arts in communication degree. 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. 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. Proficiency is established in precisely the same manner as in the Weinberg College of Arts and Sciences; see the section on the foreign language requirement in the Weinberg section of this catalog.

General Requirements

Of the 45 courses required for all major programs in the School of Communication, the last 23 courses must be taken while the student is enrolled as an undergraduate in Northwestern University, and the student must be enrolled in the School of Communication for the last three quarters preceding the granting of the degree. Credit for summer work taken at other colleges or universities as part of the last 23 courses requires approval by petition.

Thirty-five of the required 45 units must be completed with grades of A, B, or C (grades of C-minus do not satisfy this requirement). A minimum of 18 courses must be taken outside the School of Communication. No more than 18 of the 45 courses offered for the degree may be taken in the major department.

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: interdepartmental studies, communication sciences and disorders, communication studies, performance studies, radio/television/film, or theatre (including 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 Regulations in the Undergraduate Education section 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.
- Credit will not be given for two courses that meet at the same time.
- 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.

Teaching Certification

The Department of Communication Sciences and Disorders offers a program leading to public school certification.

Advising

Each new 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.

Academic Options

Interdepartmental Studies

This program provides an interdisciplinary opportunity within communication for students whose special interests are not satisfied by one of the established programs. Majors in interdepartmental studies may seek a general education with exposure to a broad range of disciplines or a professional preparation from two closely related areas of communication.

Requirements for a Major in Interdepartmental Studies

- A minimum of 3 courses distributed among at least three departments and selected from the following: GEN CMN 101, 102, 103, 104, 108, 110; THEATRE 140-1, 140-2; R/TV/F 180
- A minimum of 3 courses at the 200 level distributed among at least three departments
- An additional 10 courses in communication distributed among at least two departments, including at least 8 courses at the 300 or 400 level. It is the student's responsibility to take all courses prerequisite for 300- and 400-level courses. Eligible students are urged to elect 399 during their senior year; this independent study should be arranged to correlate two of the communication areas the student has studied.
- 6 courses at the 200 level or above outside communication, including at least 3 300-level courses. If they apply, courses taken to meet the distribution requirement may be used to satisfy this requirement.
- Major programs for undergraduate work must be approved by the associate dean for undergraduate affairs.

Interschool Certificates and Adjunct Major

For information about the interschool programs listed below, see the Other Undergraduate Programs section.

Art and Technology Program

Students majoring in radio/television/film may earn a minor in art and technology.

Music Theatre Program

The Certificate in Music Theatre provides the opportunity for School of Music students majoring in voice and School of Communication students majoring in theatre to create a second area of specialization.

Undergraduate Leadership Program

The Undergraduate Leadership Program, an interschool certificate program open to all undergraduates, helps students understand the nature of leadership and prepares them to become leaders.

Adjunct Majors

International studies, gender studies, and legal studies — undergraduate interschool adjunct majors that are taken in conjunction with a traditional major — are open to School of Communication students.

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, 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 itself offers a master of science in communication.

The School of Communication offers departmental and thesis sequences leading to the master's degree as well as a program leading to the degree of master of science in communication with emphasis in communication management or communication systems. 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 degree are available from the School of Communication.

All departments of the School of Communication participate in graduate studies and research. Graduate programs may be relatively specialized in the offerings of one department or arranged to represent the offerings of two or more departments.

Introductory and Related Courses

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. Individual conferences.

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. Recommended for students planning to participate in intercollegiate debate.

GEN CMN 108-0 Processes and Pathologies of Human Communication

Basic facts and principles of human communication and its disorders. Laboratory experience provides an introduction to research in human communication science.

GEN CMN 110-0 Voice for Performance Intensive individual development and use of voice for performance.

GEN CMN 204-0 Paradigms and Strategies of Leadership Theoretical models of leadership. Group vision, change, and decision making. Weekly student-led small groups discuss case studies.

Communication Sciences and Disorders

The Department of Communication Sciences and Disorders is the locus at Northwestern of basic science and research in human communication and its disorders. It offers clinical training in audiology and hearing sciences, learning disabilities, and speech and language pathology. Undergraduate and graduate curricula emphasize the study of normal human communication and cognition, thereby providing a foundation for the study of disorders of hearing, speech, language, and learning. Classroom, clinical, and research facilities of the department are located in the Frances Searle Building on the Evanston campus, with the opportunity to do further clinical work at the Feinberg School of Medicine on the Chicago campus.

Areas of Study for Departmental Majors

The undergraduate program in communication sciences and disorders is designed to provide a thorough background of information about human communication and its disorders. Basic science principles that underlie all human communication and cognition are emphasized. Students also are introduced to clinical issues and research findings that pertain to disorders of communication and learning. Upon completion of the undergraduate degree (bachelor of science in communication), many students pursue clinically based or research graduate degrees. Others enter careers in health-related private industry or the public sector.

Undergraduate majors in communication sciences and disorders may choose among four areas of concentration: human communication sciences, audiology and hearing sciences, learning disabilities, and speech and language pathology. Undergraduates may select their area of concentration any time after entering the department. However, they are encouraged to make this decision by the spring quarter of their sophomore year and are required to decide no later than the beginning of their junior year. (Students may always petition to change the area of concentration.)

Human Communication Sciences

This area of concentration is particularly well suited to students who plan to attend graduate or professional school in fields such as medicine, dentistry, psychology, biomedical engineering, or neuroscience. It also provides excellent preparation for students who plan to pursue graduate study in audiology and hearing sciences, learning disabilities, or speech and language pathology; to conduct research in these areas; or to engage in professional practice. This concentration requires a minimum of 13 courses in the

department. In addition to taking a number of basic science courses in the Department of Communication Sciences and Disorders, students in this program must successfully complete 12 science, mathematics, engineering, and/or psychology courses outside the department with a grade of C or better; grades of C-minus do not satisfy this requirement.

Students admitted to the seven-year 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.

Audiology and Hearing Sciences

This area of concentration encompasses the study of hearing, hearing disorders, and the treatment of hearing disorders. Undergraduate course work in this program provides the scientific undergirding necessary for clinical practice and/or auditory research. Emphasis is on basic communication science, including study of the anatomical, physiological, and physical bases of hearing. Information on normal communication processes is presented. An introduction to audiologic assessment and hearing loss management is provided, with the opportunity for supervised clinical experience for advanced undergraduate students.

The doctor of audiology program (AuD) is a professional degree program in audiology and hearing sciences designed to prepare students for the clinical practice of audiology. Students interested in careers in auditory research may emphasize the development of research skills at the master's degree level to prepare for continued study at the doctoral level.

Students completing graduate study in audiology and hearing sciences may qualify for clinical certification by the American Speech-Language-Hearing Association (ASHA), Illinois state licensure in audiology, and registration with the Illinois Department of Public Health in the area of hearing aid dispensing. Audiology professionals may be employed in hospitals, community and university clinics, industry, schools, rehabilitation centers, and research laboratories. Advanced professionals may be self-employed in private practice.

Learning Disabilities

The undergraduate concentration in learning disabilities provides academic preparation for graduate study leading to the MA and PhD degrees in learning disabilities and related fields. The field of 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. Students also may create an interdisciplinary program by combining learning disabilities with such ancillary fields as audiology, education, linguistics, neuroscience, psychology, or speech and language pathology.

The first two years of the undergraduate curriculum emphasize the psychological, linguistic, and biological bases of normal language and cognitive development. Clinical examples and observations in area clinics and local schools are incorporated into these courses. Advanced undergraduate courses are focused more directly on disorders in basic processes and on clinical applications of basic theory, including some supervised clinical teaching.

Graduates may enter MA and/or PhD programs at Northwestern or elsewhere to pursue advanced work and school certification as a learning behavior specialist or as a researcher. Graduates with master's or PhD degrees may work in public or private schools, universities, hospitals, or private practice.

Speech and Language Pathology

The undergraduate emphasis in speech and language pathology combines academic instruction with laboratory activities and supervised clinical experiences to give students a background for graduate study in the field. The first two years of the undergraduate curriculum emphasize the psychological, linguistic, neurological, acoustic, anatomical, and physiological bases of normal auditory and language behavior. As 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, such as problems of speech sound production, language development, fluency, and voice. This program also offers courses of study leading to the MA and PhD degrees as well as postdoctoral study in speech and language pathology. Graduate courses are concerned with the neurophysiologic and structural disorders affecting communication and swallowing and with a more detailed study of disorders of language, fluency, articulation, and voice. Students study the theory, evaluation, and management of aphasia, cerebral palsy, cleft palate, laryngeal pathologies, and other complex disorders.

Students completing graduate programs of study in speech and language pathology may qualify for teaching certification by the Illinois State Board of Education, Illinois state licensure, and certification by the American Speech-Language-Hearing Association (ASHA). Professional speech and language pathologists work in schools, child development programs, specialized educational settings, universities, hospitals, clinics, rehabilitation centers, and private practice.

Honors Program

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 in the Undergraduate Education section of this catalog.

Independent Study

Upperclass students in the department 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.

Requirements for a Major in Communication Sciences and Disorders

Specific requirements may vary slightly according to the area of concentration. Students should consult their adviser for details.

- Introductory courses: GEN CMN 108 or CSD 207 and at least 2 of the following: GEN CMN 101, 102, 103
- 200-level courses: 201, 202, 200-level statistics course in psychology or education
- 300- and 400-level courses in communicative disorders: 10 courses (excluding practicum courses), including 307 and at least 1 each in audiology and hearing sciences, learning disabilities, and speech and language pathology
- Electives: 14 courses, at least 8 of which must be outside the department
(Students who plan to work in schools at the elementary or secondary level are advised to include courses in education and other areas that apply toward the requirements for a teaching certificate in their special field.)
- Courses taken in the department: No more than 18 can be counted toward the BSCmn degree
- Writing proficiency requirement: All students must meet the writing proficiency requirement
- Residence requirement: enrollment in the department for the last five quarters preceding the granting of the degree

Also see the description of requirements for students admitted to the seven-year Honors Program in Medical Education under Areas of Study for Departmental Majors, Human Communication Sciences, earlier in this section.

Basic Science Courses for Undergraduates and Graduates

GEN CMN 108-0 Processes and Pathologies of Human Communication See Introductory and Related Courses.

CSD 201-0 Phonetics Training in transcription of English speech sounds. Introduction to phonological analysis, dynamics of articulation, dialect variations.

CSD 202-0 Biological Foundations of Human

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.

CSD 304-0 Statistics in Communication Sciences

and Disorders Introduction to research design and data analysis in communication sciences and disorders; statistical inference.

CSD 305-1 Electronic Laboratory Instrumentation Basic analog and digital electronic theory for the use, modification, and design of behavioral laboratory equipment. Applications in speech and hearing.

CSD 305-2 Computer Laboratory Instrumentation

Computer use in the laboratory for equipment control and data acquisition. Real-time programming and networking between computers and laboratory equipment. Prerequisites: 305-1 and proficiency in any computer language.

CSD 306-0 Psychoacoustics Principles underlying perception of pitch, loudness, auditory space, auditory patterns, and speech. Psychophysical procedures for studying psychoacoustics and 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 physiological 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 Anatomy and Physiology of the Central

Hearing Mechanism Anatomy, physiology, experience-related neural plasticity, right/left brain specialization, auditory-visual integration; relationship to perception and learning in normal and clinical population.

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 320-0 Physiologic Instrumentation

Fundamentals of physiological measurement and analysis. Use of physiological instrumentation for the transduction and measurement of speech articulator movement. Design of experiments and interpretation of data. Prerequisite: 301.

CSD 350-0 Cognitive Development in Atypical Learners

Normal cognitive development in perception, attention, memory, language, conceptualization, and problem solving with application to atypical children with genetic and brain abnormalities.

CSD 351-0 Development and Disorders of Memory

Scientific models and evidence for the development of memory. Memory disorders in relation to developmental and life span issues.

CSD 399-0 Independent Study Prerequisite:

consent of associate dean after submission of petition.

Audiology and Hearing Sciences

Courses for Undergraduates and Graduates

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.

Undergraduates may take 400-level courses in this area with permission of the instructor

Learning Disabilities

Courses for Undergraduates and Graduates

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. Prerequisite: junior standing or above.

CSD 374-0 Behavior Assessment and Management in

Children Theories and application of behavior analysis and management principles. Emphases on assessment techniques, classroom management approaches, and strategies for the facilitation of learning.

CSD 375-0 Diagnostic Procedures for Exceptional

Children Introduces students to differential diagnostic procedures used in special education. Examination of cognitive

and emotional disorders, sensory impairment, physical handicaps, and legal aspects of diagnosis.

CSD 376-0 Remedial Education for Children with Learning Disabilities Theories and intervention principles for disorders of oral language, reading, written language, mathematics, and nonverbal learning.

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. Prerequisites: 375, 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 388-0 Attention Deficit Disorder and Related Disorders Identification and treatment of attention deficit disorders and related childhood behavior disorders. Emphases on objective and subjective assessment, life-span issues, and medical and psychological interventions.

Speech and Language Pathology

Courses for Undergraduates and Graduates

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: 397 and 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 Theories of normal and atypical child development — including cognition; language; gross and fine motor, social, and interpersonal functioning; and intrapsychic functioning — 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. Prerequisites: advanced undergraduate or graduate status in developmental disabilities or consent of instructor.

CSD 369-0 Special Topics in Speech and Language Pathology Current scientific and professional problems in speech and language pathology. Topics vary by quarter.

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 396-0 Diagnostic Procedures in Speech and Language Pathology Evaluation of speech and language disorders. Interviewing, report writing; use of standardized tests; examination of speech sensory and motor functions. Prerequisites: senior standing or above, 392, or consent of instructor.

CSD 397-0 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. Prerequisite: consent of instructor.

CSD 398-1,2 School Practicum in Speech and Language Pathology Supervised practicum of speech-language pathology services in schools. Participation in parent-teacher conferences and on IEP teams. Prerequisites: 334, 397.

Undergraduates may take 400-level courses in this area with permission of the instructor

Communication Studies

The Department of Communication Studies offers liberal arts-oriented course work focused on the most fundamental and pervasive of human activities. The study of human communication ranges from interpersonal processes such as persuasion and relationship formation to organizational processes such as group leadership and dispute resolution, as well as to the strategies and styles of public deliberation and debate and the political and cultural processes involving mass media and telecommunications systems. At the same time, the study of human communication encompasses the scholarly traditions of both the humanities and social sciences. The intellectual foundations for this study range from classical rhetoric to cognitive science, from the economics of computer-mediated communication networks to the ethics of public argument.

Course Specializations for Departmental Majors

The department has organized the wealth of theory and research on human communication — as well as the real-world applications of that theory and research — into six course specializations. These are interrelated sets of courses that can help students coordinate their choice of classes with their intellectual interests, postgraduate educational plans, and career goals. Students who major in communication studies are encouraged, though not required, to organize their course work within one or two of these specializations as described below.

Organizational Communication

The success of all organizations — whether small neighborhood groups or giant multinational corporations — depends on effective communication. Organizations must have members who are skilled in the basic communication activities of persuasion, group leadership and decision making, bargaining and negotiation, and team problem solving. And in the contemporary world, organizations also demand the knowledge necessary to analyze and act on information gathered from surveys and other research methods, to harness the resources of communication technology, and to thrive in an environment of diverse individuals. This specialization includes courses that develop basic communication skills as well as courses that examine communication processes in such contexts as task-oriented groups and professional-client relationships. It also includes courses that focus on the organizational challenges associated with technology, information management, cultural diversity, and image building. This specialization will be of interest to students who wish to work — and who will seek to lead — in either business or not-for-profit organizations. The prerequisite for beginning this specialization is 250. To complete this specialization, students must take 201 and 360 and choose a minimum of three courses from the following: 205, 229, 270, 275, 329, 341, 350, 361, 362, 363, 364, 365, 371, 391, 392, 393, and appropriate sections of 395 chosen in consultation with an adviser.

Communication Industries and Ethnologies

Mass communication and telecommunications are reshaping the culture, commerce, and politics of the United States and the world. Media firms are merging into ever-larger organizations that produce film, television, music, books, magazines, newspapers, and software for audiences worldwide. At the same time, technology is breaking down the old distinctions among computers, telephones, video, and print to create new networks that integrate video, voice, and data. These changes present new and sometimes unanticipated challenges to managers in business as well as to leaders in government, education, the arts, and the professions. This course specialization is intended for students who wish to prepare for these challenges by developing an understanding of the social, economic, legal, and technical aspects of mass communication and telecommunications. It will be of interest to students who seek careers in such communication fields as advertising and public relations, management of entertainment and information industries, and public policy making. The prerequisite for beginning this specialization is 205. To complete this specialization, students must select a minimum of five courses from the following: 201, 229, 270, 275, 287, 330-1,2, 350, 355, 370, 376, 377, 383, 385, 393, and appropriate sections of 395 chosen in consultation with an adviser.

Rhetoric, Media, and Public Culture

Citizens of the 21st century must understand the communication opportunities, obligations, and risks that emerge in an era of cultural diversification and conflict. This course specialization examines the relationship between communication and culture from a rhetorical and critical perspective — that is, from a point of view emphasizing the use of language and image to characterize social reality, create forums for deliberation and debate, and confront controversial issues and cultural differences. The specialization includes courses that engage the issues raised by differences of race, class, gender, nationality, and political conviction. It also includes courses that examine such cultural processes as the legitimization of social authority, the construction of personal as well as national identity, and the articulation of national purpose and international obligation. The role of the mass media in these issues and processes is of particular concern. This course specialization is intended for students interested in positions of civic leadership, such as in community-based organizations, social reform movements, and cultural, political, and educational institutions. The prerequisite for beginning this specialization is 220. To complete this specialization, students must take 210 and one other 200-level course from the following: 225, 271, and 275. They must also select a minimum of three courses from the following: 315, 320, 322, 324, 325-1,2,3, 327, 328, 329, 330, 370, 371, 373, 375, 376, 377, 378, 392, and appropriate sections of 395 chosen in consultation with an adviser.

Relational Communication

Our lives are spent in relationships with others. Most people are born into a family, form friendships, join work groups, and begin romantic attachments that sometimes turn into new family units. Interpersonal communication is the means by which we develop, maintain, and terminate these relationships. The relational communication specialization focuses on these processes. It has four components: courses examining the psychological variables that affect how people create and interpret the communication behaviors that occur during social interaction; courses examining the contexts in which relational communication occurs, such as the family and the work group; courses focusing on strategies and processes of interpersonal influence; and courses focusing on the impact of gender, culture, and other factors on the processes of relational communication. This specialization is intended for students interested in the psychological foundations of human communication as well as students interested in the helping professions (e.g., therapy, counseling). The prerequisite for beginning this specialization is 250. To complete this specialization, students must take two core courses, 201 and 241, and select a minimum of three courses from the following: 205, 341, 343, 344, 350, 360, 382, 392, 394, and appropriate sections of 395 chosen in consultation with an adviser.

Media and Politics

Communication is essential to both effective leadership and citizen participation. Leaders must employ the arts and sciences of communication to negotiate policy, move public opinion, maintain relations with other nations, and of course, win votes. Citizens must understand these arts and sciences if they are to maintain self-government. This course specialization focuses on the role of communication in the political processes of modern democracies, especially on how government officials, candidates, and citizens interact with the mass media in the realm of public affairs. The specialization is intended for students interested in political organizing and consulting, opinion polling, policy analysis, and research work in public interest groups and other not-for-profit organizations. The prerequisite for beginning this specialization is 205. To complete this specialization, students must take a minimum of three courses from the political leadership group, focusing on the rhetoric and strategies of political persuasion, consisting of 315, 321, 322, 325-1,2,3, 328, 380, and 391; and a minimum of two courses from the citizen participation group, concerning Americans' beliefs and the ways they respond to political information, consisting of 201, 270, 271, 355, 370, 371, 372, 373, 380, 383, 393, and appropriate sections of 395 chosen in consultation with an adviser.

Argumentation and Advocacy

Lawyers, policy makers, and indeed all citizens must be able to put forward and defend their views when matters of common concern are debated. This course specialization is based on the conviction that the skills of advocacy can best be cultivated in the liberal arts tradition by uniting intensive practice in the arts of argumentation with theory-based understanding of advocacy and deliberation. In this specialization, courses emphasizing practice require students to think critically about their positions, plan their communicative strategies effectively, and argue their cases forcefully. Courses emphasizing understanding enlarge students' views of the traditions and institutions — especially the law — that shape the processes of advocacy and deliberation on vital issues. Thus prepared, students can take their places as articulate citizens in the various communities to which they belong. The perspectives and skills offered in this specialization are particularly appropriate for students interested in law careers. The prerequisite for beginning this specialization is 220. To complete this specialization, students must select two practice-oriented courses from 214, 215, and 221, as well as three theory-oriented courses from 205, 210, 315, 320, 321, 322, 324, 325-1,2,3, 327, 330-1,2, 363, 391, and appropriate sections of 393 and 395 chosen in consultation with an adviser.

General Requirements for a Major in Communication Studies

14 School of Communication courses:

- GEN CMN 102
- 205, 220, and 250
- An additional 10 School of Communication courses, at least 7 of which must be in the department; of those 7, at least 5 must be at the 300 level. Not more than 1 unit of 393 Field Study in Communication and not more than 2 units of 399 Independent Study may be applied toward these 10 additional courses in communication. A maximum of 18 courses in the Department of Communication Studies may be counted toward the bachelor's degree.

Additional requirements:

- 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 minor, dual major, or adjunct major satisfies this requirement.
- Electives in communication and other areas to complete a minimum of 45 courses.

Departmental Honors Program

The Undergraduate Honors Program in Communication Studies offers an opportunity for highly motivated students to conduct original scholarly research. Through the senior year, each student works closely with faculty to produce an original research project in an interest area determined by the student. Seniors who complete the program graduate with departmental honors. Also see Honors and Prizes in the Undergraduate Education section of this catalog.

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 Studies 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 210-0 The Arts of Controversy:An

Introduction to Rhetorical Thinking Controversy as a rhetorical practice essential to healthy political culture. Use of rhetoric to appreciate different (and frequently conflicting) approaches to issues.

COMM ST 214-0 Legal Argumentation Argumentation practices in the legal forum. Nature and procedures of legal controversies about what is just; modes of reasoning about fact and law; history and ethics of legal advocacy.

COMM ST 215-0 Principles of Rhetorical Criticism

Introduction to the critical study of political, legal, and ceremonial rhetoric. Development of skills in analyzing and assessing such rhetoric and appreciating how it reflects and shapes basic social and cultural values.

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 Forms of Public Address Selected genres of public address, including the eulogy, the censure, the inaugural, the apology, and the dedication.

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 235-0 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 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 Team Leadership and Decision Making Theories and research relating to communication in small groups and group decision making.

COMM ST 270-0 Theories of Mass Communication Introductory survey of current issues in mass communication research. Workings and effects of media industries. Impact of media violence, effect of political news coverage and advertising, media effectiveness in public education.

COMM ST 271-0 Race, Gender, and the Mass Media How race and gender are constructed by the American mass media; how social groups use the media for their own

purposes. News coverage of minorities, images of women and minorities in advertising, social effects of pornography.

COMM ST 275-0 Persuasive Images:Rhetoric of Contemporary 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 287-0 Communication Technology and Society Basic introduction to communication technologies, both new and old. Societal and economic issues they raise, examined from a variety of disciplinary perspectives.

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 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 two units of such credit may be applied toward fulfillment of the major requirements.

Courses Primarily for Juniors,Seniors, and Graduates

PERF ST 311-0 Performance in Everyday Life See Performance Studies.

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 as groups contesting abortion, animal rights, feminism, and other local and national issues.

PERF ST 316-0 Folklore and Oral Traditions See Performance Studies.

COMM ST 320-0 Advanced Argumentation Theories of argument drawn from classical and contemporary sources, with application to practice; making, judging, and appreciating forms of argument; consideration of their logical, ethical, and persuasive force. Prerequisite: 210 or 220.

COMM ST 321-0 Public Argumentation Training in the arts of public argument through examination of contemporary controversies over social policies, foreign affairs, cultural events, and trials of public character. Sequel to 210.

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.

COMM ST 324-0 The Making of the Woman's Oratorical Tradition American woman social reformers of the 19th century broke the taboo against female orators and proved themselves masters of the art. Development of the tradition from its origins in the 1820s through the early 20th century.

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 327-0 Contemporary Rhetorical Practice Contemporary history from a rhetorical perspective. Analysis of public communications and rhetorical study of nonrational events; emphasis on social movements and political controversy in the United States since 1960.

COMM ST 328-0 The Rhetoric of War The genre of war rhetoric; American experience in the 20th century as drawn from speeches, diaries, newspaper reports, government documents, films, and poetry.

COMM ST 329-0 Rhetoric, Science, and Technology Contemporary debates on the standing and production of scientific argument. Current controversies over the social constitution and consequences of science and technology.

COMM ST 330-1,2 Contemporary Problems in Freedom of Speech Personal freedom and public communication under the U.S. 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.

R/TV/F 330-0 Electronic Media Management See Radio/Television/Film.

R/TV/F 333-0 Cable Communications See Radio/Television/Film.

COMM ST 341-0 Communication and Aging Relationship between adult developmental processes and changes in communication behavior. Prerequisite: 201.

R/TV/F 341-0 Technological Innovations See Radio/Television/Film.

COMM ST 343-0 Social Cognition and Communication In-depth analysis of theories examining the cognitive processes that occur before, during, and after interactions. Issues related to person perception, self-presentation, scripts, and schemas. Prerequisite: 201.

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. Prerequisites: 201 and 241.

COMM ST 350-0 Computer-Mediated Communication and Information Systems Examination and analysis of the tools of and issues in computer-mediated communication and networked information systems; effects of new communication technologies at the interpersonal, group, organizational, and societal levels.

COMM ST 355-0 Audience Analysis Methods used to analyze electronic media audiences, with emphasis on quantitative research techniques. Prerequisite: 201.

COMM ST 360-0 Theories of Organizational Communication Theories and research dealing with communication in formal organizations and institutions.

COMM ST 361-0 Intergroup Communication and Urban Change The small group as an agent of social change in urban society; internal and external communication in such change. Prerequisites: 250 and 360.

COMM ST 362-0 Professional-Client Communication Communication between professionals and clients in medicine, law, education, psychotherapy, and social services. Alternatives to the professional-client model of problem solving. Prerequisites: 201 and 360.

COMM ST 363-0 Bargaining and Negotiation Communication in bargaining and negotiation in organizational settings. Cognitive and motivational theories emphasizing bargaining and negotiation strategies. Prerequisites: 201, 205, and 360.

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. Prerequisite: 360 or equivalent.

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. Prerequisites: 201 and 360.

COMM ST 370-0 Current Perspectives in Mass Communication Research In-depth study of theories currently applied to the study of mass communication. Prerequisite: 201.

COMM ST 371-0 Public Opinion Nature of public opinion; history of techniques for expressing and assessing public opinion. Theories about the relationships among media, public opinion, and policy. Prerequisite: 201.

COMM ST 372-0 Mass Communication and Campaign Strategies Communication components of political campaigns, including broadcast advertising, direct mail, candidate speeches, debates, and news coverage. Campaign professionals share their expertise; students critically examine the effectiveness and appropriateness of campaign strategies and tactics. Prerequisite: 201.

COMM ST 373-0 News Media and American Society Examination of the news form, content and meaning of the news, and the role of the news media in social continuity and change.

COMM ST 375-0 Rhetoric and the Arts The impact of art forms such as theatre, music, dance, film, and television on the public. Critiquing of guest artists by students.

COMM ST 376-0 The Rhetoric of Popular Criticism How critics communicate their ideas and values to the public. Prerequisite: 275.

COMM ST 377-0 Marketing Popular Culture The invention and packaging of popular culture products, including film, music, television, and celebrities. Prerequisite: 275.

COMM ST 378-0 Rhetoric and Aesthetic Theory Interpretation and critique of the impact of major movements in aesthetic theory on the theory and practice of rhetorical communication. Prerequisite: 210, 215, or an equivalent course in interpretation or criticism.

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. Prerequisite: 205 or 210.

COMM ST 381-0 Classroom Communication Behavior The classroom as a communication system; verbal and nonverbal patterns of interaction. Systematic analysis of teacher-student behavior according to interpersonal and group processes.

COMM ST 382-0 Family Communication Behavior 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.

COMM ST 383-0 Satellites Historical development and contemporary issues regarding satellites. Government, research, military, and corporate uses of satellites and the relationships between satellites and telecommunications, geostrategic issues, information society, cyberspace, and economic development.

COMM ST 385-0 Mass Media Economics Economic framework for analyzing factors influencing economic organization of media industries and behavior of media firms. Framework applied to policy issues.

COMM ST 389-0 Practicum in Mass 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. Prerequisite: 201.

COMM ST 391-0 Ethical Issues in Communication Ethical problems in public, group, and interpersonal communication; criteria for their resolution.

COMM ST 392-0 Intercultural Communication Designed to integrate theory and practice in heightening student's awareness of the impact of culture on one's perception, beliefs, meanings, and verbal/nonverbal communication.

COMM ST 393-0 Field Study 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.

COMM ST 394-0 Gender and Communication Designed to integrate theory and practice in heightening awareness of the importance of gender as a communication variable.

COMM ST 395-0 Topics in Communication Studies Reading, research, and discussion in areas of significance. Topics vary.

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 two 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.

Performance Studies

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; performance theory and criticism. Internships and field study for performance studies majors extend and deepen their classroom work with experiential learning. Extra-curricular 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, 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.

Requirements for a Major in Performance Studies

- Introductory courses: 1 quarter of either GEN CMN 101 or 102; GEN CMN 103
- 200-level courses: a minimum of 4 courses in communication, including the following courses in the department: 216, 224, and 1 unit of 210-1, 210-2, or 210-3
- Production courses in theatre: 2 courses selected from THEATRE 140-1,2, 240-1,2,3, 241-1,2,3, 249-1,2, 354, 355, 363; or 1 course selected from preceding courses and one registration for 119; or 2 registrations for 119
- An additional 10 courses in communication, at least 6 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 6 300-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

- 6 courses at the 200 level or above outside communication, including at least 3 300-level courses in literature; if they apply, courses taken to meet the distribution requirement may be used to satisfy this requirement
- Electives in communication and other areas

Courses Primarily for Freshmen and Sophomores

GEN CMN 103-0 Analysis and Performance of Literature See Introductory and Related Courses.

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 Graduates

Unless otherwise indicated, one 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, both as literary texts and cultural texts, through solo, duo, and group performance. The literary genre will vary from year to year.

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 post-war American literature.

PERF ST 322-0 Performing the Psychological Novel Use of performance in the analysis and criticism of selected 19th- and 20th-century novels.

PERF ST 324-1,2 Presentational Aesthetics **1.** Theatrical convention, presentational mode, and conscious artifice in the performance of dramatic literature, poetry, and non-fiction. **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 399-0 Independent Study Prerequisite: consent of associate dean after submission of petition.

Radio/Television/Film

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 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 7200-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 Chicago-area television and radio station and production companies. Frequent guest lectures are offered by alumni with careers in media and by other well-known professionals.

Requirements for a Major in Radio/Television/Film

- Introductory courses: 180; a minimum of 3 courses at the 100 or 200 level in communication outside the department
- 200-level courses: 220, 230, 280; 280 is prerequisite for all 300-level production and writing courses
- An additional 8 courses in communication at the 300 and 400 levels, including at least 6 courses in the department at the 300 and 400 levels; not more than 1 unit of 349 Internship in Radio/Television/Film and 399 Independent Study may be applied toward the 6 courses required in the department; the remaining internship and 399 units count as elective credits
- 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: competency in a modern foreign language, which may be established by a placement exam; completion of the fourth quarter or a higher class; or an AP score of 3, 4, or 5
- Electives in communication and other areas

Courses Primarily for Freshmen and Sophomores

R/TV/F 180-0 Media Construction I:Media Literacy Image construction and manipulation; image sequencing; sound and sound-image relations; basics of Web design. Prerequisite for 280. Required for majors; typically taken in freshman year.

R/TV/F 202-0 Introduction to Popular Culture:The Mass Media Cultural meanings of narrative and commercial forms in radio, television, and film. Historical and contemporary theories of popular culture.

R/TV/F 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.

R/TV/F 230-0 Understanding Media Contexts Media industries as social and cultural forces; economic and political dimensions of the global media. Prerequisite for all 300-level courses in the department. Required for majors; typically taken in sophomore year.

R/TV/F 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.

R/TV/F 280-0 Media Construction II:Sight and Sound Foundation course in single-camera production, with emphasis on expressive possibilities of lighting. Prerequisites: 180, 220. Prerequisite to 300-level production courses. Required for majors; typically taken in sophomore year.

R/TV/F 298-0 Studies in Media Topics Theoretical or practical or both; emphasis on evolving trends.

Courses Primarily for Juniors,Seniors, and Graduates

R/TV/F 301-0 Broadcast News Survey of existing research and critical analysis of the process, content, impact, and utilization of broadcast news.

R/TV/F 310-0 History of Broadcasting Global evolution of radio and television, with events in United States as a central historical factor; programming and audiences, trends, cultural influences, issues. Survey of literature and research.

R/TV/F 312-1,2 History of Film International survey of motion pictures as a distinctive medium of expression from its prehistory to the present.

R/TV/F 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 socio-political persuasion.

R/TV/F 313-2 Documentary Film and Video Contemporary work and issues in documentary film and video.

R/TV/F 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.

R/TV/F 322-0 Radio/Television/Film Genre Concept of genre in the media, with reference to popular American forms.

R/TV/F 323-1 Experimental Film:History and Criticism Films and theories of experimentalists since the 1920s; contemporary underground movement.

R/TV/F 323-2 Experimental Film and Video Contemporary work in experimental film and video.

R/TV/F 325-0 Feminism and Film/Video Introduction to feminist film theory, the feminist critique of mainstream cinema, and film and video work by women offering alternatives to the mainstream.

R/TV/F 326-0 Mass Media Criticism Contemporary critical methods applied to mass communication media. Critical literature supplemented by written analyses of selected films, television programs, and other appropriate material.

R/TV/F 330-0 Electronic Media Management Organization and management of the television station and other electronic media organizations and facilities; functions and interrelationships of various departments.

R/TV/F 331-0 Regulation of Broadcasting Government regulation and industry self-regulation; historical perspective and examination of current issues.

R/TV/F 333-0 Cable Communications Legal, technical, and programming aspects of cable and satellite communications. Services offered by existing systems and the complexities of developing systems.

R/TV/F 334-0 Television in Education Uses, potentialities, current developments in educational media, including non-commercial educational media stations and media in the schools.

R/TV/F 341-0 Technological Innovations How technology develops and is assimilated into mass media.

R/TV/F 342-0 Program Planning and Programming Programming broadcast stations, networks, and cable in relation to audiences, markets, coverage, policies, facilities.

R/TV/F 345-0 Film as Business American film industry's structure, policies, and relations with foreign governments and other segments of the entertainment business, including financing, distribution, and exhibition.

R/TV/F 349-1,2 Internship in Radio/Television/Film (1–4 units) Selected students work in production departments of radio and television stations and film studios. Guided research and reading.

R/TV/F 351-0 National Cinema Historical aspects of cinema in a culture outside the United States or a social/cultural/intellectual movement within the general evolution of cinema.

R/TV/F 353-0 National Mass Media The problem of creating a distinct national cultural identity through mass media; specific nations as case studies.

COMM ST 355-0 Audience Analysis See Communication Studies.

R/TV/F 360-0 Topics in Screenwriting 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 twice for credit, depending on the change in topic. Prerequisite: 260.

COMM ST 377-0 Marketing Popular Culture See Communication Studies.

R/TV/F 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: 380 and 381.

R/TV/F 380-0 Film Production Techniques and technologies of 16mm filmmaking from initial conception to completed motion picture. Lecture/laboratory.

R/TV/F 381-0 Video Production Techniques and technologies of professional video; single-camera shooting and multisource editing. Lecture/laboratory.

R/TV/F 383-0 Radio/Audio Production Techniques and technologies of audio production, emphasizing location recording. Survey of techniques used for film, video, experimental audio, and radio production. Postproduction includes work with a digital audio workstation. Lecture/laboratory.

R/TV/F 385-0 Integrated Media Arts Introduction to theory and practice of media using microcomputers. For nonmajors; an elective in the Integrated Arts Program.

COMM ST 385-0 Mass Media Economics See Communication Studies.

R/TV/F 391-0 Television Studio Directing Directing, crewing, and technical skills for multiple camera live-on-tape television production in narrative and non-narrative genres; preproduction, directorial communication, blocking, pacing, visualization. Prerequisite: 380 or 381.

R/TV/F 392-0 Documentary Production Techniques for film and video, emphasizing preproduction planning, documentary techniques, and ethics. Prerequisites: 313-1 and 380 or 381.

R/TV/F 393-0 Computer Animation Study and practice of two-dimensional computer graphics and animation.

R/TV/F 394-0 Experimental Film and Video Production Production experience in the making of art film or video; tapes, films, or installations that work outside established genres. Prerequisites: 323-2 and 380 or 381.

R/TV/F 398-0 Symposium: Issues in Radio/Television/Film Special issues and topics in the analysis of radio, television, film, and popular culture.

R/TV/F 399-0 Independent Study Prerequisite: consent of associate dean after submission of petition.

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; stage production; design; playwriting; dramaturgy; creative drama and children's theatre; 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 School of Communication, 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. 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.

Requirements for a Major in Theatre

- **Introductory courses**
THEATRE 140-1,2 Theatre in Context (two quarters, includes crews); 2 courses from the following: GEN CMN 101,102,103, 110
- **Noncredit dance or physical education courses:** 3 quarters from a selected list
- **10 200- and 300-level courses,** with a minimum of 5 courses at the 300 level or above in theatre, with courses from each of the following groups:

Performance (at least 2 courses)

THEATRE 210 Training the Actor's Voice
THEATRE 243-1,2,3 Acting I: Principles of Characterization
THEATRE 312-1 The Art of Storytelling
THEATRE 340-1,2 Stage Directing
THEATRE 341-1,2,3 Acting II: Analysis and Performance
THEATRE 347 Children's Theatre
THEATRE 348-1 Creative Drama
THEATRE 348-2 Advanced Creative Drama
THEATRE 359 Directing for the Open Stage (see Graduate School catalog)
THEATRE 442 Theatre Practice: Children's Theatre Tour (see Graduate School catalog)

Design/Technology (at least 2 courses)

THEATRE 240-1,2,3 Stagecraft
THEATRE 241-1,2,3 Design Process
THEATRE 242 Stage Makeup
THEATRE 249-1 Introduction to Stage Management
THEATRE 342-1,2 Stage Lighting II
THEATRE 343-1,2 Scene Design II
THEATRE 344-1,2 Costume Design II
THEATRE 353 Topics in Stagecraft
THEATRE 354 History of Costume and Décor
THEATRE 355 Scene Painting
THEATRE 361 Makeup, Masks, and Wigs
THEATRE 363 Theatre Sound

History, Literature, and Criticism (at least 3 courses)

2 courses from one of the following core sequences (other current offerings will be listed in the quarterly class schedule):

THEATRE 244-1,2 Development of Contemporary Theatre
THEATRE 345-1,2,3 History of Western Theatrical Practice
COMPLIT 362-1,2,3 Modern Drama
THEATRE 367 History of the Lyric Theatre; DANCE 230 History of the Dance; DANCE 330 Dance Criticism
THEATRE 365-1,2 American Theatre and Drama;
AF AM ST 259 Introduction to African-American Drama

PERF ST 307-1,2 Studies in Gender and Performance;
THEATRE 307 Studies in Gender and Performance
ENGLISH 334-1,2 Shakespeare; ENGLISH 339 Special
Topics in Shakespeare

- 1 additional course from sequences above or from the following:
THEATRE 366, 368; DANCE 335; CLASSICS 345, 348;
COMPLIT 203, 312, 365; ENGLISH 312, 332, 342;
SLAVIC 318, 369; SPANISH 342
- Courses outside communication: 6 courses at the 200 level or above, including at least 3 courses at the 300 level or above (courses taken to meet the distribution requirement may be used)
- Electives: note the School of Communication 18-unit requirement (see General Requirements)

Requirements for a Major in Dance

- Introductory courses: DANCE 130-1,2,3; THEATRE 119 (two quarters, no credit); 1 course from the following:
GEN CMN 101, 102, 103, 108, 110
- 200- or 300-level communication courses: 3 courses
- At least 1 yearlong for-credit technique course each year, from the following: 240-1,2,3; 242-1,2,3; 244-1,2,3
- At least 8 courses chosen from the following categories:

Performance (minimum of 3 credits)

DANCE 133 Movement for the Stage
DANCE 232 Dance Composition
DANCE 233 Choreography for the Musical Stage
DANCE 332 Improvisation for Dance, Music, and Theatre
DANCE 333 Dance and Music: Studies in Collaboration
DANCE 334 Advanced Choreographic Study
DANCE 442 Studies in Dance

History, Theory, and Criticism (minimum of 3 credits)

DANCE 230 History of the Dance
DANCE 231 Period Dance and Historical Movement Styles
DANCE 330 Dance Criticism
DANCE 335 Special Topics in Dance Research
(methods or history topics)
THEATRE 367 History of the Lyric Theatre
Weinberg College dance history/theory courses

Professional Studies (minimum of 2 credits)

DANCE 331 Summer Dance Institute
DANCE 335 Special Topics in Dance Research
(dance science/medicine, design for dance)
DANCE 336 Labanotation, Elementary Level
DANCE 337 Dance and Expressive Arts Therapies
DANCE 342 Studies in Dance
DANCE 371 Dance in Education
THEATRE 380 Internship in Theatre Practice

Theatre

Courses Primarily for Freshmen and Sophomores

THEATRE 119-0 Production Laboratory Registration for students fulfilling production crew requirements.

THEATRE 140-1,2 Theatre in Context 1. Combination of lecture, discussion, workshop, assignments, production lab, and play viewing. Text analysis taught with a view toward stage production. Opportunities for students to try different roles (acting, directing, technical). 2. Seminar in three sections emphasizing theatre history, literature, and criticism; research; and writing skills. Crew participation in department productions.

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 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. Prerequisite: 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 or consent of instructor.

THEATRE 242-0 Stage Makeup Theory and practice of stage makeup. Crew participation in department productions.

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; 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 253-0 Mime Art of mime; theory and practice. Physical and mental conditioning of the performer, progressing to intensive work in performance concepts.

Courses Primarily for Juniors, Seniors, and Graduates

Unless otherwise noted, these courses are open only to students who have completed the departmental 200-level requirements or their equivalents.

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 two courses in this series.

THEATRE 310-0 Advanced Voice/Styles Advanced vocal techniques of the stage actor. Vocal styles include work on 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; consent of instructor.

THEATRE 312-1,2 The Art of Storytelling **1.** 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. **2.** Advanced techniques of research, preparation, and performance, culminating in a public event. Students use storytelling in presentations and performance. Prerequisite for 312-2: 312-1 and consent of instructor.

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 the 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 342-1,2 Stage Lighting II Development, communication, and implementation of ideas and images for stage lighting based on text analysis and production parameters. Emphasis on artistically productive and efficient processes leading to design solutions. Crew participation in department productions may be required. Prerequisite: 241-3, 353 Topics in Stagecraft: Stage Lighting I, and consent of instructor.

THEATRE 343-1,2 Scene Design II Principles, techniques, and processes used by the designer in theatrical production. **1.** Elements of scene design, historical source material, traditional modes of presentation. **2.** Composition, theatrical forms and styles, contemporary modes of presentation. Crew participation in department productions may be required. Prerequisite: consent of instructor.

THEATRE 344-1,2 Costume Design II Principles of costume design for the stage. Emphasis on creative design work in response to traditional and nontraditional text. **1.** Interpretation of contemporary text, character development, costume research, costume design. **2.** Interpretation of historical text, period costume research, color theory, fabric selection, costume design. Crew participation in department productions may be required. Prerequisite: 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. Prerequisite: junior or senior standing and consent of instructor.

THEATRE 347-0 Children's Theatre Selection, evaluation, direction, and production of plays for children. Prerequisite: consent of instructor.

THEATRE 348-1 Creative Drama Processed 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, observation. Course culminates with extended teaching projects with children from local schools. Prerequisites: 348-1 or equivalent; 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 Music Theatre Techniques

Various performance styles of musical theatre. Current topic will be listed in the quarterly class schedule. May be repeated for credit with change of topic. Open to students in the Music Theatre Certificate Program or by consent of instructor. Prerequisites: junior standing; 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 Graphic Arts for the Stage Designer

Techniques and materials of graphic communication for the stage designer. May be repeated for credit with change of topic. Crew participation in department productions may be required. 1. Perspective, rendering, and color.

2. Theatrical drafting and calligraphy. 3. Theatrical model building and three-dimensional design development. Prerequisite: junior standing or consent of instructor.

THEATRE 357-1,2 Freehand Drawing for the Stage Designer

Drawing for scenery, costume, and lighting designers; principles of drawing and composition using a variety of drawing materials. Lecture and studio. Prerequisite: consent of instructor.

THEATRE 361-0 Makeup, Masks, and Wigs

Design principles and construction methods used in creating visual accessories to costume design. Current topic will be listed in the quarterly class schedule. Crew participation in departmental productions may be required. Prerequisites: 241-2 or equivalent; 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 the 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. Prerequisite: junior standing and consent of instructor.

THEATRE 365-1,2 American Theatre and Drama

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. The 1940s to the 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 History of the Lyric Theatre

Three-part course, covering the major movements in the histories of dance, opera, and musical comedy. Examination of artists and their works.

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 AFAM ST 259 or consent of instructor.

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 the 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.

THEATRE 399-0 Independent Study Prerequisite: consent of associate dean after submission of petition.

Dance

Courses Primarily for Freshmen and Sophomores

DANCE 130-1,2,3 Introduction to the Dance Experience Technique, improvisation, lecture, and discussion on dance history and cultural studies. **1.** Movement analysis and theories of dance **2.** Anatomy and kinesiology. **3.** World dance. Prerequisite: consent of instructor.

DANCE 133-0 Movement for the Stage Movement/body awareness. Improvisational techniques using time, space, weight, and effort as the instrument of expression.

DANCE 230-0 History of the Dance Movement concepts in the major developmental periods of Western ballet and modern dance.

DANCE 231-0 Period Dance and Historical Movement Styles Body carriage, use of gesture, and dance of the pre-classic period. Practical and theoretical understanding of movement styles of the Middle Ages and Renaissance and Baroque periods.

DANCE 232-0 Dance Composition The choreographic process. Fundamental choreographic elements: time, space, shape, form, dynamics, and design.

DANCE 233-0 Choreography for the Musical Stage Setting movement/dance for vocalists and actors. Teaching choreography to nondancers and working with large numbers (chorus) on stage.

DANCE 240-1,2,3 Studies in Ballet

DANCE 242-1,2,3 Studies in Modern

DANCE 244-1,2,3 Studies in Jazz

Courses Primarily for Juniors, Seniors, and Graduates

Unless otherwise noted, these courses are open only to students who have completed the departmental 200-level requirements or their equivalents.

DANCE 330-0 Dance Criticism Critical and theoretical thought of writers on Western theatrical dance.

DANCE 331-0 Summer Dance Institute Choreography workshop exploring various dance forms with guest artists. Summer only.

DANCE 332-0 Improvisation for Dance, Music, and Theatre Improvisation as a source for performance and composition. Interrelationships of the performing arts. For musicians, actors, and dancers to investigate new dimensions of their art. Prerequisite: consent of instructor.

DANCE 333-0 Studies in Collaboration Workshop exploration of collaboration as well as historical and theoretical perspectives. Seminar, practicum.

DANCE 334-0 Advanced Choreographic Study Lecture-laboratory investigation of advanced choreographic concepts; abstraction, style, use of music, group work, humor in dance. Prerequisite: 232 or consent of instructor.

DANCE 335-0 Special Topics in Dance Research Research methodologies, dance scholarship, criticism, historical reconstruction. Critical issues and contemporary problems. Content varies. Prerequisite: consent of instructor.

DANCE 337-0 Dance and Expressive Arts Therapies Dance and the creative arts therapies in the treatment of the disabled and emotionally ill. Symbolic meaning, group dynamics, and the language of movement as it relates to personality, body image, and expression. Prerequisite: consent of instructor.

DANCE 342-0 Studies in Dance

DANCE 371-0 Dance in Education Organizing and teaching dance for children and adolescents. Creative play, movement exploration, acquisition of basic motor skills. Lecture, laboratory, field experiences.

DANCE 399-0 Independent Study Prerequisite: consent of associate dean after submission of petition.

School of Education and Social Policy

The mission of the School of Education and Social Policy (SESP) 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. In this view, learning communities include not only schools and classrooms but also workplaces, families, neighborhoods, and other societal arrangements where learning takes place. Through their broad-based interdisciplinary research, teaching, and outreach activities, SESP 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.

At the undergraduate level, the school provides preprofessional training and research activities that are closely linked to SESP's faculty and to the graduate programs in Learning Sciences and in Human Development and Social Policy. Students learn to understand human development and improve learning in its various social contexts by applying the social and behavioral sciences. The school offers four programs leading to the degree of bachelor of science in education and social policy: Human Development and Psychological Services, Learning and Organizational Change, Secondary Teaching, and Social Policy. Students in other undergraduate schools also may complete the requirements of the Secondary Teaching Program and qualify for secondary certification.

Individuals who hold a baccalaureate degree may apply to the school's master of science program, which leads to elementary or secondary teaching certification in the state of Illinois.

For more information about SESP, see the school's Web site at www.sesp.northwestern.edu.

Academic Policies

Grade and Residency Requirements

The following requirements concerning residence and grade point average apply to all students seeking the degree of bachelor of science in education and social policy:

1. A minimum of 45 course units are required for graduation from the School of Education and Social Policy.
2. Students are required to maintain a minimum grade point average of 2.0 in all work presented for the degree. To qualify for teacher certification, students must earn a minimum grade of C- and an overall average of 2.5 in all required core courses and all courses used to complete their teaching major. Students in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs must earn a minimum grade of C- in all their core and program courses and distribution requirements.
3. Full-time students in the School of Education and Social Policy may elect to enroll in some 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 one course per quarter under this option but not any distribution requirement or course in their core, program, or teaching major.
4. Not more than six of the grades in courses taken at Northwestern and presented for graduation may be a combination of P's and D's.
5. Any work taken at universities other than Northwestern that is to be counted toward fulfilling Northwestern requirements must be approved in advance by the student's adviser and the assistant dean.
6. Every candidate for a degree must file an application for the degree, along with a Course Planning Form, in the SESP Office of Student Affairs one year in advance of the date of graduation (see Academic Calendar). That office will forward the application, when approved, to the Office of the Registrar.
7. Students who wish to transfer into SESP's Secondary Teaching Program may not be able to meet the requirements unless they plan carefully throughout their undergraduate program.
8. Students who wish to transfer into SESP from another Northwestern school must
 - Meet all program requirements expected of students in SESP

- Possess a minimum cumulative GPA of 2.5
- Have successfully completed or be enrolled in a SESP course
- Demonstrate an understanding of how transferring to SESP will support their academic goals
- Attend the appropriate information and orientation sessions

9. Students transferring from another university are required to complete the last 23 course units at Northwestern University.

10. Students in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs must complete a 10-week practicum (8 weeks during Summer Session) that includes 30 hours per week at a supervised practicum site (SESP 383) and a concurrent seminar (SESP 385) analyzing the practicum experiences. Students receive 4 credits upon completion of these requirements.

Secondary education students must complete a quarter-long student teaching internship and be enrolled in TEACH ED 388/389 Student Teaching Seminar.

11. Additional requirements are stipulated in the SESP Undergraduate Handbook. All students are expected to be familiar with and observe these policies.

In addition to and independent of the requirements set by SESP, all students must satisfy the Undergraduate Residence Requirement (see Undergraduate Education section of this catalog).

Honors

Students who maintain records of academic distinction may qualify for the honors program. Any student who has attained an overall cumulative grade point average of 3.5 or above after winter quarter of the junior year is eligible for provisional admission to the program beginning spring quarter of the junior year. During the spring quarter students must successfully complete SESP 391 Advanced Research Methods. Students considering both study abroad and the honors program must plan their study abroad programs accordingly.

Students who successfully complete 391 may formally enter the three-quarter honors program by registering for SESP 398 Honors Thesis in the fall quarter of their senior year. In this course students work with a faculty adviser on a research project. If progress is satisfactory, students are eligible to

register for 398 during 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.

Additional information about the honors program is available from the honors program coordinator.

Undergraduate Research

SESP provides a variety of in-depth research and innovative learning opportunities for undergraduates, including SESP 298 Student-Organized Seminar, 390 Research Apprenticeship, and 399 Independent Study. Additional information about undergraduate research opportunities in SESP and faculty research projects may be obtained through the academic advisers in the SESP Office of Student Affairs.

Probation

In addition to the University regulations regarding academic probation, an undergraduate student in SESP is ordinarily placed on academic probation when, in any one quarter, he or she does not receive at least three final grades of A, B, C, or P or has a cumulative grade point average below 2.0. Students on probation must work with their advisers to address the deficiencies that resulted in probation. Failure to do so may result in dismissal from the University.

Academic Advisers

Each undergraduate student is assigned to an adviser in the Office of Student Affairs. For the advising system to work effectively, the student must take all academic questions to the adviser. The adviser is responsible for helping to plan the academic program to meet the requirements for completion and graduation. Advisers also help students access 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. Failure to do so may result in a hold being placed on a student's registration.

Petitions

Students must petition if they wish to be exempted from any of the regular degree or specific course requirements of SESP. Petition forms may be obtained

from the SESP Office of Student Affairs and on the SESP Web site. No petition is considered unless it is signed by the student's adviser and the SESP assistant dean for student affairs.

Academic Programs

Requirements for the Bachelor's Degree

Students in the Human Development and Psychological Services, Social Policy, Learning and Organizational Change, and Secondary Teaching Programs receive a bachelor of science degree in education and social policy; 45 units are required for the degree.

The intellectual core of the first two programs comes from SESP's human development and social policy graduate program, while the intellectual core of the last two programs comes from the school's learning sciences graduate program.

The Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs have similar distribution and core requirements, though each has different major courses. The Secondary Teaching Program is markedly different from the others, due in large part to Illinois Board of Education requirements.

Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs

Preprofessional Preparation

SESP programs offer opportunities to prepare for a number of career options. Students 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. They are encouraged to design their programs with career objectives or graduate and professional school admission policies in mind.

Human Development and Psychological Services, Learning and Organizational Change, and Social Policy are especially appropriate programs for those seeking careers in management, consulting, education reform, design of knowledge systems, clinical psychology, social work, counseling, law, public service, human resources, and public sector management.

Students interested in such fields as child development, social work, clinical psychology, medicine, and counseling normally enter the Human Development and Psychological Services Program. The core course

work in human development and psychological counseling, combined with other courses in psychology, sociology, and interpersonal communication, is particularly important for students considering such careers. Students with these interests are encouraged to include in their programs the prerequisites in psychology and quantitative methods needed for graduate work in psychology and in the human service professions.

The Learning and Organizational Change Program is well suited to students who plan careers in management, consulting, change management, training, design of knowledge systems, and human resources in profit and not-for-profit organizations as well as to those interested in reforming education through curriculum and organizational design in schools. Students combine core course work 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.

Students interested in public service and law normally choose to follow the requirements of the Social Policy Program, where they can combine the policy-related course work with courses in political science, communication studies, economics, urban affairs, and sociology to prepare either for graduate work in law or public policy or for policy positions in public and private agencies. Students in the Social Policy Program are encouraged to use electives 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.

In all three programs — Human Development and Psychological Services, Learning and Organizational Change, and Social Policy — students 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.

To work toward these goals, students register for a one-quarter practicum in off-campus settings, such as governmental entities, community agencies, hospitals,

juvenile homes, learning and development departments of for-profit organizations, and law firms, where they can observe and participate in the activities of a socializing institution. Concurrent with this practicum — taken during the junior year (including the summer before or after) in the Chicago area or, during Summer Session, in San Francisco and Washington, D.C. — students meet in a weekly practicum analysis seminar. This seminar helps them integrate their past learning from course work with their observations of human behavior in an organizational setting.

Distribution Requirements (10 units)

All students in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs must complete at least two courses in each of the following areas:

- I. Natural sciences
- II. Formal studies (mathematics, logic, etc.)
- III. Historical studies
- IV. Values (religion, philosophy, etc.)
- V. Literature and fine arts

Selected courses from Weinberg College and professional schools throughout the University may be used to fulfill distribution requirements with the consent of the student's adviser and the assistant dean of SESP.

SESP Core (8 units)

Majors in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs must complete the SESP intellectual core. Students gain a basic understanding of a particular period of human development by choosing either SESP 201 Human Development: Childhood and Adolescence or 203 Human Development: Adulthood and Aging. One course chosen from the following is also required:

SESP 201 Human Development: Childhood and Adolescence

SESP 202 Introduction to Community Development

SESP 203 Human Development: Adulthood and Aging

LOC 212 Learning and Understanding

SESP 316 Moral Values in Human Development: An Introduction

SESP 317 Gender and the Life Course

SESP 318 Adult Development and Work Careers

SESP 319 Family Development in Changing Society

Students must demonstrate theoretical and practical mastery of quantitative and conceptual analysis by completing two research methods courses, SESP 210 Introduction to Statistics and Research Methodology and SESP 372 Methods of Observing Human Behavior. Students must complete 372 before undertaking the practicum and practicum analysis seminar component of the intellectual core.

In the practicum, taken during the junior year, students complete a supervised practicum experience during the course of their program of study. The practicum involves a one-quarter unpaid internship in an off-campus setting related to the student's program. Concurrent with the internship, students attend a weekly seminar taught by a Northwestern faculty member that integrates their experiential knowledge with the theoretical training in their course work. They earn four credits for the practicum and seminar (two for SESP 383 and two for SESP 385). Practicum sites are located in the Chicago area and, during Summer Session, in San Francisco and Washington, D.C.

Students must contact the practicum director in the school's Office of Student Affairs at least two quarters (perhaps three, depending on the city in which the practicum occurs) before the beginning of the quarter in which the practicum will be taken. The practicum director advises students about procedures and application materials for a practicum placement.

Individual Program Requirements

Students in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs must prepare a plan that includes a rationale for the configuration of courses chosen for their programs. Many students work with their advisers to develop an interdisciplinary specialization within their programs by selecting five or more courses around a particular theme.

Human Development and Psychological Services

Students in this program explore in depth the complexity of the contributions to human development of institutions such as the family, the educational system, government, religious organizations, and the workplace. Students are expected to work with their advisers to develop an individualized program of study.

Total requirements — 45 courses

Distribution requirements — 10 courses

SESP Core — 8 courses**Major program** — 16 courses

- Basic courses — 5 courses
 HDPS 201 Introduction to Psychological Services
 HDPS 301 Introduction to Counseling
 3 courses chosen from HDPS 302 The Human Personality, HDPS 303 Intervention Strategies, HDPS 311 Group Dynamics, and SOC POL 304 Social Policy and the Human Services
- Required major courses — 11 courses, at least 4 at the 300 level, selected from an approved list in human development and psychological services and other areas such as anthropology, communication studies, linguistics, psychology, and sociology. Up to 3 units of SESP 390 Research Apprenticeship or SESP 399 Independent Study and 3 units of SESP 398 Honors Thesis may be counted toward this requirement.

Electives — 11 courses

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.

Learning and Organizational Change

This program teaches students how to increase individual and organizational effectiveness through improved uses of knowledge within organizations. This innovative concentration embodies technology, design, globalization, changing demographics, and new discoveries about effective learning and organizational behavior. Students are expected to work with their advisers to develop an individualized program of study.

Total requirements — 45 courses**Distribution requirements** — 10 courses**SESP Core** — 8 courses**Major program** — 16 courses

- Basic courses — 6 courses
 LOC 211 Introduction to Organization Theory and Practice
 LOC 212 Learning and Understanding
 LOC 301 Macroecognition: Intelligence in Context
 LOC 302 Education and the Changing Workplace
 LOC 306 Studies in Organizational Change
 LOC 310 Learning Organizations for Complex Environments
- Project — 1 300-level project course agreed upon by the student and the academic adviser

- Required major courses — 9 courses, at least 3 at the 300 level, selected from an approved list in learning and organizational change and other areas such as cognitive science, computer science, economics, psychology, and sociology. Students are encouraged to take at least 3 courses in economics (including ECON 310-1 Microeconomics and ECON 311 Macroeconomics), technology, and international studies or foreign language. Up to 3 units of SESP 390 Research Apprenticeship or SESP 399 Independent Study and 3 units of SESP 398 Honors Thesis may be counted toward this requirement.

Electives — 11 courses

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.

Social Policy

Students in this program explore in depth the ways in which policy decisions and social institutions influence the course of human lives. Students are expected to work with their advisers to develop an individualized program of study.

Total requirements — 45 courses**Distribution requirements** — 10 courses**SESP Core** — 8 courses**Major program** — 16 courses

- Basic courses — 6 courses
 SOC POL 201 Introduction to Social Policy
 SOC POL 304 Social Policy and the Human Services
 SOC POL 307 Educational Policy
 SOC POL 330 Economics of Social Policy
 ECON 201 Introduction to Macroeconomics
 ECON 202 Introduction to Microeconomics
- Required major courses — 11 courses, at least 5 at the 300 level, selected from an approved list in social policy and other areas such as African American studies, economics, linguistics, political science, and sociology. Up to 3 units of SESP 390 Research Apprenticeship or SESP 399 Independent Study and 3 units of SESP 398 Honors Thesis may be counted toward this requirement.

Electives — 11 courses

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.

Secondary Teaching Program

Students enrolled in the School of Education and Social Policy or elsewhere in the University who wish to pursue the secondary teaching major and recommendation for secondary teaching certification must apply for formal admission to the Secondary Teaching Program. Those completing degree requirements within SESP receive the degree of bachelor of science in education and social policy; 45 units are required for the degree. Students in other undergraduate schools also must complete a major and fulfill degree requirements of their schools.

Preparation for Professional Work in Middle and Secondary Schools

Those interested in the undergraduate Secondary Teaching Program should contact SESP's Office of Student Affairs. The Secondary Teaching Program is approved by the Illinois State Teacher Certification Board; those completing the program therefore qualify for secondary certification in Illinois. There is reciprocity with many other states.

Students in the Secondary Teaching Program take extensive course work in the liberal arts and complete a major in the academic subject they expect to teach. They also observe professional teaching in a variety of educational settings and complete a part-time co-teaching practicum experience and a full-time student teaching internship.

Distribution Requirements (15–17 units)

All students must complete 2 courses in each of the following areas:

- I. Natural sciences
- II. Formal studies (mathematics, logic, etc.)
- III. Social and behavioral sciences
- IV. Historical studies
- V. Values (religion, philosophy, etc.)
- VI. Literature and fine arts
- VII. Communication (2 intensive writing courses and 1 public speaking or other oral communication course are required)
- VIII. Multicultural (2 courses reflecting a non-Western perspective; courses taken in areas III through VI may also fulfill this requirement)

Selected courses from Weinberg College and professional schools throughout the University may be used to fulfill distribution requirements with the consent of the student's adviser and the assistant dean of SESP.

Professional Core (11 units)

- SESP 201 Human Development: Childhood and Adolescence
- TEACH ED 304 Seminar on Teaching: Introduction to Schooling in Communities
- TEACH ED 313 Problems in the Philosophy of Education
- TEACH ED 327 Educating Exceptional Children
- TEACH ED 341 Teaching and Learning in Social and Cultural Contexts
- 1 methods and techniques course chosen from TEACH ED 354 through 359 Methods and Techniques
- TEACH ED 378 Practicum/Seminar: Humanities or 379 Practicum/Seminar: Mathematics and Science
- TEACH ED 388 Student Teaching Seminar: Humanities or 389 Student Teaching Seminar: Mathematics and Science

Teaching Major Requirements

Programs in specific teaching major fields listed below are designed to meet requirements of the Illinois State Board of Education. Teaching major requirements may differ from those of a departmental major, and departmental course offerings change frequently. Teacher certification candidates are required to meet regularly with the advising staff of the Office of Student Affairs to ensure that certification requirements are met.

Art (12 units)

- 3 introductory courses: ART 120, 124, 125
- 6 studio courses: ART 222 or 320, 225, and 4 additional courses in painting and drawing, printmaking, sculpture, or photography
- 3 art history, theory, and criticism courses: 2 chosen from ART HIST 220, 230, 240, 250; 1 chosen from ART 270, 272, or 372

Biological and Physical Sciences

Biological Sciences (12 units)

- 4 core courses: BIOL SCI 210-1,2,3; 301 or 309
 - 2 courses chosen from BIOL SCI 204, 315, 346, 347
 - 3 courses chosen from ANTHRO 306; BIOL SCI 302, 304, 306, 325, 327, 345, 346, 347; GEOL SCI 317
 - 1 300-level laboratory course
 - Electives: 2 300-level biological sciences courses
- Prerequisites to above courses: CHEM 101, 102, 103, 210-1,2; MATH 214-1,2 and STAT 202, 302, or MATH 214-3; PHYSICS 130-1,2,3 or 135-1,2,3

Chemistry (12 units)

- General chemistry: CHEM 101, 102, 103 or 171, 172
 - Organic chemistry: CHEM 210-1,2,3 or 212-1,2
 - Physical chemistry: CHEM 342-1,2
 - Advanced chemistry: CHEM 329, 333
 - Laboratory: 1 course chosen from BIOL SCI 301, CHEM 215, 335, 345, 361
 - Electives: 1, 2, or 3 200- or 300-level chemistry courses to bring total to 12 units
- Prerequisites to above courses: MATH 214-1,2,3; PHYSICS 135-1,2,3

Physics (12 units)

- 3 introductory courses: PHYSICS 125-1,2,3 or 135-1,2,3
 - 3 classical physics courses chosen from PHYSICS 330-1, 331, 332, 333-1
 - Modern physics: PHYSICS 335 or 339-1
 - Laboratory: 2 courses chosen from PHYSICS 252, 339-1,2
 - Electives: 3 courses chosen from ASTRON 220 and/or any 200- or 300-level courses
- Prerequisites to above courses: MATH 214-1,2,3, 215, 219, 221

English (15 units)

- 3 introductory courses: ENGLISH 298 and 210-1,2 or 270-1,2
- 2 composition courses such as ENGLISH 205 and 1 additional composition course (TEACH ED 325 recommended)
- 7 literature courses: 2 American literature courses, 2 English literature courses, and 3 additional literature courses
- 1 linguistics course chosen from LING 220, 221, 250, 260, 270, 311, 312, 321, 322, 323, 341, 342
- 1 reading and language acquisition course: TEACH ED 324
- 1 literature course from a non-Western culture or the descendants of a non-Western culture

Foreign Languages**French (12 units)**

- 6 language courses: FRENCH 202, 203, 301, 302, 303, 305
- 3 literature courses: FRENCH 210 and 2 additional 300-level literature courses taught in French
- 3 culture and civilization courses chosen from FRENCH 211, 380, 390, 391-1,2, 396

German (12 units)

- 4 language courses: GERMAN 205, 208, and 2 units of 391 with different topics
- 3 literature courses chosen from GERMAN 201-1,2,3,4 or 204
- 5 literature and culture courses chosen from GERMAN 301, 310-1,2,3,4, 329, 332

Latin (12 units)

- 3 language courses: LATIN 101-1,2,3
- 4 literature courses: LATIN 201-1,2,3, 310
- 5 other 200- or 300-level Latin, Greek, or classics courses

Spanish (12 units)

- 2 language and composition courses: SPANISH 201-1,-2, or 207; 202-1 or -2
- 3 literature courses chosen from SPANISH 250, 251, 260, 261
- 3 culture and civilization courses: SPANISH 220, 323, 390
- 4 additional 300-level courses taught in Spanish, with at least 1 course in Spanish literature and culture and 1 course in Latin American literature and culture

Mathematics (12 units)

- 5 calculus/analysis courses chosen from MATH 214-1,2,3, 215, 221, 303, 310-1,2,3
- 2 algebra courses chosen from MATH 219, 334, 337-1
- 1 probability and statistics course chosen from MATH 330-1; STAT 202, 302
- 1 computer science course
- MATH 308 or 329-1
- MATH 326
- 1 additional 300-level mathematics course

Social Sciences**History (12 units)**

- 3 U.S. history courses
- 2 European history courses
- 1 non-Western/third-world history course
- 6 additional history courses, 4 of which must be 200- or 300-level courses

Economics with History (16 units)

- 4 introductory courses: ECON 201, 202, 281, STAT 210
- 4 major courses: ECON 310-1, 311, and 2 additional 200- or 300-level economics courses
- 4 U.S. history courses
- 4 world history courses

Political Science with History (16 units)

- 3 introductory courses: POLISCI 220 and 2 courses chosen from 201-1,2, 204, 221, 230, 240, 250
- 2 methods courses: POLISCI 395 and 1 course chosen from 310, 311, or 312
- 3 300-level political science courses
- 4 U.S. history courses
- 4 world history courses

Sociology with History (16 units)

- 2 100- or 200-level sociology courses
- 4 theory and methods courses: SOCIOL 226, 303, 306, 329
- 2 300-level sociology courses
- 4 U.S. history courses
- 4 world history courses

Electives

Additional units of elective course work must be taken to complete the 45-unit degree requirement. Students are encouraged to discuss their elective plans with the teacher certification manager.

Clinical Experiences

Secondary teaching students complete two clinical experiences: a 100-hour practicum and a secondary teaching internship.

Students typically complete the practicum during spring quarter of their junior year. Applications must be submitted to the undergraduate teacher education director in October of the junior year. The practicum includes a minimum of 10 hours per week in a classroom for the length of the quarter. Students take a practicum seminar (TEACH ED 378 or 379). They are also enrolled in a methods course (TEACH ED 354-59) and a third education course (TEACH ED 341). Students usually enroll in a fourth class, frequently in their concentration area. They must complete a preliminary contract for their practicum during the first two weeks of the quarter.

Students then typically complete the student teaching internship during fall or winter quarter of their senior year. To apply for student teaching, they must have satisfactorily completed their practicum and related requirements (see above) and at least 9 courses in their teaching major. They also must have a grade point average of 2.5 or above in their major and professional core courses. (Note: While a grade point average of 2.5 is the minimum requirement, an average

closer to 3.0 is more competitive for a student teaching placement.)

The student teaching internship involves full-time placement (40 hours per week) in a local school for the entire quarter. Students must also attend one evening seminar (TEACH ED 388 or 389). The internship and the seminar together earn four units of credit. No other courses are taken during that quarter. Students must complete a preliminary contract for their student teaching internship during the first two weeks of the quarter.

Additional Requirements for Certification

- United States citizenship or evidence of permanent resident status
- Illinois State Teacher Certification Examination (Basic Skills and Content Area tests)

Information about the required Illinois State Teacher Certification Examination is available in the Office of Student Affairs. Some school districts require a police background check before student teachers may begin their internships and become eligible for certification.

Recommendation for Certification

Students successfully completing approved teacher training programs at Northwestern qualify to receive Illinois certification. Although legal requirements for certification vary from state to state, each teacher training program offered at Northwestern is sufficiently flexible to permit a student who plans carefully to complete provisional requirements of most states. A teacher certification reciprocity agreement exists between Illinois and 40 other states. Information is available in the SESP Office of Student Affairs.

Northwestern will recommend a student for a teaching certificate only when the student has successfully completed an approved Northwestern University teacher preparation program. Students should apply through the SESP Office of Student Affairs no later than the quarter preceding the final quarter of study at Northwestern.

Graduates of a teacher-training program at Northwestern who do not apply for certification upon graduation may not be eligible for licensure at a later date. The University will make every effort to assist its graduates in obtaining teaching certification but cannot guarantee eligibility at a later date.

Other Programs

The interdisciplinary and flexible nature of SESP programs allows many undergraduates to pursue a minor in addition to their SESP program or to enroll in University-wide certificate programs. With careful planning, some students may choose a second major outside SESP. Many students also elect to spend one or more quarters in a Northwestern University–approved study abroad program.

For information on the interschool programs listed below, see the Other Undergraduate Programs section of this catalog, unless otherwise directed.

Business Institutions Program

The Program in Business Institutions approaches the study of business through an investigation of the cultural, political, and social consequences of business institutions. For more information, see the Weinberg College section of this catalog.

International Studies Program

International studies is an undergraduate interschool adjunct major that is taken in conjunction with a departmental major. It describes our interconnected world system and how the contemporary world is politically structured and economically organized.

Legal Studies Program

Legal studies is another undergraduate interschool major that is taken in conjunction with a departmental major. Not a “pre-law” program, it 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.

Partnership through the Arts Program

Students in SESP or the School of Music may participate in this program, which is designed to increase understanding of collaborations between public schools and arts organizations.

Service Learning Certificate Program

Students across the University may earn a certificate in service learning through a two-year program that connects volunteer experience with an academic component to increase their understanding of community needs.

Undergraduate Leadership Program

The Undergraduate Leadership Program, an interschool certificate program open to all undergraduates, helps students understand the nature of leadership and prepares them to become leaders.

Courses

Core 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.

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 316-0 Moral Values and Human Development: An Introduction Moral development of the individual from several perspectives: age-developmental differences, cross-cultural and gender differences, relationship between moral reasoning and moral behavior.

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 Changing Society Societal changes and their effects on the family.

SESP 372-0 Methods of Observing Human Behavior Guided practice in systematic and participant observation of human behavior. Observer bias, field notes, unobtrusive measures.

SESP 383-0 Practicum (2 units) Internship only for students in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs. Intensive, supervised participant observation of interpersonal relationships, especially those of professional and client, and the effects of institutional structure and policy on both professionals and clients. To be taken concurrently with 385. Prerequisites: SESP 372 and consent of program director.

SESP 385-0 Practicum Analysis Seminar (2 units) Small-group meetings only for students in the Human Development and Psychological Services, Learning and Organizational Change, and Social Policy Programs to analyze 383 practicum experiences, organize their perceptions of their own internships, and share them with other class members. To be taken concurrently with 383. Prerequisite: SESP 372.

Research and Other Opportunities

SESP 298-0 Student-Organized Seminar Students initiate courses supervised by sponsoring faculty to explore topics not covered in other courses. Consulting with a faculty sponsor, students prepare a seminar plan and submit it to the assistant dean for student affairs before the middle of the quarter preceding the quarter in which the seminar is to be held. The plan includes a topic description, reading list, specifications of term papers and written examinations, prerequisites, and meeting schedule. All proposals are formally reviewed and approved before the seminar is offered. Enrollment is allowed in only one Student-Organized Seminar per quarter and must be on the pass/no credit basis. Consult with the assistant dean for further details.

SESP 390-0 Research Apprenticeship Opportunity for undergraduates to apprentice with faculty mentors engaged in research projects centering on questions of learning and human development and the organizational arrangements in which these processes occur. Prerequisites: consent of instructor directing the research project and assistant dean. (Students wishing to register must first complete the Request for Independent Study/Special Courses Form available in the SESP Office of Student Affairs.)

SESP 391-0 Advanced Research Methods Overview of research methods that may be used in the design and implementation of the honors thesis.

SESP 398-0 Honors Thesis A 3-credit research experience in which students develop, design, implement, and evaluate a research project under the guidance of a faculty adviser. Prerequisites: senior status; a cumulative grade point average of 3.5 by the end of winter quarter of the junior year; successful completion of SESP 391 during the spring quarter of the junior year; submission of a proposal by the end of the summer prior to the senior year; consent of program director.

SESP 399-0 Independent Study Under the direction of faculty members, students pursue special topics not covered in regular courses around the questions of learning and human development and the organizational arrangements in which these processes occur. Prerequisites: consent of instructor directing the study and of the assistant dean. (Students wishing to register must first complete the Request for Independent Study/Special Courses Form available in the SESP Office of Student Affairs.)

Human Development and Psychological Services

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 301-0 Introduction to Counseling Overview of counseling theories, techniques, client systems, and service settings.

HDPS 302-0 The Human Personality Classic and contemporary psychological approaches to personality; understanding the whole person in his or her societal and historical context. Emphasis on both theory and research.

HDPS 303-0 Intervention Strategies Intervention strategies in the areas of human development, education, psychological well-being, and social welfare within a social-ecological framework. Emphasis on long-term change in people and social environments.

HDPS 311-0 Group Dynamics Theory and research in the social psychology of groups and social systems. Small- and large-group dynamics; intergroup relations. Participation in a weekend group relations conference.

HDPS 332-0 Career Development: Theory and Counseling Process of career development and its relation to the world of work. Discussion of career development theories. Focus on self-assessment; decision-making skills; educational, occupational, and community information; and job-seeking skills.

HDPS 340-0 Sex, Love, and Marriage Explores sexuality and love within the context of marriage using historical, sociological, and psychological perspectives.

Learning and Organizational Change

LOC 211-0 Introduction to Organization Theory and Practice Major organizational behavior theories are introduced; students have opportunities to examine these theories and practice through organizational analysis.

LOC 212-0 Learning and Understanding Framework for learning in all aspects of life: traditional school subjects, professional training, creative and performing arts, personal health, basic survival skills. Students are encouraged to draw from their own experiences.

LOC 215-0 Ecology and Design of Intervention Cognitive and social consequences of design for designers, implementers, and users.

LOC 301-0 Macrocognition: Intelligence in Context

How people learn to understand, reason, and solve problems; knowledge representation, expertise, transfer, and metacognition; study of distributor cognition.

LOC 302-0 Education and the Changing Workplace

The changing nature of work and how this will affect skills required for work and the teaching of those skills in the 21st century.

LOC 306-0 Studies in Organizational Change Theories and methods of organizational changes are examined through analysis of organizational adaptations using 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.

COMP SCI 330-0 Human-Computer Interaction See Computer Science, McCormick School of Engineering and Applied Science.

LOC 391-1,2 Organizational Planning and Analysis

Culminating academic experience in which students apply knowledge and skills to analysis of real-world learning and organizational change problems and to the design and analysis of solutions. 1. Seniors only. 2. Learning and organizational change seniors only.

Secondary Teaching

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 40 hours of field experience. Note: Students seeking certification must take the Illinois Basic Skills Test before the end of the quarter of enrollment in TEACH ED 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 324-0 Foundations of Reading and Language Acquisition Cognitive foundations of reading comprehension processes and their influences on methods of instruction and assessment. Interrelationships among 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. Includes supervised field experience.

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 329-0 Health and Physical Development

Interaction and interdependence of physical well-being, mental and emotional health, and the surrounding social environment. Topical areas covered for secondary education students completing state certification requirements.

TEACH ED 341-0 Teaching and Learning in Social and Cultural Contexts

Exploration of what it means to be a teacher. Examination of historical images of teachers and teaching and also of our own social groundings, including race, class, and gender. Concurrent registration in 378 or 379 and the applicable methods and techniques course (354–59) required. Prerequisite: consent of SESP Office of Student Affairs.

TEACH ED 354–59 Methods and Techniques Students in the Secondary Teaching Program take one of the following six methods courses:

- TEACH ED 354 Methods and Techniques: Art
- TEACH ED 355 Methods and Techniques: Foreign Languages
- TEACH ED 356 Methods and Techniques: English
- TEACH ED 357 Methods and Techniques: Secondary Mathematics
- TEACH ED 358 Methods and Techniques: Sciences
- TEACH ED 359 Methods and Techniques: Social Sciences

These methods courses analyze the literature and research related to the subject area and teaching methodology. In addition, they examine the development of learning experiences, methods, and educational techniques appropriate to the middle and high school levels. Concurrent registration in 341 and 378 or 379 required.

TEACH ED 378-0 Practicum/Seminar: Humanities

TEACH ED 379-0 Practicum/Seminar: Mathematics and Science

Students complete a practicum that requires a minimum of 10 hours per week for the whole quarter observing and assisting in a school approved by the director of undergraduate teacher education. Concurrent registration in 341 and the applicable methods and techniques course (354–59) required. Prerequisite: 304; passing score on the Illinois Basic Skills Test.

TEACH ED 388-0 Student Teaching Seminar: Humanities**TEACH ED 389-0 Student Teaching Seminar: Mathematics and Science (4 units)**

This seminar and accompanying internship, which lasts the entire quarter, helps develop teaching methodologies through an intensive clinical experience and teaching under the supervision of master teachers in the teacher-training schools. Increasingly sophisticated teaching responsibilities and, finally, primary responsibility for teaching a group or a class. Prerequisites: 341; 378 or 379; the applicable methods and techniques course (354–59); successful completion of the practicum experience; an approved contract for the internship experience; consent of the director of undergraduate teacher education; and passing score on the Illinois subject-area test.

Social Policy

SOCPOL 201-0 Introduction to Social Policy Social policy formulation: substance of major American social policies and manner in which the American political system shapes social policy in this country.

SOCPOL 303-0 Administration and Policy Studies Education and human development as a multi-institutional, ecological, and macrosociological phenomenon. Issues in the philosophy, history, economics, and politics of education.

SOCPOL 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, income, and aging.

SOCPOL 305-0 Law and Social Policy Use and influence of the legal system in and on social institutions and policy.

SOCPOL 307-0 Educational Policy Conflict between societal imperatives for selecting and preparing youth for future careers and offering youth opportunity; how society and schools address this conflict; various approaches to policy reform.

SOCPOL 310-0 Legal Aspects of Education Structure of school governance; decision making; relevant state and federal legislation affecting public schooling.

SOCPOL 330-0 Economics of Social Policy How economists view social policy issues. Economic models of household decision making. How economists account for costs and benefits of public and private programs and decisions. Prerequisite: ECON 201, 202, or consent of instructor.

Robert R. McCormick School of Engineering and Applied Science

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 of an interdisciplinary nature.

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 for professional engineering careers in a competitive world, capable of understanding, applying, and contributing to technology in whatever areas or careers they subsequently 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 engineering
- materials science and engineering
- mechanical engineering
- medical engineering (Honors Program in Medical Education only)

The programs in biomedical, chemical, civil, computer, electrical, environmental, industrial, manufacturing, mechanical engineering, and materials science and engineering, as well as McCormick and its cooperative education program, are accredited by

the Engineering Accreditation Council of the Accreditation Board for Engineering and Technology.

With the proper use and combination of requirements, options, and electives, students may prepare themselves for graduate work in engineering and also for graduate studies in medicine, law, business, or other areas. Bachelor of science degrees are awarded also in approved ad hoc combined studies programs.

Graduate programs of study are available in all the above fields as well as in theoretical and applied mechanics, manufacturing management, project management, and engineering management. These programs leading to degrees at the master's and doctoral levels are described completely in the Graduate School catalog and in publications on engineering graduate programs.

Excellence in research is a distinguishing characteristic of the engineering faculty. A faculty such as this, working at the frontiers of knowledge, is in the best position to maintain currency in courses and curricula and to develop an atmosphere inspiring scholarship and originality among students.

McCormick has a student body of approximately 1,500 undergraduates and 950 graduate students. It is housed in the Technological Institute, which contains more than 750,000 square feet of floor area and provides excellent educational and research facilities.

The Seeley G. Mudd Library for Science and Engineering, adjoining the Technological Institute, is an integrated and centralized collection serving engineering, applied mathematics, astronomy, biochemistry, biology, chemistry, and physics.

More information about McCormick can be found on its Web site (www.mccormick.northwestern.edu).

Academic Policies

Requirements for the Degree of Bachelor of Science

Students must successfully complete all 48 courses of the curriculum or have equivalent academic experience. 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.

A grade point average of not less than C is required for all courses presented for the degree. The grade point average of the 16 major program courses presented for the degree must be at least 2.0. Further, no more than 2 of these courses 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).

In addition to and independent of the requirements set by McCormick, all students must satisfy the Undergraduate Residence Requirement. (See the Undergraduate Education section of this catalog.)

Pass/No Credit Option

McCormick undergraduates may take a maximum of eight quarter-courses under the pass/no credit (P/N) option for use toward the degree. During the freshman and sophomore years, however, only one course per quarter may be taken under the P/N option.

The P/N option may be used in the following areas:

- **Basic program:** In courses taken as social sciences/humanities selections or as unrestricted electives. Although the number of 300-level courses is not restricted (to the limit of eight as above), only four 100- or 200-level courses may be taken under the P/N option and used to satisfy the seven-course requirement in the social sciences/humanities area and the speaking requirement. This option may not be used in mathematics, engineering analysis and computer proficiency, basic sciences, engineering design and communications, and basic engineering courses.
- **Departmental program:** Consult the 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 a McCormick requirement only if a P/N grade 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. Placement or exemption may be granted on the basis of the CEEB tests or special examinations in subject areas or by appropriate analysis of high school background. Any placement (verified by a grade above C- in a subsequent course) in approved sequential work will reduce the course requirements for the BS by the number of courses preceding the placement. These stipulations regarding placement and exemption and degree requirements may differ from those of other schools of the University. Students receiving credit from advanced placement examinations and other such programs must still meet the Undergraduate Residence Requirement.

Personal Computers

Since Northwestern's campus is fully networked, students can access local and remote information sources from dormitory rooms and laboratories. Accordingly, the McCormick faculty has adopted a policy making each engineering undergraduate responsible for his or her own computing hardware and software for basic tasks such as word processing, spreadsheet calculations, and graphics and for connection to the University's computer network. McCormick maintains a number of public and departmental computing laboratories, but these are used primarily for higher-level or specialized applications.

Academic Options

Cooperative Engineering Education Program

The Walter P. Murphy Cooperative Engineering Education Program alternates periods of paid industrial experience and academic studies for full-time students in all departments of engineering and applied science. During 18 months of industrial employment, students can apply theory while gaining practical experience. This perspective enables them to develop an understanding of the responsibilities of their future professional careers.

Freshmen are invited to participate in workshops to prepare them 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, with the help of the academic advisers, special schedules may be arranged to enable students to meet individual academic requirements as well as co-op requirements.

Students register for their work quarters, but no tuition or fee is charged. The registration keeps co-op students enrolled at Northwestern during work periods. 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 earn a portion of their educational expenses.

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

Students who complete the co-op plan receive tuition rebates during their final academic quarters to assure that they will not pay higher total tuition than other students in the same entering class.

In addition to the academic degree, McCormick awards co-op students a certificate in recognition of successful completion of the Walter P. Murphy Cooperative Engineering Education Program. Students must successfully complete the schedule of school and work, which meets standards set by the program, the co-op employer, and ABET, in order to receive recognition as co-op students on graduation from McCormick.

In some states, ABET-accredited 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.

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. It is important to note that neither students nor cooperative employers obligate themselves to permanent employment by virtue of the co-op status, although most students get 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 be admitted to the Undergraduate Honors Program any time during their junior or presenior year. (Students within three quarters of graduation are past this admission point.) At the time of admission, they must have a cumulative grade point average of 3.5 or better.

Honors students participating in the program must (1) 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 and (2) 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 a student's individually evaluated performance is not judged to meet the standards of success, the student will still receive course grades and credits as earned.

Undergraduate Research

Opportunities for undergraduate research are made available and encouraged in several ways. Each major field of study offers independent study courses for research enrollment on an elective basis. The Undergraduate Honors Program incorporates a required research component.

McCormick's Undergraduate Research Board, composed of student leaders, administers a program that funds individual research projects from the Sara Boley Undergraduate Research Fund. The board helps select the winner of the Harold Benedict Gotaas Award, presented to the senior engineering student who submits the best original research paper.

Students normally perform undergraduate research projects under the direction of faculty who are doing research in their department or in a University or McCormick research center, laboratory, or council. Engineering faculty may be associated with a variety of research centers based at McCormick:

DevLab (Information Technology Development Laboratory)

Institute for Environmental Catalysis

Center for Intelligent Processing of Composites

Materials Technology Laboratory

McCormick Manufacturing Institute

Motorola Center for Communications Research

Optimization Technology Center

Center for Parallel and Distributed Computing

Center for Photonic Communications and Computing

Center for Quality Engineering and Failure Prevention

Center for Quantum Devices

Steel Research Group

McCormick faculty are also involved in University research centers:

Center for Advanced Cement-Based Materials

Center for Catalysis and Surface Science

Infrastructure Technology Institute

Materials Research Center

Institute for Nanotechnology

Transportation Center

Faculty may also be involved with joint ventures with other institutions:

Synchrotron Research Center

Biologically Inspired Materials Center

Center for Surface Engineering and Tribology

Center for Bioengineering Educational Technologies

Nanoscale Science and Engineering Center

Multiple BS Degrees

Students with wide-ranging interests may work toward two or more bachelor of science degrees in McCormick. The work in additional areas does not need to be completed at the same time, but the full requirements for each degree must be approved by each department or program no later than two academic quarters before the completion of work for the second degree but no earlier than the junior year. The full requirements for each degree must be satisfied. At least six additional courses or equivalents must be presented before the awarding of each additional degree.

Second Field of Specialization

Elective opportunities in the McCormick curriculum may be used toward 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-course requirement for the BS degree.

Concurrent BS/MS

During their senior year, qualified undergraduate students at McCormick may work simultaneously toward the bachelor of science and master of science degrees in engineering. Integrated planning of course work allows the possibility of taking graduate-level courses during the third and fourth years. Also provided are early assurance of graduate admission and early planning of project or research work.

It is possible for some students to finish the work for an MS in a combined program in less than the normal five years. In McCormick, any advanced placement, exemption, or demonstrated proficiency will reduce the course work requirements.

The course requirements remain unchanged for the two degrees. The McCormick requirement for the BS is 48 courses, and the requirement for the MS is specified by the individual department (9–12 courses). No course used for the MS requirement may be used for the BS requirement.

Application for admission to concurrent BS/MS study may be made any time during the seventh through the ninth quarters, in accordance with departmental advice. However, upon beginning graduate study, students may have no more than four courses to complete toward the undergraduate degree. The graduate application must be accompanied by a full plan of BS/MS studies and must be approved by the appropriate department and the Graduate School. A department may require that students do additional work preliminary to a concurrent BS/MS program at any level.

Five-Year BA/BS

McCormick encourages breadth of interest and to this end supports combined degree programs in engineering and liberal arts. One approach is the 3-2 program, in which students attend a liberal arts college

for the first three years with a course of study that develops a basic understanding of science and mathematics and a strong component in the social sciences and humanities. Following the three years of basic studies and on recommendation of their liberal arts college, students transfer to Northwestern. When they complete the requirements of a field of engineering in two years, a BS in engineering is awarded by Northwestern and a BA by the original college. Any student enrolled in an accredited liberal arts college program may apply for transfer admission to follow a 3-2 plan.

Another approach to combining liberal arts and engineering is a parallel arrangement of studies at Northwestern, in which a fifth year results in a BA with a major in Weinberg College and a BS in a particular field of engineering. Students should file a petition outlining this dual plan of study before their fourth year; it must be approved by the departments and schools administering the degree work. Students must complete the stated requirements of both schools and expected majors.

Students receiving financial aid should note the restrictions under Quarters of Eligibility on page 18.

Engineering and Music

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. The program may be entered no later than the beginning of the sophomore year; admission requires concurrent approval of both the School of Music and McCormick. (See also Five-Year BS/BMus or BS/BAMus in the School of Music section of this catalog.)

Business Basics Certificate

Students who aim to have business careers and want to improve their ability to make a contribution soon after they graduate may wish to consider pursuing a certificate program in business basics. This program involves a combination of required business courses and work experience. Students who complete the co-op program need to take 2 courses in addition to the 48 needed for a bachelor's degree; other students will need to take four extra courses. An acceptable report on the work experience is also required.

Honors Program in Undergraduate Research

The Honors Program in Undergraduate Research in McCormick provides an unusual opportunity for students with superior motivation and scholastic credentials (high school rank and test scores) to be admitted to work with an engineering faculty mentor/adviser in a challenging research project. This research project participation could begin in the first year and continue through all the undergraduate years, allowing close association with a faculty researcher probing the frontiers of knowledge in engineering or engineering science.

This unique opportunity for experiencing the excitement of original research and the associated approach to learning provides students with not only encouragement but also excellent preparation for graduate study. If students in the Honors Program in Undergraduate Research achieve advanced placement as well as satisfactory performance in the research project and accompanying course work, during their third year of undergraduate study they will be considered for admission to the Graduate School and for award of financial aid.

Honors Program in Engineering and Management

Students are eligible to participate in a joint program between McCormick and the Kellogg School of Management. High school students whose scholastic credentials are superior and who are strongly motivated to combine engineering and management expertise in their future careers may be admitted to undergraduate engineering in McCormick and also granted deferred admission to the master of business administration program in Kellogg.

The program consists of a combination of undergraduate and graduate study interspersed with related work experience. The initial studies are in a chosen field of engineering, with a schedule of school and work in industry, preferably in accordance with the co-op program. Students must maintain a 3.0 grade point average.

After participants receive their bachelor of science degree in their chosen engineering field, they must gain two additional years of full-time work experience (or three additional years if co-op was not completed) in industry before the two years of full-time study leading to the master of business administration degree.

Honors Program in Medical Education

The Honors Program in Medical Education (HPME) 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, McCormick, or the School of Communication and to the Feinberg School of Medicine. HPME students then participate in a challenging program, with the first three years in undergraduate study and the last four years in the Feinberg School, thus reducing the period of formal training by at least 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.

Honors Program in Engineering and Education

The Honors Program in Engineering and Education is designed for students who have strong interests in education and training as well as in science, mathematics, and engineering. The program provides an opportunity to complete a graduate degree in the learning sciences and an undergraduate degree in engineering in five years while gaining industrial or research experience related to a specific expertise in the field.

The program places high value on both academic research and industrial experience. Students may choose industry experience in educational software development through the co-op program, research experience with a faculty member at the Institute for the Learning Sciences, or a selective combination of both during their undergraduate and graduate studies.

Students admitted to the program must maintain a 3.0 grade point average. A one-quarter grace period to bring a lower grade point average up to 3.0 will be granted.

Honors Program in Engineering and Journalism

The Honors Program in Engineering and Journalism is intended to prepare exceptional students for communications careers emphasizing engineering, science, and technology. This joint program involves completing a McCormick bachelor's degree and then a Medill School of Journalism master's degree. It normally requires five years of study, but unusually capable students may be able to shorten the time through use

of advanced placement credits and accelerated scheduling. To be considered for the program, applicants to Northwestern complete an additional questionnaire that is evaluated by a Medill faculty panel. Students are evaluated by the faculty during the program to verify that performance is satisfactory. Part of the engineering humanities requirements must be fulfilled with Medill courses EDIT 201 Editing and Writing the News and 202 History and Issues of Journalism.

Honors Program in Engineering and Law

A law degree built upon an engineering undergraduate education is unusually valuable for a host of careers, such as those in technology-intensive businesses or in intellectual property, including patents. The Honors Program in Engineering and Law combines a Northwestern engineering degree, on-the-job work through the co-op program, and provisional admission to Northwestern University School of Law. The undergraduate portion takes four years, including five academic quarters of co-op work. Students must maintain a 3.25 undergraduate GPA. They take the LSAT at the beginning of their junior year and are expected to score at or above the median of the previous year's entering law class. Their admission to the law school is reviewed late in the junior year.

Undergraduate Leadership Program

The Undergraduate Leadership Program, an inter-school certificate program open to all undergraduates, helps students understand the nature of leadership and prepares them to become leaders. (See Undergraduate Leadership Program in the Other Undergraduate Programs section of this catalog.)

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 that is to follow. The aim is not to displace students in their learning efforts but to provide explanations to bridge the uncertain or unknown and lead to depth of understanding.

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 major field 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. Curricular and other advice may be obtained from the school by addressing an e-mail request to mccormick-school@northwestern.edu.

Organizations for Engineering Students

The Northwestern Engineering Student Council 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 faculty and administration. It encourages and coordinates the activities of engineering students and student groups.

The McCormick Undergraduate Research Board is organized to stimulate undergraduate research and to provide financial support for projects begun by individual students.

The following professional societies have established student branches on the campus:

American Institute of Chemical Engineers
 American Institute of Industrial Engineers
 American Society of Civil Engineers
 American Society of Mechanical Engineers
 ASM International
 Biomedical Engineering Society
 Institute of Electrical and Electronics Engineers
 Institute of Electrical and Electronics Engineers
 (computer subchapter)
 Institute of Electrical and Electronics Engineers
 (engineering in medicine and biology subchapter)
 Materials Research Society
 National Society of Black Engineers
 Society of Automotive Engineers
 Society of Hispanic Professional Engineers
 Society of Manufacturing 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

Undergraduate Programs of Study

McCormick Curriculum Requirements

All curricula leading to the bachelor of science degree in engineering or applied science must have the same basic components — mathematics, engineering analysis and computer proficiency, basic sciences, design and communications, basic engineering, social sciences/humanities, unrestricted electives, and major program.

The abbreviations used for McCormick departments and curricula in the listings that follow are
 BME (biomedical engineering)
 CHEM ENG (chemical engineering)
 CIV ENG (civil engineering)
 COMP SCI (computer science)
 ECE (electrical and computer engineering)
 ES APPM (engineering sciences and applied mathematics)
 ENV ENG (environmental engineering)
 GEN ENG (general engineering)
 IEMS (industrial engineering and management sciences)
 MAT SCI (materials science and engineering)
 MECH ENG (mechanical engineering)
 MFG ENG (manufacturing engineering)

Mathematics (4 courses)

MATH 214-1,2,3 Calculus
 MATH 215 Multiple Integration and Vector Calculus
 (Note: ES APPM 252-1,2 satisfy requirements for MATH 214-3 and 215.)

Engineering Analysis and Computer Proficiency (4 courses)

GEN ENG 205-1,2,3,4 Engineering Analysis

or

GEN ENG 206-1,2,3 Honors Engineering Analysis
and ES APPM 253 Honors Engineering Analysis 4

Basic Sciences (4 courses)

4 courses from at least 2 of the areas below; no more than 2 from earth 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 210-1 Genetics and Evolutionary Biology
 - BIOL SCI 210-2 Biochemistry and Molecular Biology
 - BIOL SCI 210-3 Physiology and Cell Biology
 - CHEMENG 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 sciences/astronomy
 - GEOL SCI 201 Surface Processes
 - GEOL SCI 202 Earth's Interior
 - ASTRON 220 Highlights of Astrophysics

Design and Communications (3 courses)

- Writing and design
 - GEN ENG 106-1,2 Engineering Design and Communication
- Speaking
 - GEN CMN 102 Public Speaking
 - or GEN CMN 103 Analysis and Performance of Literature

Higher-level courses may satisfy this requirement; they are approved on an individual basis.

Basic Engineering (5 courses)

5 courses from at least 4 of the following areas:

- Thermodynamics
 - BME 250 Biothermodynamics
 - 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
- Fluids and solids
 - BME 270 Introduction to Biomedical Fluid Mechanics
 - BME 271 Introduction to Biomechanics

CHEM ENG 321 Fluid Mechanics

CIV ENG 216 Mechanics of Materials I

CIV ENG 219 Continuum Mechanics I

MECH ENG 241 Fluid Mechanics I

MECH ENG 262 Stress Analysis and Finite Elements I

- Materials science
 - MAT SCI 201 Principles of the Properties of Materials
 - or MAT SCI 203 Microstructure and Engineering Properties of Materials
 - or MAT SCI 301 Chemical Aspects of Engineering Materials
- Electrical science
 - ECE 202 Introduction to Electrical Engineering
 - ECE 221 Fundamentals of Circuits
 - ECE 222 Fundamentals of Signals and Systems
 - ECE 223 Fundamentals of Solid-State Engineering
 - ECE 224 Fundamentals of Electromagnetics and Photonics
 - ECE 270 Applications of Electronic Devices
 - BME 221 Analysis and Simulation of Biological Systems
- Systems engineering and analysis
 - CHEM ENG 210 Analysis of Chemical Process Systems
 - IEMS 310 Operations Research
 - IEMS 326 Economics and Finance for Engineers
- Computer architecture and numerical methods
 - ECE 203 Introduction to Computer Engineering
 - ECE 205 Fundamentals of Computer System Software
 - ECE 328 Numerical Methods for Engineers
 - ESAPPM 346 Modeling and Computation in Science and Engineering
- Computer programming
 - COMP SCI 211 Fundamentals of Computer Programming II
 - COMP SCI 317 Data Management and Information Processing
 - ECE 230 Programming for Computer Engineers
- Probability, statistics, and quality control
 - BME 220 Introduction to Biomedical Statistics
 - CHEM ENG 312 Probability and Statistics for Chemical Engineering
 - CIV ENG 306 Uncertainty Analysis in Civil Engineering
 - ECE 302 Probabilistic Systems and Random Signals
 - IEMS 201 Introduction to Statistics
 - IEMS 303 Statistics I
 - MECH ENG 359 Reliability Engineering

Social Sciences/Humanities (7 courses)

7 courses, which must be approved in advance by the McCormick Humanities Panel, chosen according to one of two options in the following areas:

- Social and behavioral sciences
 - Historical studies and values
 - Fine arts, language, and literature
- Option A: At least 2 courses must be chosen in each area. Only 3 may be 100-level introductory courses; 3 must be thematically related to provide depth.

Option B:5 of the 7 courses must be clearly thematically related. For breadth, no more than 5 courses may come from a single area.

Unrestricted Electives (5 courses)

Students may take any credit course in the University to explore or extend technical or nontechnical interests.

Major Program (16 courses)

Any program of study finds its depth or concentration in the 16 courses given to the major program of the curriculum. Each engineering curriculum provides considerable elective opportunity within these courses. The intent is to provide opportunity for individualization, but coherence in the selection of elective courses is still necessary. In accredited programs, the understanding is that certain criteria will be met, and guidance to this end is essential. Accordingly, it is required that a plan of study listing intended selections be submitted for approval by the end of the eighth quarter of study (winter quarter of junior year).

Most curricula offer suggested areas of specialization or options that provide excellent guidance in using electives. These course plans are available in the department or program offices or the McCormick Academic Services Office and can be the basis for course planning. Alternately, self-designed plans may be submitted, but they should be worked out in consultation with a faculty adviser.

Department Curricula

Students must meet not only McCormick curriculum requirements but also the specific requirements for the department curriculum being pursued. The following listings of these curricula present additional information or specifics to be used with the basic curriculum.

Some of the listed curricula contain specializations or options within the curriculum. These are for advice and guidance for elective course choice. In addition, some courses may be regarded as duplicates, and taking them may increase the number of requirements needed to earn a McCormick degree. For further details about the options or specializations within a particular program, consult with the department coordinator sponsoring that curriculum, check with McCormick's Academic Services Office, or see the school's Web page at www.mccormick.northwestern.edu.

Applied Mathematics Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; 2 courses in chemistry, biological sciences, and/or earth sciences/astronomy

Design and communications — 3 courses

Basic engineering — 5 courses

5 courses from at least 4 of the following areas: systems engineering and analysis, mechanics, thermodynamics, fluids and solids, materials science, electrical science, computer science, and computer engineering

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

• Required courses — 7 courses

ES APPM 311-1,2 Methods of Applied Mathematics

ES APPM 311-3 Methods of Applied Mathematics:

Complex Variables

ES APPM 346 Modeling and Computation in Science and Engineering

ES APPM 421-1,2 Models in Applied Mathematics
1 of the following:

• ES APPM 399 Projects

• ES APPM 421-3 Models in Applied Mathematics

• ES APPM 438-1 Interdisciplinary Nonlinear Dynamics
(with consent of department)

• ES APPM 495 Special Topics in Applied Mathematics
(with consent of department)

• Additional courses — 3 courses from the following areas, at least 1 in linear algebra and 1 in probability (suggested courses listed):

• Linear algebra: MATH 334

• Numerical analysis: ECE 328, 471, ES APPM 446-1,2

• Probability: IEMS 202; IEMS 303 or MATH 330-1,2,3 or ECE 302

• Engineering or the sciences — 4 courses leading to an in-depth understanding of an area of application (300 level or higher)

• Technical electives — 2 courses at the 300 level or higher in engineering, science, or mathematics

Biomedical Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; CHEM 102 and 103 or 171 and 172

Design and communications — 3 courses

Basic engineering — 5 courses from the following six areas, no more than 1 course per area:

Thermodynamics: BME 250; CHEM 342-1; MECH ENG 220

Fluids and solids: BME 270, 271; CIV ENG 216; CHEM ENG 321; MECH ENG 241

Materials science: MAT SCI 201, 301

Electrical science: ECE 202, 270; BME 221

Computer engineering: ECE 203, 328

Probability, statistics, and quality control: BME 220;
ECE 302; IEMS 201, 303; MECH ENG 359

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses at the 200 level or higher, none of which may be taken P/N

- **Core** — 7 courses

BIOL SCI 210-2 Biochemistry and Molecular Biology

CHEM 210-1,2 Organic Chemistry

2 quarters of BME 301, 302, 303 Systems Physiology
or physiology in the Feinberg School of Medicine

BME 308 Biomedical Engineering Laboratory

BME 390 Biomedical Engineering Design

- **Areas of specialization** — 9 courses

Students select one of the following areas of specialization or an alternate set of courses developed with their adviser and approved by the Biomedical Engineering Undergraduate Committee.

Biological material and biotechnology

Biomechanics and rehabilitation

Biomedical signals and images

Electronic instrumentation

Transport processes and tissue engineering

Technical electives may include BIOL SCI 210-1,3;

CHEM 101, 210-3; ECE 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.

Chemical Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; CHEM 102 and 103 or 171 and 172

(CHEM 101, the prerequisite for CHEM 102, must be taken as an unrestricted elective)

Design and communications — 3 courses

Basic engineering — 5 courses

Thermodynamics: CHEM ENG 211

Fluids and solids: CHEM ENG 321

Materials science: MAT SCI 301

Systems engineering analysis: CHEM ENG 210

Probability, statistics, and quality control: CHEM ENG 312;
IEMS 201, 303, or BME 220

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

- **Required courses** — 12 courses

CHEM 210-1,2 Organic Chemistry

CHEM 342-2 Quantum Mechanics and Spectroscopy

CHEM ENG 212 Phase Equilibrium and Staged
Separations

CHEM ENG 275 Molecular and Cell Biology for
Engineers (BIOL SCI 210-2 may substitute)

CHEM ENG 307 Kinetics and Reactor Engineering

CHEM ENG 322 Heat Transfer

CHEM ENG 323 Mass Transfer

CHEM ENG 341 Process Dynamics and Control

CHEM ENG 342 Chemical Engineering Laboratory

CHEM ENG 351 Process Economics, Design, and
Evaluation

CHEM ENG 352 Chemical Engineering Design Projects

- **Areas of specialization** — 4 courses

The remaining 4 courses are chosen from advanced engineering, mathematics, or science courses. They should be selected to fulfill one of the six areas of specialization offered by the Department of Chemical Engineering (listed below). Students may select one of these programs or petition the chemical engineering faculty for approval of other course selections in accordance with the overall departmental major program. At least 1 of these courses must be an approved 200- or 300-level science elective.

Biomedical engineering

Biotechnology

Chemical process engineering

Environmental engineering

General chemical engineering

Polymer science and engineering

Civil Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2; CHEM 101, 102; CHEM 103 or

PHYSICS 135-3

Design and communications — 3 courses

Basic engineering — 5 courses

Fluids and solids: CIV ENG 216; MECH ENG 241

Thermodynamics: 1 course

Electrical science: 1 course

MAT SCI 203 or 1 other course from systems engineering and analysis, computer science, or materials science

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

10 must be civil engineering courses.

- Basic civil engineering — 6 courses
 - CIV ENG 221 Theory of Structures I
 - CIV ENG 222 Structural Steel Design
 - CIV ENG 250 Introductory Soil Mechanics
 - CIV ENG 260 Fundamentals of Environmental Engineering
 - CIV ENG 340 Fluid Mechanics II
 - CIV ENG 371 Introduction to Transportation Planning and Analysis or 376 Transportation System Operations
- Mathematical techniques and science — 2 courses from an approved list
- Technical electives — 8 courses at the 200 level or higher in mathematics, science, engineering, or other area supporting student's specialty; 2 of the 8 must be from an approved list of design and synthesis courses.
- Areas of specialization — Listed below are samples of some traditional areas of specialization, but students are encouraged to design with their advisers a program that meets their own particular interests.
 - Applied mechanics
 - Construction
 - Environmental engineering
 - Geotechnical engineering
 - Structural engineering
 - Transportation systems

Computer Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; 2 courses from chemistry, biological sciences, or earth sciences

Design and communications — 3 courses

Basic engineering — 5 courses

Probability, statistics, and quality control: ECE 302

Electrical science: ECE 202 (grade of C- or better required for graduation)

Computer engineering: ECE 203 (grade of C- or better required for graduation) and 230

1 course from thermodynamics, fluids and solids, systems engineering and analysis, or materials science

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

- Required courses — 5 courses
 - ECE 205 Fundamentals of Computer System Software
 - ECE 303 Advanced Digital Logic Design
 - ECE 361 Computer Architecture

COMP SCI 311 Data Structures and Data Management

COMP SCI 343-1 Operating Systems

- Technical electives — 10 courses

Technical electives may be used to tailor a program to a particular area of specialization. Students must take at least 5 courses from the following four tracks and 2 courses from the fundamental electrical engineering courses listed below. The remaining 3 electives may be chosen from any 300-level technical courses from 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.

- High-performance computing track
 - ECE 328 Numerical Methods for Engineers
 - ECE 333 Introduction to Communication Networks
 - ECE 358 Introduction to Parallel Computing
 - ECE 362 Computer Architecture Project
- VLSI and CAD track
 - ECE 353 Digital Microelectronics
 - ECE 357 Introduction to VLSI CAD
 - ECE 391 VLSI Systems Design
 - ECE 392 VLSI Systems Design Projects
- Embedded systems track
 - ECE 332 Digital Image Analysis
 - ECE 346 Microprocessor System Design
 - ECE 347 Microprocessor System Projects
 - ECE 390 Introduction to Robotics
 - BME 384 Biomedical Computing
- Software track
 - COMP SCI 310 Mathematical Foundations of Computer Science
 - COMP SCI 322 Compiler Construction
 - COMP SCI 336 Design and Analysis of Algorithms
 - COMP SCI 394 Software Project Management and Development
- Fundamental electrical engineering courses
 - ECE 221 Fundamentals of Circuits
 - ECE 222 Fundamentals of Signals and Systems
 - ECE 223 Fundamentals of Solid-State Engineering
 - ECE 224 Fundamentals of Electromagnetics and Photonics
 - ECE 225 Fundamentals of Electronics
- Design requirement — 1 course chosen from
 - ECE 347 Microprocessor System Projects
 - ECE 362 Computer Architecture Project
 - ECE 392 VLSI Systems Design Projects

Computer Science Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3

1 course from computer science mathematics list (available from the department)

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3; COMP SCI 111

Basic sciences — 4 courses**Design and communications** — 3 courses**Basic engineering** — 5 courses, including

Computer science: COMP SCI 211

Probability, statistics, and quality control: 1 course

3 other courses chosen from the basic engineering list, excluding computer science courses

Social sciences/humanities — 7 courses**Unrestricted electives** — 5 courses**Major program** — 16 courses

• Required courses — 8 courses

COMP SCI 311 Data Structures and Data Management
7 computer science courses at the 200 level or higher, excluding 317

• Technical electives — 8 courses

4 courses from the advanced computer science list;
2 from the computer science mathematics list, the
computer science external technical electives list, or the
advanced computer science list (lists available on the
department Web site); 2 unrestricted electives approved
by the department adviser

• Project work

The courses above must be chosen to include 2 quarters
of project work, resulting in the construction and
demonstration of a proposed solution to some organiza-
tion's problem. Projects must be approved by a faculty
adviser beforehand. Project work will typically occur in
independent study projects (COMP SCI 399) or in project-
oriented courses (e.g., COMP SCI 394).Courses at the 400 level are primarily for graduate
students but may be open to advanced undergraduate
students with the consent of the instructor. COMP SCI
110 may be used as an unrestricted technical elective if
taken before COMP SCI 111. Technical electives may not
satisfy other requirements.**Electrical Engineering Curriculum****Total requirements** — 48 courses**Mathematics** — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; 2 additional basic science courses

Design and communications — 3 courses**Basic engineering** — 5 coursesElectrical science: ECE 202 (grade of C- or better required
for graduation)Computer engineering: ECE 203 (grade of C- or better
required for graduation) and 230

Probability, statistics, and quality control: ECE 302

1 other course from the basic engineering list, excluding
computer science courses**Social sciences/humanities** — 7 courses**Unrestricted electives** — 5 courses**Major program** — 16 courses

• Required courses — 5 courses

ECE 221 Fundamentals of Circuits

ECE 222 Fundamentals of Signals and Systems

ECE 223 Fundamentals of Solid-State Engineering

ECE 224 Fundamentals of Electromagnetics and
Photonics

ECE 225 Fundamentals of Electronics

• Technical electives — 10 courses

Technical electives may be used to tailor a program to
a particular area of specialization. Students must take
at least 6 courses chosen from the following six tracks
and 2 courses from 300-level ECE technical electives
(which may include the courses below). The remaining
2 electives may be 300-level technical courses from
science, mathematics, computer science, or engineering
courses and may include the courses below. 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.

• Circuits and electronics track

ECE 303 Advanced Digital Logic Design

ECE 346 Microprocessor System Design

ECE 353 Digital Microelectronics

ECE 391 VLSI Systems Design

ECE 393 VLSI Design and Analysis of High-Speed
Integrated Circuits

• Communications systems track

ECE 307 Communications Systems

ECE 333 Introduction to Communication Networks

ECE 378 Digital Communications

ECE 380 Wireless Communications

• Control systems track

ECE 360 Introduction to Feedback Systems

ECE 374 Introduction to Digital Control

ECE 390 Introduction to Robotics

• Digital signal processing track

ECE 332 Digital Image Analysis

ECE 359 Digital Signal Processing

ECE 363 Digital Filtering

ECE 365 Communication Filters

• Electromagnetics and optics track

ECE 308 Advanced Electromagnetics and Photonics

ECE 379 Lasers and Coherent Optics

ECE 382 Photonic Information Processing

ECE 383 Fiber-Optic Communications

ECE 386 Computational Electromagnetics and Photonics

- Solid-state engineering track
 - ECE 115 The Electron in the 21st Century
 - ECE 250 Physical Electronics and Devices
 - ECE 381 Electronic Properties of Materials
 - ECE 384 Solid-State Electronic Devices
 - ECE 385 Optoelectronics
 - ECE 388 Microelectronic Technology
- Design requirement — 1 course chosen from
 - ECE 347 Microprocessor System Projects
 - ECE 392 VLSI Systems Design Projects
 - ECE 398 Electrical Engineering Design
 - ECE 399 Projects (when 399 is a design project)

Environmental Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2; CHEM 101, 102, 103

Design and communications — 3 courses

Basic engineering — 5 courses

Thermodynamics: 1 course

Fluids and solids: MECH ENG 241

Electrical science or materials science: 1 course

Probability, statistics, and quality control: 1 course
(CIV ENG 306 recommended)

Systems engineering and analysis: IEMS 326

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

- Core — 12 courses
 - CHEM 210-1 Organic Chemistry
 - CIV ENG 260 Fundamentals of Environmental Engineering
 - CIV ENG 261 Environmental Engineering Analysis
 - CIV ENG 267 Chemistry of the Natural Environment
 - CIV ENG 340 Fluid Mechanics II
 - CIV ENG 360 Environmental Impact Evaluation
 - CIV ENG 361 Public Health Engineering
 - CIV ENG 363 Community Air Pollution
 - CIV ENG 364 Sanitary Engineering
 - CIV ENG 366 Ecosystems and Ecotoxicology
 - CIV ENG 367 Aquatic Chemistry
 - CIV ENG 370 Environmental Engineering Design
- Technical electives — 4 courses
 - 2 courses from approved list
 - 2 courses, 200 level or higher, in engineering or Weinberg College mathematics or science

Industrial Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2; CHEM 101, 102, 103 or PHYSICS 135-3 and 2 other courses

Design and communications — 3 courses

Basic engineering — 5 courses

COMP SCI 317 or ECE 328; ECE 230; IEMS 326; and 2 other courses

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

- Probability and statistics — 2 courses
 - IEMS 202 Probability
 - IEMS 303 Statistics I
 - Operations research — 3 courses
 - IEMS 313 Deterministic Models and Optimization
 - IEMS 315 Stochastic Models and Simulation
 - IEMS 317 Discrete-Event Systems Simulation
 - Applied behavioral science — 1 course
 - IEMS 340 Field Project Methods
 - Production and logistics — 1 course
 - IEMS 381 Supply-Chain Modeling and Analysis or 382 Production Planning and Scheduling
 - Senior design project — 2 courses
 - IEMS 390-1,2 Systems Project Management I, II or IEMS 391-1,2 Industrial Engineering Design Project
 - Electives — 7 courses
 - 4 IEMS courses, excluding 399
 - 1 additional engineering course
 - 2 engineering courses at the 200 level or higher or any course chosen from a list approved by the department
- P/N is permitted only in the last group. No more than 2 units of 399 are permitted. A list of electives may be found on the department Web site.
- Concentration (optional)
 - At least 4 courses chosen 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 Web site.

Manufacturing Engineering Curriculum

Total requirements — 48 courses

Mathematics — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; 2 chemistry courses

Design and communications — 3 courses**Basic engineering** — 5 courses

Thermodynamics: MECH ENG 220 recommended

Materials science: MAT SCI 201 recommended

Systems analysis: IEMS 326

Fluids and solids: CIV ENG 216 or MECH ENG 241

1 electrical science or computer engineering course

Social sciences/humanities — 7 courses**Unrestricted electives** — 5 courses**Major program** — 16 courses

• Core — 10 courses

Computer programming: COMP SCI 110 or ECE 230

COMP SCI 317 Data Management and Information

Processing or IEMS 344 Information Technology in Manufacturing

IEMS 201 Introduction to Statistics or IEMS 303 Statistics I

IEMS 305 Statistical Methods for Quality Improvement or IEMS 307 Quality Improvement by Experimental Design

IEMS 310 Operations Research

IEMS 382 Production Planning and Scheduling

MAT SCI 318 Materials Selection

MECH ENG 240 Introduction to Mechanical Design and Manufacturing

MECH ENG 340-1 Computer-Integrated Manufacturing

MECH ENG 340-2 or -3 Computer-Integrated

Manufacturing

• Senior design project — 2 courses

MFG ENG 398 Manufacturing Engineering Design Project 1 of the following:

IEMS 391-1 Industrial Engineering Design Project

MECH ENG 398 Engineering Design

A design course approved by the manufacturing engineering curriculum committee

• Technical electives — 4 courses from the approved list, updated annually by the manufacturing engineering curriculum committee

Materials Science and Engineering Curriculum**Total requirements** — 48 courses**Mathematics** — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; CHEM 102 and 103 or 171 and 172

Design and communications — 3 courses**Basic engineering** — 5 courses, including

Fluids and solids: CIV ENG 216 or 219

Thermodynamics: MAT SCI 314 and 315

Materials science: MAT SCI 201

Elective: selected from electrical science, systems engineering and analysis, computer architecture and numerical methods, computer programming, or probability, statistics, and quality control

Social sciences/humanities — 7 courses**Unrestricted electives** — 5 courses

MAT SCI 190 recommended

Major program — 16 courses

• Required courses — 11 courses

MAT SCI 316-1,2 Microstructural Dynamics

MAT SCI 331 Physical Properties of Polymers

MAT SCI 332 Mechanical Behavior of Solids

MAT SCI 351-1,2 Introductory Physics of Materials

MAT SCI 361 Crystallography and Diffraction

MAT SCI 390 Materials Design

MAT SCI 391 Process Design

MAT SCI 396-1,2 Senior Project in Materials Science and Engineering

• Technical electives — 5 courses

Each student must choose the remaining courses in a consistent manner to fulfill an area of concentration.

These courses may be in engineering, natural sciences (usually chemistry or physics), and mathematics. At least 2 of the 5 courses must be from materials science and engineering. No more than 2 of the 5 courses may be 200-level courses.

Examples of programs for concentrations in bio-materials, design and manufacturing, electronic materials, metals and ceramics, nanomaterials, polymeric materials, and surface science are described in a departmental manual for majors.

Mechanical Engineering Curriculum**Total requirements** — 48 courses**Mathematics** — 4 courses

MATH 214-1,2,3, 215

Engineering analysis and computer proficiency — 4 courses

GEN ENG 205-1,2,3,4

Basic sciences — 4 courses

PHYSICS 135-2,3; 2 chemistry courses

Design and communications — 3 courses**Basic engineering** — 5 courses

Thermodynamics: MECH ENG 220

Fluids and solids: MECH ENG 241; CIV ENG 216 or MECH ENG 262

Materials science: MAT SCI 201

Electrical science: ECE 270 (students planning to take advanced ECE courses may substitute ECE 221)

Social sciences/humanities — 7 courses

Unrestricted electives — 5 courses

Major program — 16 courses

• Required courses — 7 courses

MECH ENG 202 Mechanics II

MECH ENG 224 Experimental Engineering I

MECH ENG 240 Introduction to Mechanical Design and Manufacturing

MECH ENG 315 Theory of Machines — Design of Elements

MECH ENG 340-1 Computer-Integrated Manufacturing

MECH ENG 377 Heat Transfer

MECH ENG 390 Introduction to Dynamic Systems

• Advanced study — 4 courses, 1 from each group:
Dynamics/controls

MECH ENG 314 Theory of Machines — Dynamics

MECH ENG 363 Mechanical Vibrations

MECH ENG 391 Fundamentals of Control Systems
Mechanics

MECH ENG 362 Stress Analysis

MECH ENG 365 Finite Elements for Stress Analysis

CIV ENG 327 Finite Element Methods in Mechanics
Thermofluid science

MECH ENG 370 Thermodynamics II

MECH ENG 373 Engineering Fluid Mechanics
Design

MECH ENG 340-2 Computer-Integrated Manufacturing

MECH ENG 366 Finite Elements for Design and
Optimization

MECH ENG 398 Engineering Design

• Electives — 5 courses

2 300-level mechanical engineering courses

1 200- or 300-level technical elective

2 300-level technical electives

No more than 2 units of 399 are allowed. Students are encouraged to concentrate electives in areas of interest.

A list of 7 areas of concentration, including appropriate courses and descriptions, is available from the department office.

Combined Studies Program

For students whose particular interests and goals cannot be satisfied by one of the regular programs of study in engineering or applied science, the Combined Studies Program provides an alternative. If endorsed and guided by three faculty members and approved by McCormick's Curriculum Committee, an ad hoc curriculum leading to the bachelor of science degree may be pursued.

Available courses may be combined in a variety of interdisciplinary plans as long as the all-school specification of eight basic components is met. Examples of combined studies programs from recent years include public health, engineering physics, biomedical engineering and molecular biology, and computers and mechanical design.

Students interested in the Combined Studies Program should consult with the associate dean for undergraduate engineering.

General Engineering Courses

GEN ENG 106-1,2 Engineering Design and Communication 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 Subjects of current interest in broad engineering or interdisciplinary areas.

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 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. **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. Prerequisites: C- or better in 205-1; MATH 214-1. **3.** Dynamic behavior of the elements. Modeling of mechanical (both translational and rotational), electrical, thermal, hydraulic, and chemical systems composed of those elements. 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. Prerequisites: C- or better in 205-2; MATH 214-2.

GEN ENG 206-1,2,3 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. Consent of instructor required. (Note: For the fourth quarter of the honors engineering analysis sequence, see ES APPM 253.)

GEN ENG 220-0 Analytic and Computer Graphics Microcomputer-aided drawing (CAD) for graphical three-dimensional problem solving and presentation.

GEN ENG 394-0 Special Topics in Engineering Design Product/process design. Topics include requirements definition, conceptual and detailed design, analysis and simulation, prototype development, laboratory and field evaluation, technical assessment, and report writing.

GEN ENG 395-0 Special Topics in Engineering Topics suggested by faculty members and approved by the curriculum committee.

GEN ENG 397-0 Selected Topics in Engineering (.5 units) Topics of limited scope as suggested by faculty members and approved by the curriculum committee.

Biomedical Engineering

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. Thus, biomedical engineering refers to the application of engineering techniques to problems in medicine and biology.

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, has 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 provide 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 help provide understanding of many physiological processes. This understanding, in turn, leads to improvements in clinical practice, diagnosis, and patient care.

Undergraduate Program

Northwestern was among the first schools to recognize the value of a biomedical engineering background, and today the Department of Biomedical Engineering offers, at both the undergraduate and graduate levels, one of the largest and broadest programs in the country. The primary path students follow is the biomedical engineering program administered by the biomedical engineering department, but alternative biomedical options are offered in other engineering departments.

The biomedical engineering program provides biomedical training that is quantitative, emphasizes problem solving, and treats phenomena from the molecular to the systems levels. This curriculum prepares students for careers in dentistry, medicine, and/or research or with

corporations in the health care industry. Required courses in mathematics, engineering, and science establish a strong foundation on which to build a biomedical framework. In addition, each student selects one sequence of courses with which to develop an area of specialization.

Areas of Specialization

All areas are suitable for students planning to enter medical school, continue their biomedical engineering education in graduate school, or pursue careers in the biomedical industry or hospitals.

Biological Materials and Biotechnology

Biochemical engineering, biochemistry, molecular biology, and biosensors are components of the broad field known as biotechnology. Students in this area learn the various aspects of biotechnology from the engineer's perspective.

Biomechanics and Rehabilitation

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. Students in this area learn the fundamental engineering principles needed for this work.

Biomedical Signals and Images

The application of imaging, signal processing, and signal analysis to biomedical problems has become an important part of medicine. MRI, CT-imaging, PET, EKG, and EEG are all examples of physiological signals. Students in this area learn the physiology that underlies these signals and the engineering that underlies their recording and analysis.

Electronic Instrumentation

Electronic instruments are used widely in the diagnosis and treatment of disease and in the study of normal physiological function. Students in this area learn the fundamentals of electronic and computer (hardware and software) instrumentation.

Transport Processes and Tissue Engineering

The study of transport processes in living tissue is important in understanding blood flow, lung ventilation, and oxygen transport to and from red blood cells to various tissue beds. Students in this area learn the fundamental chemical engineering principles that relate to these processes.

Curriculum

Students earning a biomedical engineering degree must obtain a minimum of 18 total course credits in engineering design and engineering science and have obtained substantial training in design.

Those seeking admission to dental or medical school should be familiar with the entrance requirements of those schools to which they intend to apply. In addition to the specifically required courses of the biomedical engineering program, many professional schools also require additional

courses in physics, organic and/or physical chemistry, and laboratory biology. These requirements may be satisfied by judicious use of electives.

Courses Primarily for Undergraduates

BME 220-0 Introduction to Biomedical Statistics Basic statistical concepts presented with emphasis on their relevance to biological and medical investigations.

BME 221-0 Analysis and Simulation of Biological Systems Circuit analysis and network theorems, transient and sinusoidal steady-state analysis, frequency response, Fourier series, and integral convolution.

BME 250-0 Biothermodynamics 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.

BME 270-0 Introduction to Biomedical Fluid Mechanics Fundamentals of fluid mechanics and their applications to biological systems.

BME 271-0 Introduction to Biomechanics Analysis of stresses and deformations in solids. Problems in biomechanics, with particular emphasis on assumptions appropriate to modeling biological materials including bone, skin, muscle, and cell membranes.

BME 301-0 Systems Physiology Functional/structural aspects of mammalian nervous system. Neural biophysics. Laboratory exercises. Prerequisites: PHYSICS 135-2 and junior standing.

BME 302-0 Systems Physiology Cardiovascular and respiratory physiology. Human physiology from a quantitative viewpoint. Anatomy and pathology, where appropriate. Prerequisite: MATH 214-3.

BME 303-0 Systems Physiology Cellular mechanisms of and quantitative systems approach to human renal, digestive, endocrine, and metabolic physiology. Prerequisite: BIOL SCI 210-2; junior standing recommended.

BME 308-0 Biomedical Engineering Laboratory Laboratory and associated lecture concerning quantitative physiology, testing, and evaluation of biomedical apparatus. Prerequisites: at least 2 from 301, 302, and 303 and 1 from 221, ECE 202, or 270. Preference given to seniors in biomedical engineering.

BME 310-0 Molecular and Cellular Aspects of Bioengineering Molecular/cellular structure and function, mechanical influences on biological systems, molecular/cellular experiments. Prerequisites: BIOL SCI 210-2 and GEN ENG 205-3.

BME 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.

BME 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.

BME 317-0 Biochemical Sensors Theory, design, and applications of chemical sensors used in medical diagnosis and patient monitoring. Electrochemical and optical sensors. Prerequisites: chemistry through 210-2; physics through 135-3.

BME 320-0 Biomedical Signals and Imaging Fundamentals of signals and systems, time and frequency domain issues. Fourier series and transforms, convolution, frequency response, filtering, and laboratories in biomedical systems and imaging. Prerequisites: GEN ENG 205-4 and PHYSICS 135-3.

BME 321-0 Theory and Control of Biological Systems Linear control theory, mathematical foundations, transfer functions, modeling of biological systems, stability. Prerequisite: GENENG 205-4.

BME 322-0 Mathematical Modeling of Physiological Systems Analysis and modeling of physiological systems. System identification. Traditional approaches. White noise method. Prerequisites: 301, 302, or 303; 320.

BME 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.

BME 325-0 Introduction to Medical Imaging Diagnostic X rays; X-ray film and radiographic image; computed tomography; ultrasound. Prerequisites: 320 and PHYSICS 135-3 or equivalent.

BME 327-0 Magnetic Resonance Imaging Nuclear magnetic resonance; two-dimensional Fourier transform, spin-echo and gradient-echo imaging; gradient and RF hardware. Prerequisites: 320 and PHYSICS 135-3.

BME 333-0 Modern Optical Microscopy and Imaging Rigorous introduction to principles, current trends, emerging technologies, and biomedical applications of modern optical microscopy.

BME 338-0 Interaction of Laser Radiation with Tissue Propagation, scattering, and absorption of light in biological materials. Modeling of diagnostic and therapeutic uses of light. Engineering evaluation of laser-based clinical systems. Prerequisite: junior standing or higher.

BME 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 and senior standing.

BME 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.

BME 346-0 Tissue Engineering In vivo molecular, cellular, and organ engineering, with an emphasis on the foundations, techniques, experiments, and clinical applications of tissue engineering. Prerequisites: BIOL SCI 210-2 or CHEM ENG 375; GEN ENG 205-3.

BME 350-0 Transport Fundamentals Fundamental and biomedical applications of diffusive and convective heat and mass transfer. Prerequisites: 270 and MATH 214-3; 377 recommended.

BME 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.

BME 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: MECH ENG 202 or consent of instructor.

BME 371-0 Mechanics of Biological Tissues Stress and strain for small and large deformations. Nonlinear elastic, viscoelastic, pseudoelastic, and biphasic models. Prerequisite: CIV ENG 216 or equivalent.

CHEM ENG 371-0 Transport Phenomena in Living Systems See Chemical Engineering.

BME 372-0 Hemodynamics Mechanical aspects of the human circulation system. Blood and blood vessel rheology. Pressures and flows in the arterial system. Prerequisites: 270; 302 or 402; or consent of instructor.

BME 373-0 Cardiac Mechanics Mechanical behavior of isolated muscle fibers, ventricular walls, and isolated ventricles. Interactions between ventricles and circulation systems. Prerequisite: 371, CIV ENG 216, or consent of instructor.

BME 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.

BME 379-0 Artificial Organs Basic transport process analyses. Engineering analyses and design of artificial organs: kidneys, lungs, hearts, pancreas, liver. Comparison of natural/artificial organ function. Prerequisites: 302 and 303 or 402 and 403; a heat and/or mass transport course.

BME 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: 221, ECE 202 or 270, or equivalent, or consent of instructor.

BME 384-0 Biomedical Computing Principles of modern (computer-based) medical instrumentation, including analogy versus digital design tradeoffs, efficient digital filter designs, and algorithms for physiological signal processing, automated event recognition, and classification. Prerequisites: ECE 270 or equivalent and some experience in computer programming, or consent of instructor.

BME 390-0 Biomedical Engineering Design Design strategy and concepts, including reliability, safety, ethics, economic analysis, and marketing. FDA regulations and patents. Prerequisite: senior standing in biomedical engineering.

BME 395-0 Special Topics in Biomedical Engineering

BME 399-0 Projects

Chemical Engineering

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 by the chemical and bioprocess industries gives chemical engineering its characteristic concern with the management and development of innovation. Preparation for careers in chemical engineering requires a comprehension of physical, chemical, biological, and engineering principles. The program aims at developing people who can plan, design, and operate new processes and who may have potential for managerial responsibility in highly technical industrial enterprises.

The chemical engineering curriculum provides this broad fundamental training and prepares graduates for the chemical and process industries or advanced study. The first two years are devoted largely to mathematics, physics, chemistry, and basic engineering. After this, the fundamentals of chemical engineering fall into two sequences: the chemical process principles, emphasizing thermodynamics and kinetics of chemical change, and the transport processes, emphasizing the transfer of mass, momentum, and thermal energy in the physical handling of substances and in their heating, cooling, separation, and purification. Theoretical principles and practical applications are then integrated in courses in systems design and control. Supporting courses in allied fields of engineering and the sciences broaden the technical proficiency of chemical engineers, while courses in the social sciences, humanities, and arts deepens their background in the common hopes and problems of humanity.

Areas of Specialization

The curriculum permits students to select an area of specialization and to develop background for further study at the graduate level or for application to specific industries. Students are encouraged to select one of the six areas listed

below or to plan an alternate program with an adviser. There are numerous electives in the basic program, and students are urged to give early consideration to planning for effective use of these opportunities.

Biomedical Engineering

Increasing numbers of chemical engineers enter medical school and work in related areas such as pharmaceutical production, biomedical materials, and artificial organs. The biomedical engineering option satisfies the needs of these students by adding courses in biology, biochemistry, and biomedical engineering to the foundation in chemical engineering. Students therefore can prepare for careers in medicine or biomedical engineering as they obtain a degree in chemical engineering.

Biotechnology

Biotechnology is the industrial exploitation of biological systems or processes. Microorganisms are employed for production of food, beverages, antibiotics, and solvents as well as for waste treatment. Advances in genetic engineering have led to the production (in animal cells, yeast, and bacteria) of a wide range of enzymes, growth factors, hormones, immunoregulators, and monoclonal antibodies for use in disease diagnosis and therapy. Animal cells and microorganisms produce chemicals via a complex network of tightly regulated chemical reactions, making biotechnology a natural extension of chemical engineering. The biotechnology option provides the background necessary to apply chemical engineering skills in biological systems, especially for process optimization, control, scale-up, and product recovery.

Chemical Process Engineering

The chemical process engineering option is designed to prepare students for many areas, including design, operations, research, and management. Recommended for students who want a broad background in chemical engineering, it provides preparation for employment in many fields, including the chemical process and petroleum industries. It is also good preparation for graduate work in chemical engineering or other areas, both technical and nontechnical.

Environmental Engineering

Means for improving the quality of our environment, disposing of wastes, and devising waste-free processes often involve chemical processing. The development, construction, and operation of these processes increasingly involves chemical engineers in a leading role. The next decade will see the replacement of many present industrial processes by new ones designed to eliminate or minimize waste products, requiring imaginative engineering. The environmental engineering specialization offers students a way to add special competence in environmental and civil engineering concerns to a chemical engineering degree and to prepare for attacking environmental problems.

Polymer Science and Engineering

Synthetic polymers are large molecular substances that now provide the basis for the plastics, fiber, and rubber industries. Synthetic polymers are used in fields as diverse as the automotive industry, pollution abatement, low-cost housing, and biomedical engineering and indeed wherever needs exist for new materials with unique properties. The polymer field requires a knowledge of chemistry and some background in materials science in combination with expertise in chemical engineering, especially in transport processes. The option in polymer science and engineering provides training to undergraduates considering working in the field or going to graduate school.

General Chemical Engineering

This option provides flexibility for students who desire exposure to a wide range of topics or who wish to specialize in fields of science or engineering not listed above.

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. Process dynamics and automatic control principles are studied in the Process Dynamics and Control Laboratory. A computing laboratory is used in a variety of courses. Chemical laboratory experience is also a part of the polymer course.

Courses Primarily for Undergraduates

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 and 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. Prerequisites: 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. Prerequisite: 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 (C– or better) and 211.

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.

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.

CHEM ENG 322-0 Heat Transfer The differential equations of energy transport. Solutions for various applications. Prerequisite: completion of mathematics requirements with no grades of D.

CHEM ENG 323-0 Mass Transfer Diffusion and rate concepts; application to distillation, extraction, absorption, humidification, drying. Prerequisites: 321 and 322.

CHEM ENG 341-0 Process Dynamics and Control Dynamic behavior of chemical process components. Feedback control principles. Prerequisite: senior standing; 307 recommended.

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: 307 and 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: senior 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, and 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 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 and 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 and 307.

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: 322 and GENENG 205-4 or consent of instructor; 321 and 323 recommended.

CHEM ENG 372-0 Interfacial Phenomena and Bionanotechnology The physical chemistry of systems of large interfacial area, with specific examples of their unusual behavior and useful properties for applications in bionanotechnology. Prerequisite: senior standing 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. Prerequisite: 375.

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 Engineering

Civil engineers plan systems such as transportation networks or procedures for water control and supply, and they design structures such as buildings, bridges, dams, and sewage disposal plants. They work together 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, as contrasted with more routine solutions to other engineering problems.

Planning, of course, requires abundant data of all sorts — topography, geology, soils, vegetation, weather and climate, stream-flow and lake currents, traffic routes and patterns, pollution, population, cultural background and preferences, skills and ambitions. Many civil engineers collect, analyze, and present the data, developing and improving measuring instruments as part of their job. 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.

Designing systems and structures requires the planning forecasts plus 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. Thus, they become partly qualified to operate construction companies, with some entering the construction business. Administrative and business activities require them also to learn something about accounting, personnel management, and contracts.

Since civil engineering students have such a wide range of career options, the Department of Civil Engineering prescribes a minimum of required courses and required subjects. Students elect the remainder freely or from specified broad categories. The breakdown, from which honors students may deviate with consent of the department's education committee, is as follows:

Courses specified by name and number	20
Courses specified by subject	6
Courses required to fit into broad categories	17
Free electives	5
Total	48

For details see the civil engineering curriculum.

Areas of Specialization

Civil engineering students may select a program that fits their needs by choosing courses judiciously. The 5 free electives, the 17 courses required to fit into broad categories, and most of the 6 courses specified by subject only (such as thermodynamics or electrical engineering science or chemistry) allow students to construct diverse specialized curricula, broadly based study programs, or intermediate combinations. 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 by students are listed in the civil engineering curriculum.

Laboratories

Environmental Engineering

Facilities are provided for instruction and research in environmental chemistry, environmental microbiology, environmental fluid mechanics, and the unit operations of water and waste treatment. Specialized apparatus and instrumentation are available for studies in each area.

Geotechnical Engineering

This facility has a variety of conventional and special equipment for computer-controlled testing and evaluation of rocks, soils, and soil-foundation systems — under both static and dynamic loadings — for undergraduate study, graduate study, and research. In addition, construction-monitoring instruments are remotely operated via telemetry.

Structural Engineering and Structural Mechanics

The department has a large first-class modern laboratory for testing structural materials, especially cement-based materials and composites. The laboratory is equipped with several closed-loop computer-controlled or servo-controlled testing machines capable of static and dynamic loading as well as advanced instrumentation for electron and optical microscopy studies with facilities for image analysis and holographic capabilities, creep testing in programmed environmental chambers, multiaxial or torsional loading, impact testing, acoustic defect detection, and other nondestructive test methods. Basic facilities, including a perforated testing floor, are available also for static and dynamic testing of structural models and structural components. Students conduct experiments using electrical and mechanical strain gauges, structural models, and photo-elastic models. A fully equipped shop and technical assistance are available for the design and construction of special loading devices.

Computation

The department integrates computing through its own dedicated servers and network administrator. The system aids project management, geotechnical, and structural computing as well as specialized software accessed from other departments.

Courses Primarily for Undergraduates

MAT SCI 203-0 Microstructure and Engineering Properties of Materials See Materials Science and Engineering.

CIV ENG 206-0 Analyzing Environmental Issues Simple concepts from the sciences and engineering applied to specific environmental problems, including the concepts of risk. Understanding of and quantitative facility in multi-disciplinary aspects of environmental decisions.

CIV ENG 212-0 Mechanics Force systems, equivalence of force systems, and resultants. Equilibrium of a rigid body and systems. Kinematics and dynamics of a rigid body in plane motion. Work and energy relations for a rigid body in plane motion. Prerequisites: PHYSICS 135-1 and registration in MATH 215.

CIV ENG 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.

CIV ENG 219-0 Continuum Mechanics I Introductory concepts of mechanics of continua. Analysis of deformation and stress and the equations of motion, with special emphasis on the elastic solid and Newtonian fluid. Prerequisites: PHYSICS 135-1 and MATH 217.

GEN ENG 220-0 Analytical and Computer Graphics
See General Engineering Courses.

CIV ENG 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.

CIV ENG 222-0 Structural Steel Design Rational basis of structural design. Design approach for structural steel components of a building system. Prerequisite: 221.

MECH ENG 241-0 Fluid Mechanics I See Mechanical Engineering.

CIV ENG 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 ENG 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 and MATH 214-2 (may be taken concurrently).

CIV ENG 261-0 Environmental Engineering Analysis Development of quantitative analytical tools for describing physical, chemical, and microbiological processes in natural and engineering systems relevant to environmental engineering. Prerequisites: 260 and CHEM 102.

CIV ENG 267-0 Chemistry of the Natural Environment Fundamental principles of organic and inorganic chemistry applied to air, water, soil, and sediments. Focus on problem solving. Laboratory/field projects. Prerequisite: CHEM 103.

CIV ENG 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 ENG 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 ENG 307-0 Microstructure of Cement-Based Materials Chemistry of the principal silicate and aluminate cements used in building and civil and environmental engineering. Emphasis on underlying science rather than on practical application. Experimental and theoretical aspects of cement chemistry; relationships between processing, microstructure, and properties.

CIV ENG 314-0 Mechanics of Crustal Processes Application of elementary mechanics to geological processes of crustal deformation, including faulting, earthquake generation and deformation, folding, and coupling of fluid flow with deformation. Prerequisites: 216 and MATH 221 or GEN ENG 205-4.

CIV ENG 318-0 Mechanics of Fracture Stress concentration: analysis of the stress field near a crack tip; fracture modes; brittle and ductile fracture; fracture toughness; fracture criteria; fracture-mechanics design; fatigue; dynamic effects. Prerequisites: course in mechanics of materials and MATH 217.

CIV ENG 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: CIV ENG 221.

CIV ENG 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: CIV ENG 221.

CIV ENG 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 ENG 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 ENG 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 ENG 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 ENG 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 ENG 332-0 Construction Estimating Estimation of cost at different stages of design; conceptual estimating, quantity takeoff of various elements, such as materials, labor, equipment. Prerequisite: 330 or consent of instructor.

CIV ENG 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 ENG 338-0 Public Infrastructure Management Explores the complexity of managing public infrastructure facilities by means of a five-part interactive model. Aims to impart a realistic appreciation of contemporary policies and practices. Prerequisite: senior standing.

CIV ENG 340-0 Fluid Mechanics II Civil engineering applications of fluid mechanics. Turbulent flow in pipes, pipe networks, and open channels. Prerequisite: CIV ENG 321 or MECHENG 241 or consent of instructor.

CIV ENG 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 ENG 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 ENG 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 ENG 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 ENG 356-0 Transport Processes in Porous Media Transport processes in porous media, including unsaturated flow, flow in deformable porous media, convective transport of solutes with hydrodynamic dispersion effects, and coupled flow phenomena with particular emphasis on electrokinetics. Prerequisite: 355.

CIV ENG 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 ENG 359-0 Hazardous Waste Management Definition and regulation of wastes. Pollutant transport, fate, and toxicology. Management via audits and prevention. Treatment and control. Risk and site assessment and site remediation. Prerequisite: upperclass standing in engineering or science or consent of instructor.

CIV ENG 360-0 Environmental Impact Evaluation Environmental legislation and quality indices. Methods for evaluating impact of engineering projects on environmental quality. Impact statements, projects, and summary impact reports. Prerequisite: junior standing.

CIV ENG 361-0 Public Health Engineering Evaluation of the disease status of a community; elements of vital statistics and epidemiology; etiology of infectious and noninfectious diseases; control of environmentally based health hazards.

CIV ENG 363-0 Community Air Pollution 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. Prerequisite: junior standing.

CIV ENG 364-0 Sanitary Engineering 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. Prerequisite: MECH ENG 241; CIVENG 340 recommended.

CIV ENG 365-0 Radiation Health Principles of health physics: sources of radiation, physics of radioactivity and ionizing radiation, interaction of radiation and matter. Radiation dosimetry, biological effects, safety standards, and principles of radiation protection.

CIV ENG 366-0 Ecosystems and Ecotoxicology Terrestrial, freshwater, marine, and estuarine ecosystems. Fundamentals

of toxicology and their application to natural environments and biotic components; tolerance limits and adaptation of organisms to environmental change brought on naturally or by human technology and activity. Prerequisite: junior standing in engineering or science.

CIV ENG 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: CHEM 103 or CIV ENG 267.

CIV ENG 368-0 Industrial Hygiene and Environmental Control Application of industrial hygiene principles and practice; measurement and control of atmospheric contaminants. Design and evaluation of industrial ventilation systems. Prerequisite: junior standing.

CIV ENG 370-0 Environmental Engineering Design Decision making in selection and implementation of environmental control measures. Water supply and wastewater management: quantities to be handled, transportation systems, treatment processes, solid wastes management. Prerequisite: 364.

CIV ENG 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 ENG 372-0 Transportation System Design and Analysis Integrative design and analysis experience; physical and programmatic problems, including operations, terminals, and management; fundamental concepts of transportation; systematic approaches to creative problem solving. Prerequisite: 371.

CIV ENG 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.

CIV ENG 395-0 Special Topics in Civil Engineering Topics suggested by students or faculty and approved by the department.

CIV ENG 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 ENG 399-0 Projects Special studies under faculty direction. Credit to be arranged.

Computer Science

The Department of Computer Science offers a wide variety of programs leading to the BS degree. Courses and research focus on software, ranging from theoretical models to practical applications. Particular areas of research include

- artificial intelligence, including mobile robots with perceptual systems, models of memory and reasoning, knowledge representation, natural language comprehension, planning, and problem solving
- human-computer interaction, including interface design, task modeling, intelligent interfaces, 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 systems, including parallel, distributed, and real-time systems, networks, performance analysis, prediction and scheduling, and Internet and grid application development
- computer graphics, human-computer interfaces for spatial applications, visualization, and computer entertainment

Courses and research are highly interdisciplinary, with particularly strong connections to education and psychology, through both shared faculty and joint research projects. Detailed information on degree requirements and elective courses is available from the department office.

Computer science majors may complete a minor in art and technology. For details, see the Other Undergraduate Programs section of this catalog.

Facilities

Computer science students have access to state-of-the-art facilities, ranging from simple microcomputers to the latest multimedia workstations. The campus, including residence halls, is extensively networked with a 100-megabit FDDI University network backbone. All students have full Internet access. Electronic mail, Web sites, and other computer-based communication facilities are used to increase the bandwidth between students and faculty beyond the classroom.

Courses Primarily for Undergraduates

COMP SCI 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.

COMP SCI 111-0 Fundamentals of Computer Programming Introduction to principles of programming and procedural thinking. Procedural abstraction, data abstraction, modularity, object-oriented programming. Uses the Scheme programming language and computer facilities. Substantial programming assignments, including numerical and symbolic programs. Required for computer science majors.

COMP SCI 120-0 Introduction to Computers and Information Technology Basic concepts of computer systems. Considerable hands-on experience with applications such as word processors, databases, and spreadsheets. Information technology's impact on today's society. No previous experience with computers needed. Not for students who have taken 110 or 111 or for McCormick students.

COMP SCI 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.

COMP SCI 211-0 Fundamentals of Computer Programming II 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 computer science majors. Prerequisite: 111.

COMP SCI 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 ECE 230.

COMP SCI 310-0 Mathematical 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. Prerequisites: 110 or 111 and MATH 214-3.

COMP SCI 311-0 Data Structures and Data Management The 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 computer science majors. Prerequisite: 211 or ECE 230.

COMP SCI 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 students in computer science. Prerequisite: 110, 111, or programming experience.

COMP SCI 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: 311.

COMP SCI 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, discrimination trees. Project driven. Substantial programming assignments. Prerequisite: 110, 111, or programming experience.

COMP SCI 330-0 Human-Computer Interaction Introduction to human-computer interaction and the design of systems that work for people and their organizations. Understanding the manner in which humans interact with and use their computers for productive work. Prerequisite: programming experience.

COMP SCI 332-0 Introduction to Computer Vision Introduction to computer and biological vision systems, image formation, edge detection, image segmentation, texture, representation and analysis of two- and three-dimensional structures. Prerequisites: 311, MATH 219, and IEMS 201.

COMP SCI 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: 310, 311, or consent of instructor.

COMP SCI 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.

COMP SCI 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.

COMP SCI 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: 311.

COMP SCI 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: 311.

COMP SCI 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. Prerequisite: 311.

COMP SCI 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. Prerequisite: 348 and 325-1 or equivalent LISP experience

COMP SCI 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.

COMP SCI 351-0 Introduction to Computer Graphics Mathematical software and hardware requirements for computer graphics systems. Data structures and programming languages. Random displays. Graphic applications. Prerequisite: 311.

COMP SCI 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: 311; at least 1 unit of 322, 343, 348, or 351.

COMP SCI 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.

COMP SCI 395-0 Special Topics in Computer Science Topics suggested by students or faculty and approved by the department.

COMP SCI 399-0 Projects Seminar and projects for advanced undergraduates on subjects of current interest in computer science.

Electrical and Computer Engineering

The Department of Electrical and Computer Engineering has two distinct curricula — electrical engineering and computer engineering — both of which offer a broad range of programs leading to the BS degree. In addition, the department offers MS and PhD degrees.

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 tera-bit 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, other 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.

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 the field of writing software that runs on compilers. Students are taught the techniques of designing and analyzing 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 multi-FPGA systems, and CAD techniques.

Laboratory and Computer Facilities

The department has a variety of modern, well-equipped instructional and research laboratories. Facilities primarily for electrical engineering include laboratories for electronic circuits, digital circuits, solid-state electronics, the 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. Facilities for electrical and computer engineering include laboratories in digital systems design, microprocessor systems, microprogramming, computer communication networks, 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. The department also maintains the ECE Computing Laboratory, which has many networked workstations and appropriate software to support class work and projects. The machines are connected to external networks, allowing off-site computing. There are also three parallel machines available at the Center for Parallel and Distributed Computing.

Undergraduate electrical and computer engineering majors are entitled to accounts on departmental computers that are generally more powerful and less heavily used than other University computers.

Courses Primarily for Undergraduates

ECE 115-0 The Electron in the 21st Century Introduction to the basic physics of solid state, to materials science, and to semiconductor science and technology; overview of semiconductors, light emitters and detectors, and optoelectronics.

ECE 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. Prerequisite: GEN ENG 205-3.

ECE 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.

ECE 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. Prerequisite: GEN ENG 205-1,2,3,4 or COMP SCI 110; ECE 203 is recommended.

ECE 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.

ECE 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 time and discrete time Fourier transforms. Laplace transform; z-transform. Prerequisite: 202.

ECE 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, and MATH 215.

ECE 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. Prerequisite: 202.

ECE 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 and 223.

ECE 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. Prerequisite: GEN ENG 205-1,2,3,4.

ECE 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 are explored. Prerequisites: 221 and PHYSICS 135-2.

ECE 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 majors. Prerequisites: MATH 214-2 and PHYSICS 135-2 or equivalent.

ECE 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 215.

ECE 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.

ECE 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 and 302.

ECE 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.

ECE 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 majors.

ECE 328-0 Numerical Methods for Engineers

Introduction to numerical methods; numerical differentiation, numerical integration, solution of ordinary and partial differential equations. Students write programs in FORTRAN, C, or Pascal using methods presented in class. Prerequisites: GEN ENG 205-1,2,3, and MATH 214-1,2,3.

ECE 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 representation and analysis of three-dimensional structures. Prerequisites: MATH 219, COMP SCI 311, and IEMS 202.

ECE 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 330, or equivalent basic probability theory.

ECE 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 and 205.

ECE 347-0 Microprocessor System Projects

Programmable logic devices such as PAL, FPGA, etc. Design, prototype, and test individual projects involving microprocessors and programmable logic devices. Prerequisites: 303 and 346.

ECE 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 and 225.

ECE 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: 303 and COMP SCI 311.

ECE 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; 230 or COMP SCI 211.

ECE 359-0 Digital Signal Processing Discrete-time signals and systems. Discrete-time Fourier transform, z-transform, discrete Fourier transform, digital filters. Prerequisite: 222.

ECE 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. Prerequisite: 222.

ECE 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 and 303.

ECE 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. Students use industrial-strength design tools and VHDL as the design specification language. Designs are evaluated using benchmark programs for correctness and performance. Prerequisite: 361.

ECE 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.

ECE 365-0 Communication Filters Analytical approximations in the design of analog filters. Matched filters and their implementation with surface-acoustic-wave and charge-coupled devices. Prerequisites: 221 and 307.

ECE 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.

ECE 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 and 307.

ECE 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 and 224.

ECE 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.

ECE 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.

ECE 382-0 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.

ECE 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 and 224.

ECE 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.

ECE 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.

ECE 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.

ECE 388-0 Microelectronic Technology 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: 381 or consent of instructor.

ECE 389-0 Superconductivity and Its Applications Properties of materials in the superconducting state; charge flow dynamics of type II superconductors; high- T_c superconductors; applications for computers and high-frequency devices. Prerequisite: 381 or consent of instructor.

ECE 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.

ECE 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.

ECE 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.

ECE 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.

ECE 397-0 Special Topics in Electrical and Computer Engineering Topics suggested by students or faculty and approved by the department.

ECE 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.

ECE 399-0 Projects Seminar and projects for advanced undergraduates on subjects of current interest in electrical and computer engineering.

Engineering Sciences and Applied Mathematics

The Department of Engineering Sciences and Applied Mathematics offers course work 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 course work either in mathematics or one or more areas of application.

Courses Primarily for Undergraduates

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 214-3 and 215. Prerequisite: invitation or consent of instructor.

ES APPM 253-0 Honors Engineering Analysis 4 Conclusion of the honors engineering analysis sequence (see GEN ENG 206-1,2,3). Solution methods for ordinary differential equations, including exact, numerical, and qualitative methods. Applications and modeling principles; solution techniques. Prerequisites: ES APPM 252-2 or MATH 214-2, GEN ENG 205-2, and 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: 252-3, MATH 221, or GEN ENG 205-4.

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: 252-3, MATH 221, or GEN ENG 205-4.

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 215, 219, and 221 or GEN ENG 205-4; PHYSICS 135-1,2 or equivalent; familiarity with a programming language; or consent of instructor.

ES APPM 399-0 Projects Special studies to be carried out under faculty direction. Credit to be arranged.

Environmental Engineering

Environmental engineering is concerned with the interactions of people and environment, the applications of scientific knowledge to the understanding and analyses of these interactions, and the improvement of the quality of our environment. This undergraduate program provides an engineering and scientific basis for understanding contemporary environmental problems and approaches to their solutions, understanding the natural systems with which human activities must be compatible, and developing a grasp of engineering analysis and design for environmental control systems planning and design.

McCormick faculty members are engaged in research on physical, chemical, and biological processes for water supply, waste treatment, pollution control, and resource recovery; water resources; toxicology; environmental systems planning and design; chemistry and treatment of industrial wastes; land reclamation and contaminant effects on ecosystems.

Completion of the undergraduate degree program in environmental engineering 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.

Industrial Engineering and Management Sciences

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 IE 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 basics 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.

To learn more about the program, visit the department's Web site at www.iems.northwestern.edu.

Courses Primarily for Undergraduates

Probability and Statistics

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 majors.

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. Prerequisite: MATH 215 or equivalent.

IEMS 303-0 Statistics I 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. Prerequisite: 202 or equivalent.

IEMS 304-0 Statistics II 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.

Operations Research

IEMS 310-0 Operations Research Survey of operations research techniques. Linear programming, decision theory, stochastic processes, game theory. Not open to industrial engineering majors. 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. Prerequisite: GEN ENG 205-3.

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, and 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; and ECE 230.

General Business Management

IEMS 224-0 Principles of Accounting and Finance Introduction to accounting and finance for engineers. Double-entry system; accounting cycle; financial statement analysis; assets, liabilities; flexible budgets; job-process costing. Homework, lab presentation, and group project.

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: One course in accounting or finance such as 224, 326, or ECON 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. Prerequisites: MATH 215; basic understanding of probability and economics recommended.

Organization Theory, Behavioral Science, and Technology Management

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 for non-majors: consent of instructor.

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 344-0 Information Technology in Manufacturing Overview of information technology used in the high-technology manufacturing environment. Integration of people, business processes, manufacturing processes, and information technology. Work experience recommended.

Economics and Financial Decisions

IEMS 373-0 Financial Engineering I 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 215, ECE 230, or equivalent, or consent of instructor.

Production and Logistics

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: 310 or 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: 302; 310 or 313.

Senior Design Project

IEMS 390-1,2 Systems Project Management I,II

1. 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. Prerequisites: 340 and senior standing. **2.** Project management methods applied to analysis and design of a complex real-world system. Students choose and carry out a single classwide project. Planning, organizing, staffing, directing, and controlling; working with clients and stakeholders. Prerequisite: 390-1.

IEMS 391-1,2 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 and 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, trade-offs, testing, and evaluation. Written and oral reports. Prerequisites: senior standing; 313 and 315 for industrial engineering majors; 310 for manufacturing engineering majors.

Special Topics

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.

Manufacturing Engineering

The manufacturing engineering program prepares students to design, manage, control, and operate complex manufacturing systems. An interdisciplinary degree, it exposes students to all phases of manufacturing, from product design and development to manufacturing, from marketing to distribution, and from vendor management to information systems and control. Graduates find employment in traditional manufacturing firms, new economy startups, and state-of-the-art consulting ventures.

Course work in manufacturing engineering includes the core areas of engineering economics, statistical analysis, quality engineering and experimental design, production planning, information systems, material selection, product design, and process design and control. Through extensive use of teamwork, students also develop people management skills. Technical electives are chosen from manufacturing-related areas such as manufacturing management, computer-aided design, microelectronic systems, manufacturing logistics, transportation, and information systems. A two-quarter senior design project is required.

Students interested in the manufacturing engineering degree can obtain an additional engineering degree through dual-degree programs available with industrial engineering, mechanical engineering, computer engineering, and electrical engineering.

To learn more about mechanical engineering, visit the department Web site at www.mfe.northwestern.edu.

Courses Primarily for Undergraduates

MFG ENG 395-0 Special Topics in Manufacturing

Engineering Topics relevant to manufacturing engineering as approved by the department. Prerequisite: consent of instructor.

MFG ENG 398-0 Manufacturing Engineering Design

Project Large-scale, open-ended team projects in real-world settings. Integrated, multidisciplinary approach addressing product, process, and systems considerations. Written and oral reports. Prerequisite: senior status or consent of instructor.

MFG ENG 399-0 Independent Study Independent study on a manufacturing engineering topic supervised by a faculty member. Prerequisite: consent of instructor.

Materials Science and Engineering

Materials science and engineering is a discipline that 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 apply basically 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 of Materials Science and Engineering offers an undergraduate program leading to the BS degree. The department also participates in the co-op and BS/MS programs. The curriculum centers on basic engineering and materials course work but also provides the flexibility to focus on different areas of concentration as described below. A 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 each 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 materials science and engineering in many other 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

Engineers in industry typically work in teams on projects requiring experience with design and manufacturing. This concentration is meant for students desiring additional strength in these areas and is especially appropriate for those planning a career in industry. It builds on the design content in the materials science curriculum and provides additional interdisciplinary design experience. The concentration also provides 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 these 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 feature sizes in the range of 1 to 100 nanometers, is an important research topic that will become increasingly emphasized as nanotechnology industries develop. Examples of nanomaterials include new ultrahigh-strength materials with nanometer-range structural features and new 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 that are 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 critically on composition at surfaces and grain boundaries (internal surfaces), surface treatments, and the environment. The surface scientist must not only be able to determine the properties of surfaces or interfaces but also be able 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. This features a unique combination of instruments (cold field-emission transmission electron microscope, atom-probe field-ion microscopes, scanning tunneling microscopes), providing atomic resolution imaging and chemical analysis, 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.

Courses Primarily for Undergraduates

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 majors.

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 Principles of the Properties of Materials Introduction to atomic and molecular organization in solids, with emphasis on structure-property relations in ceramics, electronic materials, metals, and polymers. Prerequisite: CHEM 102.

MAT SCI 203-0 Microstructure and Engineering Properties of Materials Processing, microstructure, and properties of engineering materials with emphasis on structural materials such as concrete, steel, wood, glass, and ceramics. Prerequisites: CHEM 102 and MATH 214-3.

MAT SCI 301-0 Chemical Aspects of Engineering Materials Equilibrium and nonequilibrium development of microstructures. Mechanical behavior of metals, ceramics, and polymers. Corrosion and stability of engineering materials. Materials processing. No credit for materials science majors. Prerequisite: CHEM 342-1 or CHEM ENG 211.

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.

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 322-0 Kinetics of Heterogeneous Reactions Rates and mechanisms of heterogeneous gas-solid, liquid-solid, and solid-solid reactions such as carburization, reduction, oxidation, corrosion, stress-corrosion, and heterogeneous structural transformations. Role of microscopic and macroscopic defects.

MAT SCI 331-0 Physical Properties of Polymers Different kinds of polymeric materials. Relationships between structure and physical properties; rubber elasticity, the glassy state, crystallinity in polymers. Lectures, laboratory. Prerequisites: 201 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: 316-1,2; 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 335-0 Polymer Processing and Properties Effects of processing flows on microstructure and properties of semicrystalline and glassy polymers. Extrusion and molding; structural characterization and mechanical behavior; additives.

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: GENENG 205-4 and 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: 201 and 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: GENENG 205-4 and 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 376-0 Nanomaterials Introduction to structure-property relationships of materials processed at the nanometer scale. This highly interdisciplinary course is 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 385-0 Image Analysis Quantitative analysis of microstructures in materials from measurements on two-dimensional sections, transmission micrographs, and scanning electron micrographs.

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 and 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

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, individuals who possessed the know-how to reduce these ideas to practice. Today, traditional know-how and creative ability are as necessary as ever but no longer sufficient in an increasingly competitive world. It has become necessary to also know why things occur and thus to be able to exert the proper guidance at the earliest stages of planning. Furthermore, in a world of finite resources and in a society increasingly aware of its environment, mechanical engineers must cope with not only the traditional concerns of efficiency and safety but also the undesirable effects of pollution. Clearly, the tools that future mechanical engineers need to possess must be more sophisticated to allow the important but ever-subtle effects to be recognized and controlled.

Mechanical engineering plays a dominant role in a wide spectrum of industries, among them the transportation industry (automotive, rail, air, and marine), heavy machinery (machines producing other machines), the power industry, the environmental industry (heating, ventilation, and air-conditioning), robotics, the 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 in mechanical engineering provides a broad fundamental education preparing students for direct entry into industry as well as further professional study. The first part of the curriculum is devoted to mathematics, physics, and chemistry. With this background, fundamental mechanical engineering subjects are studied. These include dynamics, solid mechanics, fluid mechanics, and thermodynamics 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 the technical proficiency of mechanical engineering, while the elective courses in social sciences, fine arts, history, and philosophy enlarge their 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 five required elective courses wisely, students can develop a highly personalized curriculum.

Some areas of concentration are computer-aided design/computer-aided manufacturing, fluid mechanics, robotics, systems and control, and tribology. In addition, there are special 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 to 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/MEMS 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 at the department office.

Courses Primarily for Undergraduates

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 and concurrent registration in MATH 215.

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: GENENG 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: GENENG 205-3 and concurrent registration in MATH 215.

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, ECE 270, and MECH ENG 262 or CIV ENG 216.

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 and concurrent registration in 262 or CIV ENG 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 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.

CIV ENG 314-0 Mechanics of Crustal Processes See Civil Engineering.

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. Prerequisite: 240 or CIV ENG 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 ENG 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: GEN ENG 205-3 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 ENG 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 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 ENG 216 and 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 ENG 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 and GEN ENG 205-4.

MECH ENG 365-0 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 215, or CIV ENG 216.

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 and 365 or consent of instructor.

MECH ENG 370-0 Thermodynamics II 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 (MEMS) Introduction to microelectromechanical 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 ENG 216 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. Particular emphasis on the dynamics and kinematics of proteins, especially those that are locomotory or force generating. Lectures, team projects, and presentations. Prerequisite: MATH 214-3 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: GENENG 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. 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

Journalists perform a vital function in a democracy that depends on an informed electorate and in a world that depends on effective communication. The Medill School of Journalism seeks to develop professional writers and editors who are broadly educated in the liberal arts and sciences; who are technically skilled; who understand the historical underpinnings of a free press in America; and who appreciate the social, legal, and ethical issues of the news media in modern-day society.

The core journalism courses — which make up 25 percent of the undergraduate curriculum — are designed to prepare students for careers in the news media, with emphases on writing, reporting, editing, and graphics.

During the junior year, students participate in Teaching Media, an academic internship in which they receive course credit for working full-time at a daily newspaper, magazine, or television station for 11 weeks. This program offers a professional laboratory in which students study under the supervision and guidance of editor-instructors monitored by Medill faculty. Students who encounter financial hardship while on this program may apply to the school's Benjamin H. Baldwin Fund for some support.

The nonjournalism courses — about 75 percent of the undergraduate curriculum over four years — include a wide selection of social and natural sciences, arts, and humanities classes, so that students will have the background to understand and communicate the world's events.

Many undergraduates find media jobs in print, broadcast, or online journalism; public relations; or allied fields directly after graduation. Others pursue a Medill master's degree. The graduate program in editorial journalism offers concentrated study in reporting and writing, broadcast journalism, new media, and magazine publishing. The school's other graduate program, integrated marketing communications (IMC), has specialized concentrations in advertising and sales promotion, public relations, and direct,

database, and e-commerce marketing. Students are admitted to a graduate program only if their undergraduate course work indicates the aptitude necessary for rigorous specialized education.

Medill has awarded about 15,000 degrees since its founding in 1921; the school's graduates stand among the leaders of the profession. Medill's 900 students — 600 undergraduates and 300 graduate students representing nearly every state in the union and several countries — take pride in the school's ranking as one of the nation's preeminent journalism centers.

For more information, see the school's Web site at www.medill.northwestern.edu.

Academic Policies

Requirements for the Degree of Bachelor of Science in Journalism

1. A minimum of 45 units must be completed on the college level.
2. Students must take the final 23 units (of 45 required for graduation) at Northwestern and complete the last three quarters of work while enrolled at Medill. An exception is made for students who are enrolled in a study abroad program that has been approved in advance by Northwestern's Study Abroad Office and Medill. Credit for summer work completed at other colleges or universities may be counted as part of the final 23 credits if approved in advance by Medill.

In addition to and independent of the requirements set by Medill, all students must satisfy the Undergraduate Residence Requirement. (See the Undergraduate Education section of this catalog.)

3. At least 11 but no more than 12 units in journalism may be counted toward the 45 course units required for graduation; 33 of the 45 must be in areas other than journalism. Students with more than 45 units may take additional journalism units.
4. Exceptions to any degree requirements must be approved by the Medill Academic Standards Committee. Petitions and the committee's rules for filing petitions are available in the Medill Office of

Student Records and Services or from the chair of the committee.

5. No course may count toward more than one requirement.

Medill Curriculum Requirements

Arts and sciences (23 units)

See the Medill Undergraduate Handbook for a complete list of courses that fulfill the arts and sciences course requirements.

Distribution requirements — 14 units

- Art or art history — 1 course
- Economics — 1 course
- History — 3 courses
At least 1 course must be in U.S. history, and at least 1 must be in non-U.S. history.
- Literature — 3 courses chosen from any department in the University dealing with literature, either in English or in a foreign language
- Political science — 1 course in American government and 1 course in international relations or international studies
- Religion, philosophy, or ethics — 1 course not including courses in logic
- Science/mathematics/logic — 3 courses
At least 1 must be chosen from the Department of Statistics or the following:

ANTHRO 362

BME 220

MATH 292-1,2,3

MATH 210

POLI SCI 310

POLI SCI 311

POLI SCI 312

POLI SCI 315

PSYCH 201

SOCIOL 303

The remaining 2 courses may be chosen from the list above or from any of the following core subjects: astronomy, biological sciences, chemistry, computer science, electrical and computer engineering, geography, geological sciences, logic (philosophy), mathematics, and physics.

Social science concentration — 3 units in any one of the following departments: anthropology, economics, history, political science, psychology, or sociology

If the student selects economics, history, or political science, the 3 units taken to fulfill the social science concentration must be in addition to those required of all Medill students. At least 1 of the 3 units must be at the 300 level.

Students may apply no more than 1 100-level course toward the social science concentration. INTL ST 201-1,2,3 Introduction to the World System may be used toward the 3-unit social science concentration in political science.

Students may not apply more than 1 unit of field study or independent study credit toward the social science concentration.

Arts and sciences concentration — 6 units in any department of Weinberg College other than the area selected for the 3-unit social science concentration

For any concentration except in astronomy, biological sciences, chemistry, geological sciences, mathematics, physics, or a foreign language, students may apply no more than 1 100-level course and must take at least 2 300-level courses.

Students are exempt from this requirement if they complete a minor in Weinberg College, complete a second major in any department of Weinberg College, or complete an adjunct major offered through Weinberg College. Permission to pursue a second or adjunct major must be secured from the appropriate Weinberg College department chair.

Students may not apply more than 2 units of field study or independent study credit toward this 6-unit concentration.

Electives (10 or 11 units)

Students may take any non-Medill credit course to explore or extend their interests.

Journalism (11 or 12 units)

Core — 4 units

Freshman year

201 Editing and Writing the News

202 History and Issues of Journalism

Sophomore year

301 Newswriting and Reporting

Senior year

370 Law and Ethics of Journalism

Teaching Media — 5 units

Students pursue one of the following programs starting late sophomore year or junior year:

Teaching Newspaper

340 Newspaper Editing and Writing

1 of the following:

341 News and New Media

374 Analytical Reporting

376 Print Media Design

345 Teaching Newspaper: Reporting (1 or 2 units)

346 Teaching Newspaper: Editing (1 or 2 units)

Teaching Magazine

350 Magazine Writing

351 Magazine Editing

355 Teaching Magazine: Writing (2 units)

356 Teaching Magazine: Editing

Teaching Television

360 Broadcast Writing

361 Television News Producing

365 Teaching Television: Broadcast News (2 units)

366 Teaching Television: Editing

Electives — 2 or 3 units

Students who have completed Teaching Media may take as an elective any journalism course not required for their Teaching Media program. Electives may be chosen regardless of a student's Teaching Media program (for example, a Teaching Television student may take magazine courses, newspaper courses, investigative journalism, additional television courses, or a combination of courses).

In addition to courses listed above, these electives include

367 Broadcast Reporting

368 Television News Documentary

373 Investigative Journalism

375 Literary Journalism

377 Reporting across Race and Culture

390 Special Topics

399 Independent Study

Either of the undergraduate IMC courses —

303 Advertising and 304 Direct Marketing — may be applied as a journalism elective. Students may take both 303 and 304 only if 1 of these courses is taken as a 12th journalism unit. Of the 11 required journalism units for the bachelor of science in journalism degree, 10 must be in editorial courses.

Grade Requirements

1. Students must achieve a 2.00 minimum grade point average in all nonjournalism courses taken for a letter grade and a 2.25 minimum grade point average in journalism courses. In addition, all journalism students are subject to the following grade requirements:

- The journalism grade point average will reflect the grades of all journalism courses attempted (including F's).
 - All Y and X grades, unless made up satisfactorily by the end of the subsequent quarter, will be counted as F's.
 - A grade of F and/or N earned twice in the same required course will be grounds for mandatory transfer out of Medill.
 - To be eligible for the junior-year Teaching Media program, students must earn a grade of C or better in Newswriting and Reporting and in the two media-specific courses that immediately precede the Teaching Media program and a minimum 2.25 grade point average in those three courses plus Editing and Writing the News.
 - A maximum of two units of D or below in journalism courses or three units of D or below overall will be permitted. Exceeding these limits will be grounds for mandatory transfer out of Medill.
 - When journalism courses are repeated, both grades are computed in the journalism grade point average. However, only one course may be applied toward the 45 units required for the bachelor's degree in journalism. (An exception to this last stipulation is 373 Investigative Journalism, which may be applied to the 45 required credits a second time with the consent of the instructor.)
 - Students who do not meet the minimum grade point requirements are placed on academic probation. Continued poor performance will result in a mandatory transfer to another school within Northwestern University or dismissal from the University.
2. Medill undergraduates are required to take these courses for letter grades (A, A-, B+, B, B-, C+, C, C-, D, F):
- All journalism courses (except those offered by the faculty under the P/N option)
 - All courses in the social science concentration
 - All basic requirements in art/art history, economics, history, literature, philosophy/religion, political science, and science/mathematics/logic.

3. Other courses may be taken on the pass/no credit (P/N) option, if that option is available. A total of no more than 6 units of credit may be taken P/N and counted toward the 45 units required for graduation. (The 3 P/N grades from Teaching Newspaper, Teaching Magazine, or Teaching Television are included in these 6.) Only 1 course per quarter may be taken P/N.

Medill Honor Pledge

Since September 2002 all newly enrolled first-year students and nonmajors taking journalism courses have been required to sign the Medill Honor Pledge, which, among other things, concerns the importance of honesty and integrity in journalistic and academic work.

Faculty Advisers

When students enter Medill, they are assigned to a faculty adviser who is available to help develop an individual academic program. Medill staff and student peer advisers also help advise students in such areas as degree requirements, career paths, noncredit internships (especially during the summers), and work in campus media.

Academic Options

Internships

Internship employment by newspapers, magazines, radio and television stations, online media, 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 Teaching Media program.

Other Undergraduate Programs

Students in the Medill School of Journalism also may enroll in courses offered by the Center for the Writing Arts, the interschool Undergraduate Leadership Program, and the international studies and legal studies adjunct majors, among other areas (see the Other Undergraduate Programs section of this catalog).

Activities

Through student publications and broadcast media, professional organizations, and convocations, Medill students have many journalistically related opportunities outside of the classroom.

Students write and edit the independent student newspaper the *Daily Northwestern*, published during the academic year, and the *Summer Northwestern*, a weekly newspaper published during Summer Session. Also published on campus are *Syllabus*, the student yearbook, and a wide variety of other publications. The University gives no academic credit for work on student-run publications. The *Daily Northwestern*, *Summer Northwestern*, and *Syllabus* are published by Students Publishing Company and have no formal connection with Medill.

Radio station WNUR-FM provides another outlet for student newswriters, sportscasters, editors, and commentators, as does *Northwestern News Network*, a student-produced news program aired on a local cable television channel.

Writing skills are helpful in other extracurricular activities such as student government, the Waa-Mu Show, student-planned colloquia, and various literary publications.

The Society of Professional Journalists and the National Association of Black Journalists, professional organizations that promote high standards among journalists, have chapters on campus. Other organizations for students interested in journalism include Blackboard and the Communications Residential College. Top scholars in the senior and graduate classes are initiated into Kappa Tau Alpha, the national journalism honorary society.

ROTC Course Credits

ROTC course credits may be used as a portion of the 45 units required for graduation. These units are considered elective courses.

Accelerated Master's Program

Through the Accelerated Master's Program, the Medill School of Journalism allows a few students each year to earn both bachelor's and master's degrees in editorial journalism in less than five years. Students apply in their junior year; those accepted into the highly selective program must show academic excellence, the promise of success in journalism, and a demonstrated high level of professional commitment and personal maturity.

Early Graduation

Students who plan to graduate early must notify the school in writing 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 Residence Requirement.

Courses

EDIT 201-0 Editing and Writing the News The fundamentals of journalistic editing, writing, research, and visual presentation.

EDIT 202-0 History and Issues of Journalism The history of print and broadcast journalism, primarily in the United States, as well as the historical development of several contemporary media and ethical issues.

EDIT 301-0 Newswriting and Reporting Reporting and writing several types of news stories for print and broadcast media under deadline pressure; exploring the use of graphics. Prerequisites: 201 and sophomore standing.

IMC 303-0 Advertising Orientation to advertising in the economy and society. Introduction to theory and practice of marketing, research, copywriting, media planning, direct marketing; how advertising works; advertising agencies and other organizations; role of advertising in the society and economy; legal aspects.

IMC 304-0 Direct Marketing Fundamental principles of direct marketing, including marketing, promotion, and business considerations; survey of database, media, and creative techniques used by traditional and nontraditional marketers.

EDIT 340-0 Newspaper Editing and Writing Fundamentals of newspaper editing, including headlines, page layout and design, photo editing, information graphics, and appropriate electronic tools. Prerequisite: 301 for Teaching Newspaper; otherwise 355 or 365.

EDIT 341-0 News and New Media An exploration of the move of traditional publications into electronic publishing, the journalist's role in that process, and the appropriate electronic tools. Prerequisite: 340 or concurrent registration in 340 for Teaching Newspaper; otherwise 345, 355, or 365.

EDIT 345-0 Teaching Newspaper:Reporting (1 or 2 units) Honing reporting and newswriting skills in a newsroom through practical assignments under deadline pressure and close editorial supervision. Prerequisites: 340 and 341, 374, or 376. Taken with 346.

EDIT 346-0 Teaching Newspaper:Editing (1 or 2 units) Honing skills in news editing, headline writing, page layout/design, and graphics in a newsroom through practical assignments under deadline pressure and close editorial supervision. Prerequisites: 340 and 341, 374, or 376. Taken with 345.

EDIT 350-0 Magazine Writing Reporting, writing, and illustrating magazine articles, with emphasis on voice, style, subject matter, and organization; the development of ideas; the marketing of articles. Prerequisite: 301 for Teaching Magazine; otherwise 345 or 365.

EDIT 351-0 Magazine Editing Editing magazine copy and graphics, with emphasis on precision, style, and structure; an overview of the magazine industry and the role of magazines in society. Prerequisite: 301 for Teaching Magazine; otherwise 345 or 365.

EDIT 355-0 Teaching Magazine:Writing (2 units) An exploration of aspects of magazine writing and reporting. Practical assignments in a magazine office with deadline pressure and close professional supervision. Prerequisites: 350 and 351. Taken with 356.

EDIT 356-0 Teaching Magazine:Editing An exploration of aspects of magazine editing, graphics, and publishing. Practical assignments in a magazine office with deadline pressure and close professional supervision. Prerequisites: 350 and 351. Taken with 355.

EDIT 360-0 Broadcast Writing Writing news scripts for television on an appropriate computer system, editing videotape, and writing stories to coordinate with the video. Prerequisite: 301 for Teaching Television; otherwise 345 or 355.

EDIT 361-0 Television News Producing Writing and producing a television news program using the appropriate computer and editing equipment, news wires, and video feeds. Emphasis on the editorial decision-making process. Prerequisite: 360.

EDIT 365-0 Teaching Television:Broadcast News (2 units) Gathering television news from the field; writing scripts, readers, voiceovers, vosots, packages, and on-camera news for reporters and anchors. Taken in a television newsroom under close professional supervision. Prerequisite: 361. Taken with 366.

EDIT 366-0 Teaching Television:Editing Gaining exposure to the television assignment process by working with the assignment desk; editing voiceovers, sound bites, and packages. Taken in a television newsroom under close professional supervision. Prerequisite: 361. Taken with 365.

EDIT 367-0 Broadcast Reporting Basics of reporting for broadcast and preparation of broadcast stories. Emphasis on interviewing, packaging a story, and analyzing techniques. Prerequisites: senior standing and 360.

EDIT 368-0 Television News Documentary Formats used in documentary production, with emphasis on transforming a major research effort into a half-hour program or a multi-part series. Prerequisites: senior standing and 366 or 367.

EDIT 370-0 Law and Ethics of Journalism The legal and ethical framework defining media freedoms and constraints in the United States. Historical context and focus on the evolution of constitutional, statutory, judicial, and ethical standards. Prerequisite: senior standing.

EDIT 373-0 Investigative Journalism The news media in their adversarial role in public affairs reporting, including investigative and interpretative reporting and advocacy journalism; the impact of the news media on public opinion and policy making. Prerequisite: senior standing. With consent of instructor, may be counted twice toward journalism credits.

EDIT 374-0 Analytical Reporting Development of an in-depth reporting/writing project, including researching the subject; analyzing the appropriate interviews, computer data, and/or surveys; writing and editing; and preparing information graphics. Prerequisite: 301 for Teaching Newspaper; otherwise 345, 355, or 365.

EDIT 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: senior standing.

EDIT 376-0 Print Media Design The fundamental tools of layout, typographic contrast, and color theory with a focus on current approaches to newspaper, magazine, and newsletter design. Prerequisite: 340 or 351.

EDIT 377-0 Reporting across Race and Culture Issues of race, ethnicity, and culture in their journalistic applications; practices that have contributed to inaccurate coverage of racial issues and groups; strategies for making coverage accurate, relevant, and fair. Prerequisite: junior standing.

EDIT 388-0 Internship (0 units) Student-initiated internships in journalism. Supervised by Medill faculty. Prerequisites: sophomore standing and consent of instructor.

EDIT 390-0 Special Topics Specialized, experimental courses offered from time to time by faculty. Prerequisites: vary depending on the course.

EDIT 399-0 Independent Study Academic work sponsored and supervised by a faculty member working one-on-one with a student. Prerequisite: consent of Medill Academic Standards Committee.

School of Music

Since its establishment in 1895, the Northwestern University School of Music has ranked among the most prestigious music schools in the nation, providing an environment in which young musicians can dedicate themselves to their art. The school offers students a variety of musical experiences, enabling them to develop into highly proficient performers and scholars. It is a professional school within the University — students accepted into the school are also accepted into the University and consequently have the advantage of academic study in a variety of courses with distinguished faculty. As part of a private institution, the School of Music has developed distinctive programs to meet the artistic and professional needs of its students, preparing them for careers as instrumentalists, singers, teachers, composers, conductors, theorists, historians, critics, managers, and others requiring a specialized knowledge of music. These programs are responsive to new directions, recognizing that a great institution of musical learning preserves the riches of past practices while it encourages its students to explore the practices that will produce the music of the future.

The faculty believe that each undergraduate should be given a comprehensive musical background, that the education should be centered on performance founded on scholarly studies in music theory and history, and that all musical training should be accompanied by a broad cultural background in the humanities. In addition to providing instruction in voice and all principal instruments, composition, and music technology, the school supports orchestras, bands, choral ensembles, opera, and a wide variety of small ensembles that give students experience in all avenues of musical expression.

The graduate division of the School of Music is open to students who are deemed capable of advanced study. Graduate courses emphasize scholarly performance and include concentrated work and research in students' major fields of interest. The ultimate aim is to develop informed musicians, independent scholars, and inspired teachers.

Although the excellence of any school depends mainly on the quality of its faculty and students and the soundness of its curriculum, distinguished musicians are brought to the campus from time to time to enrich the regular programs and to give a special impetus to study. In recent years, guests have included Elly Ameling, Daniel Barenboim, Pierre Boulez, Grace Bumbry, Tito Capobianco, Eliot Fisk, Renée Fleming, James Galway, Witold Lutoslawski, Wynton Marsalis, James Moody, Richard Pearlman, Tony Randall, Renata Scott, and Pinchas Zukerman. An annual performing arts series presents concert artists in performances and master classes for students. The school is also uniquely situated to allow excellent opportunities for professional collaborations in the Chicago metropolitan area.

In addition to outstanding instruction and significant platform experience at the University, the school offers students excellent opportunities for participating in metropolitan Chicago's rich musical life. While working toward a degree, students can gain valuable performing experience and enhance their education as developing musicians.

For more information, see the school's Web site at www.music.northwestern.edu.

Mission Statement

We affirm that music is a universally treasured art and an essential component of culture.

The mission of the School of Music is to provide the highest order of education in all major aspects of music. We endeavor also to expand the musical experiences and understandings of students throughout the University and to enhance the quality of our community's musical life. While continuing to animate the vital traditions of music's past, we encourage creative and dynamic visions of its future.

The School of Music pursues this mission through professional undergraduate and graduate programs for a selective student body of highly qualified musicians who also meet competitive academic standards. We attempt to integrate the artistic and intellectual aspects

of our students' education and to provide a depth and breadth of musical study that equips them with a continuing capacity to grow in their musicianship and to adapt to changing professional demands. Our faculty members strive to be inspiring teachers as well as musical and intellectual leaders. They are actively engaged in expanding knowledge about music through their research and scholarship; in preparing students to be performers, composers, teachers, scholars, and informed audiences; and in enriching their community's culture through their own artistry.

Academic Policies

Programs of Study

The School of Music offers programs leading to the professional degrees of bachelor of music, master of music, graduate certificate in music, and doctor of music. While these programs are designed to prepare the individual for a professional life in music, the setting of the school within a university of Northwestern's quality provides special benefits to students for broadening their education in related disciplines. The school also offers a nonprofessional degree, the bachelor of arts in music. The School of Music is a founding member of the National Association of Schools of Music, which fully accredits all its degree programs.

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 School of Music 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 and are given significant opportunities to explore other interests with free electives.

Bachelor of Music

Courses of study leading to the bachelor of music degree include music cognition, music composition, music education, musicology, music technology, music theory, general academic studies, and performance in jazz studies, piano, organ, string instruments, voice, winds, and percussion.

Through the use of electives, it is possible in the final two years of study leading to the bachelor's

degree, with the adviser's help and the faculty's approval, to design an ad hoc program that cuts across specializations to meet a particular student's needs and career ambitions. Students interested in a specially designed and approved program that most fits their interests and abilities may petition for such a program. The program is designed in consultation with faculty and area professionals with expertise in the particular area of interest. Ad hoc specializations have included arts administration, music criticism, ethnomusicology, music theater production, and music business.

Graduates of the bachelor of music with specialization in the music education program meet all requirements for teacher certification in the state of Illinois (and most other states). In addition to the core program common to all School of Music students, music education majors take 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.

Bachelor of Arts in Music

In addition to the professional curricula just described, the School of Music offers a nonprofessional degree program leading to the bachelor of arts in music. Featuring an opportunity for substantially wider explorations in the liberal arts and fewer music requirements, the bachelor of arts in music is intended for students who have strong ability in music but are not necessarily interested in a musical vocation. Students who are interested in this program may petition for it at any time after they have been admitted to the School of Music.

Five-Year BA/BMus

Students accepted into the combined Weinberg College of Arts and Sciences–School of Music program may simultaneously earn a BA degree from Weinberg College and a BMus degree from the School of Music. They must complete all Weinberg degree requirements, including at least 30 Weinberg courses, as well as all School of Music bachelor of music degree requirements, including at least 30 music courses. Fulfilling both music and Weinberg requirements usually takes five years of full-time study, and the Undergraduate Residence Requirement of 15 quarters is obligatory (see Undergraduate Education).

Participants in this combined program must be accepted by both the School of Music and Weinberg

Degree Requirements

Bachelor of Arts in Music (49 course units required)

Music	Nonmusic
Core Studies (13–16 units) Musicology (3 units) Music theory (3 units) Aural skills (1.5 unit) Keyboard skills (1.5 unit; optional) Basic conducting (1 unit) Ensembles (1.5 unit) Performance study (3–6 units): includes private instruction and related course work on principal instrument or voice. A second year of instruction may be taken. Electives 300-level musicology (3 units) 300-level music theory (3 units)	General Education Distribution (14 units) 1 English composition course (1 unit) 1 freshman seminar or one general education elective (1 unit) 2 courses from each of the six Weinberg distribution areas: natural sciences, formal studies, social and behavioral sciences, historical studies, values, literature and fine arts (12 units) Foreign Language (6 units) May be satisfied by completing the third quarter of an intermediate (second-year college) course in a classical or modern language or by passing an examination to demonstrate equivalent proficiency Electives (10 units) A maximum of 3 elective units may be taken as additional courses in music.

Bachelor of Music (47.5–53 course units required)

Music	Nonmusic
Core Studies (13 units) Musicology (3 units) Music theory (3 units) Aural skills (3 units) Keyboard skills (1.5 units) Basic conducting (1 unit) Ensembles (1.5 units) Major Studies (16.5–21 units) Major Studies Requirement: See specific department and program. Majors in one of the following areas: principal instrument, voice, jazz studies, music cognition, music composition, music education, musicology, music theory, music technology, academic studies, or an ad hoc major.	General Education Distribution (12 units) Basic or intermediate English composition (1 unit) 1 course from each of the following Weinberg distribution areas: natural sciences, formal studies, social and behavioral sciences, historical studies, values, literature and fine arts (5 units) Nonmusic electives (6 units) Free electives (6 units)

Bachelor of Music with Major in Music Education (50.5–53 course units required)

Music	Nonmusic
Core Studies (15 units) Musicology (3 units) Music theory (3 units) Aural skills (3 units) Keyboard skills (1.5 units) Applied study (3 units) Ensembles (1.5 units) Professional Studies in Music Education (24.5–27 units) Students in the undergraduate music education program must choose one of the three specialization tracks: instrumental, choral, or general. See program description for professional and specialization requirements.	General Education Distribution (11 units) General education course requirements (see program description for specific courses)

Five-Year Bachelor of Arts and Bachelor of Music (60 course units)

Music**Core Studies** (16 units)

Musicology (3 units)

Music theory (3 units)

Aural skills (3 units)

Keyboard skills (1.5 units)

Basic conducting (1 unit)

Applied study (3 units)

Ensembles (1.5 units)

Major Studies (16.5–21 units)

Major Studies Requirement: See specific department and program. Majors in one of the following areas: principal instrument, voice, jazz studies, music cognition, music composition, music education, musicology, music theory, music technology, academic studies, or an ad hoc major.

Nonmusic**Arts and Sciences** (minimum of 30 units)

Weinberg distribution requirements

Weinberg departmental major

Foreign language proficiency

Writing proficiency

Five-Year Bachelor of Science and Bachelor of Music or Bachelor of Arts in Music (66 course units)

Music**BMus:Core Studies** (16 units)

Musicology (3 units)

Music theory (3 units)

Aural skills (3 units)

Keyboard skills (1.5 units)

Basic conducting (1 unit)

Applied study (3 units)

Ensembles (1.5 units)

BMus:Major Studies (15–19.5 units)

Major Studies Requirement: See specific department and program. Majors in one of the following areas: principal instrument, voice, jazz studies, music cognition, music composition, music education, musicology, music theory, music technology, academic studies, or an ad hoc major.

Nonmusic

BAMus: See Music requirements under Bachelor of Arts in Music above.

Engineering and Applied Science (36 units)

General education (BMus: 2 units; BAMus: 15 units)

Mathematics (4 units)

Basic sciences (4 units)

Basic engineering (5 units)

Engineering analysis (4 units)

Design/communication (3 units)

Department program (16 units)

Five-Year Master of Science in Journalism and Bachelor of Music or Bachelor of Arts in Music (47.5–53 course units plus fifth-year required courses in journalism)

Journalism

The curriculum for this five-year program involves the successful completion of the list of courses below during the first four years of study, in addition to all requirements for the chosen music degree. The fifth year is spent entirely as a student in the Medill School of Journalism.

EDIT 201 Editing and Writing the News

EDIT 301 Newswriting and Reporting (prerequisite: 201) (1 unit)

EDIT 202 History and Issues of Journalism or EDIT 370 Law and Ethics of Journalism (1 unit)

EDIT 340 Newspaper Editing and Writing or EDIT 350 Magazine Writing or EDIT 360 Broadcast Writing (1 unit)

Other nonmusic**BMus candidates:**

Independent Study/Internship (1 unit)

1 additional course in each of the following Weinberg distribution areas: natural sciences or formal studies, social and behavioral sciences, historical studies, values, literature and fine arts (5 units)

1 additional nonmusic elective (1 unit)

BAMus candidates:

Independent Study/Internship (1 unit)

College of Arts and Sciences. Interested students should consult with the associate dean for undergraduate studies in Weinberg College and the director of student affairs in the School of Music.

Five-Year BS/BMus or BS/BAMus

Students accepted into the combined McCormick School of Engineering and Applied Science–School of Music program may simultaneously earn a BS degree from the McCormick School and a BMus or BAMus degree from the School of Music. They must complete all McCormick School degree requirements, including at least 36 McCormick courses, as well as all School of Music bachelor of music or bachelor of arts in music degree requirements, including at least 30 courses. Fulfilling both music and engineering requirements usually takes five years of full-time study, and the Undergraduate Residence Requirement of 15 quarters is obligatory (see Undergraduate Education).

Participants in this combined program must be accepted by both the School of Music and the McCormick School. Interested students should consult with the undergraduate engineering dean's office in the McCormick School and the director of student affairs in the School of Music.

Five-Year BM/MSJ or BAMus/MSJ

Northwestern offers extremely talented students the opportunity to earn in five years both a BMus or BAMus degree from the School of Music and an MSJ degree from the Medill School of Journalism. The joint program is intended to prepare exceptional students for journalism careers emphasizing music and arts reporting. Some journalism courses are required at the undergraduate level before students enter the graduate program. Prospective students apply to this joint program while applying for undergraduate admission to Northwestern.

Degree Requirements

Candidates for the degree of bachelor of music must complete the minimum number of courses required for their major. Depending on the major, this may be as many as 53 units, but the degree can usually be completed within four years.

All freshmen in the School of Music must participate in band, choir, or orchestra, as appropriate to their principal auditioned instrument. It is recommended that freshmen not participate in more than two ensembles per quarter.

For their last 24 units, all students must be registered at Northwestern; for their last 12 units, they must be registered in the School of Music. Credit toward graduation is generally not granted for summer work taken at other colleges or universities as part of the last 24 units.

The work offered to meet the requirements for a degree may not average lower than C. Not more than one-fifth of this work may be of grade D. A maximum of six 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 an application for the degree a 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 24-unit residency requirement.

In addition to and independent of the requirements set by the School of Music, all students must satisfy the Undergraduate Residence Requirement (see Undergraduate Education).

Music Performance Study

The School of Music offers instruction in piano, organ, string instruments, winds, percussion, and voice. Students should consult their adviser or program coordinator for the assignment of an instructor. Consent of the instructor and department chair as well as concurrent registration in ensemble are required.

Elective performance study assignments are made by the appropriate department chair as space is available.

Faculty Advisers

Each student is assigned to a faculty adviser. It is highly recommended that each student confer with the adviser at least once each quarter. Students may not make a change of registration beyond the add-drop dates without the approval of the director of student affairs.

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 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. Students who know they will be absent from classes or performing organizations for three or more consecutive days for such professional or personal commitments as auditions or off-campus performances or for any other nonemergency reasons are required to prepare a petition requesting permission to be absent from their academic and performance responsibilities in the School of Music. This petition must be submitted to the director of student affairs for approval.

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.

Academic Options

Double Major

Students may earn a double major in four years with proper academic planning and by fulfilling the requirements of both majors.

Bachelor of music candidates may double major only within the School of Music. In certain cases the curriculum may require enrolling in more than four courses per quarter. Typically, the double major combines a specialization in a performance area with one in the academic area or composition, although double majors within the academic area are possible also. A double major in two performance areas is generally not permitted.

Bachelor of arts in music candidates may double major with any major offered in the Weinberg College of Arts and Sciences but may earn only one bachelor of arts degree.

Interdisciplinary Certificates

School of Music students may elect to complete one of the interdisciplinary certificates developed by the School of Music faculty and representing disciplines often used in the music profession. These certificates cross the normally established disciplines

to enable students to combine the study of music with another area in an interdisciplinary fashion. Each includes a minimum of six and a maximum of nine courses. Students applying for School of Music interdisciplinary certificates must present records showing a minimum of five courses not double counted in their specializations.

Students who complete all required courses and notify the Office of Student Affairs that they have done so will receive a notation on their Northwestern transcripts. Applications to receive the certificate are available from the Office of Student Affairs and should be completed along with the Application for a Bachelor's Degree.

Commercial Music

The Certificate in Commercial Music requires 8 courses:

- JAZZ ST 330 Writing for Jazz Ensembles
- R/TV/F 383 Radio/Audio Production
- MUS COMP 311 Composition Class (one unit)
- 2 courses chosen from
 - CONDUCT 320 Band Arranging
 - CONDUCT 321 Writing for Choral Ensembles
 - JAZZ ST 331 Advanced Jazz Writing
 - MUS COMP 314-1 Instrumentation
- 2 courses chosen from music technology
- 1 course in popular music

Jazz Studies

The Certificate in Jazz Studies requires 6 courses:

- 1 improvisation course chosen from
 - JAZZ ST 162 Applied Jazz Improvisation
 - JAZZ ST 262 Applied Jazz Improvisation
 - MUSICOL 337 Improvisation and World Musicianship
- 1 jazz writing course chosen from
 - JAZZ ST 330 Writing for Jazz Ensembles
 - JAZZ ST 331 Advanced Jazz Writing
- 1 jazz history, theory, or literature course chosen from
 - AF AMST 240 Survey of African American Music (spring quarter)
 - MUSICOL 334 Jazz: Its Roots and Elements
- 3 electives chosen from improvisation; jazz writing; jazz history, theory, or literature; or jazz piano for the non-keyboard player courses
- Jazz performance (no credit)

- Large ensemble (University Jazz Ensemble, University Jazz Lab Band) and chamber ensemble (Chamber Jazz Ensemble) for six quarters

Music Business

The Certificate in Music Business requires 8 courses:

- ADVERT 203 Basic Advertising (School of Continuing Studies)
- ECON 260 Accounting and Business Finance (prerequisites: ECON 201, 202)
- MKTG 201 Marketing I: Principles of Marketing (School of Continuing Studies)
- ORGBEH 309 Human Resource Management (School of Continuing Studies)
- ORGBEH 367 Strategic Planning and Management (School of Continuing Studies)
- Two business-related electives
- MUSIC 398 Internship

Music Cognition

The Certificate in Music Cognition requires 9 courses:

- 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)

Music Criticism

The Certificate in Music Criticism requires 7 courses:

- MUSICOL 399 Independent Study
- 2 musicology electives
- EDIT 201 Editing and Writing the News
- EDIT 301 Newswriting and Reporting (prerequisite: 201)
- EDIT 202 History and Issues of Journalism or 370 Law and Ethics of Journalism
- EDIT 340 Newspaper Editing and Writing, 350 Magazine Writing, or 360 Broadcast Writing

Music Technology

The Certificate in Music Technology requires 6 courses:

- 6 300-level courses in music technology (see School of Music Undergraduate Handbook for details)

Interschool Programs

For information about the interschool programs listed below, see the Other Undergraduate Programs section of this catalog.

Art and Technology Program

School of Music undergraduates may earn a minor in art and technology. This program also offers a certificate in sound design.

International Studies Program

International studies, an undergraduate interschool adjunct major taken in conjunction with a traditional major, is open to students in the School of Music.

Music Theatre Program

The Certificate in Music Theatre provides the opportunity for School of Music students majoring in voice and School of Communication students majoring in theater to create a second area of specialization.

Partnership through the Arts Program

Partnership through the Arts, a certificate program open to students in the School of Music and the School of Education and Social Policy, fosters understanding of arts partnerships with public schools.

Undergraduate Leadership Program

The Undergraduate Leadership Program, an interschool certificate program open to all undergraduates, helps students understand the nature of leadership and prepares them to become leaders.

Graduate Studies

The Graduate Division of the School of Music offers programs of study leading to the master of music degree, the graduate certificate in performance, and the doctor of music degree. Information concerning these programs is available from the Office of Admissions, School of Music. For information about the requirements for the doctor of philosophy degree in music, contact the Graduate School or see its bulletin.

Resources

Musical Organizations

As a part of their program of study, music majors are required to participate in those musical organizations for which they are qualified. Students from all other schools of the University are encouraged to participate in any organizations for which they qualify.

Symphony Orchestra

This large ensemble provides experience in the concert presentation of representative symphonic repertoire as well as operas and concertos.

Chamber Orchestra

The Chamber Orchestra performs works of all periods. Repertoire is limited to the music of chamber and small symphony orchestras.

Philharmonia

This orchestra is open upon audition to interested and qualified students from any school in the University and performs a wide-ranging repertoire.

Symphonic Wind Ensemble

Flexibility and musicianship mark the programs of the Symphonic Wind Ensemble. Its objectives are to perform literature of the highest aesthetic value with emphasis on major original works for band and to attain balanced performance through rigid requirements for individual musicianship and advanced playing technique.

Symphonic Band

Made up of 65 wind and percussion performers, the Symphonic Band seeks to perform the finest works available for large band or wind orchestra at the highest possible level.

Concert Band

The Concert Band provides an excellent performing experience for interested and qualified students from any school in the University. The Concert Band performs fine literature, including both original and transcribed works.

Wildcat Marching Band

The Wildcat Marching Band is an all-University organization that combines marching precision and exceptional playing ability in a finely polished and spirited unit. The band performs for all football games at home and one or more out-of-town games each season.

University Brass Ensemble

The University Brass Ensemble provides performance challenges and learning opportunities for serious brass players interested in literature for ensembles of various sizes and compositional styles.

Jazz Groups

The Jazz Ensemble, Jazz Band, and a variety of small combo groups enable students to gain experience in the jazz idiom and to improve improvisation skills. They also offer student composers and arrangers the chance to write for various jazz instrumental combinations.

Percussion and Mallet Ensembles

The Percussion and Mallet Ensembles offer students an opportunity to perform percussion chamber works representative of diverse musical styles from Renaissance transcriptions through avant-garde theater pieces. The ensembles maintain active performance schedules both on and off campus and are open to all percussion students.

Contemporary Music Ensemble

The Contemporary Music Ensemble provides experience for student performers and composers in the performance of contemporary unpublished works. The ensemble annually presents a concert featuring a complete program of student compositions.

University Chorale

The University Chorale is a 40-voice ensemble that is the most select of the University choruses. Its personnel are chosen on the basis of their musicianship and their interest in the performance of both a cappella and accompanied literature.

University Singers

The University Singers is a larger choral ensemble of 60 to 80 singers with high performance standards. This ensemble frequently combines with other choral organizations in the performance of important choral-orchestral works.

University Chorus

The University Chorus is made up of singers from the School of Music, other qualified students, University faculty and staff, and interested residents of the community. It is organized for the purpose of performing large-scale choral works.

Chapel Choir

School of Music students participate in the Chapel Choir at the weekly worship services held in the Alice Millar Chapel. This choir also presents at least three evening concerts during the year.

Early Music Ensemble

The Early Music Ensemble provides study and performance of music written before 1800. Workshops are conducted in early instruments, including recorders, crumhorns, sackbuts, viols, and continuo, and in vocal genres. Any student may request an interview/audition for this ensemble. At least one performance is given each quarter.

Chamber Music Ensembles

Chamber ensembles include piano trio; string trio, quartet, quintet, sextet, and octet; harp ensemble; brass quintet, choir, and band; woodwind quintet; trombone quartet and ensemble; and tuba, saxophone, mixed winds, trumpet, horn, and flute ensembles.

Facilities

The 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, Organ, and Church Music Program have offices in this building. Regenstein Hall houses rehearsal facilities, practice rooms, a 200-seat lecture/recital room, and the library and offices for the University bands. The Department of Music Performance Studies office and studios for faculty of the Conducting and Ensembles, String Instruments, and Wind and Percussion Instruments Programs also are located in Regenstein Hall. Practice Hall 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. The School of Music maintains two computer labs and an electronic music studio.

Music Library

The Music Library, internationally recognized for its collection of contemporary music, is one of the country's finest academic music libraries. It has spacious, aesthetically pleasing facilities, including a listening center and a reference room with wireless laptop connections. Holdings include more than 240,000 books, scores, journals, manuscripts, and sound recordings as well as access to numerous electronic resources. The Music Library's special collections include manuscripts documenting contemporary notation compiled by John Cage; the Cage Correspondence Files; holograph scores and sketches; rare printed resources; and a portion of the Moldenhauer Archive. A distinctive unit within the University Library, the Music Library has its own reference, technical, and circulation services provided by music subject specialists.

Eckstein Bequest

The School of Music is the beneficiary of an endowment from the estate of Mrs. Louis Eckstein, the Chicago arts patron whose husband founded the Ravinia Music Festival. The Eckstein bequest is used to support all facets of the School of Music, particularly its financial aid and scholarship programs. The Eckstein Endowment has provided the financial resources to support the school's pursuit of excellence.

In recognition of the Eckstein bequest, the school has established the Eckstein Scholars Program for outstanding entering freshmen.

Collection of Artist Instruments

The Northwestern University special collection of string instruments provides an exposure to a concept of sound available only through instruments with special resources of beauty and sonority. It has been formed over a period of years through the generosity of many friends. Seniors and graduate students may use these instruments when they appear as recitalists or soloists with University orchestras.

Pi Kappa Lambda

Pi Kappa Lambda, national music honor society, was founded at Northwestern University in 1918 for the recognition and encouragement of the highest level of musical achievement and academic scholarship among music majors. Alpha chapter elected as its first member Peter Christian Lutkin, the first dean of the School of Music, and his initials in their Greek equivalents were adopted for the name of the society. The national office has been housed in the Northwestern University School of Music since 1984. Two deans and one faculty member from Northwestern have served as national president, and the society has grown to more than 200 chapters in colleges, conservatories, and university schools of music.

To be considered for membership in Pi Kappa Lambda, seniors must be in the upper one-fifth of their class, and juniors in the upper one-tenth of their class. Candidates must also display a high level of musical excellence as well as scholarship. Nominations and elections are the responsibility of the Pi Kappa Lambda faculty committee.

Music Studies for Nonmajors

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. Information about auditions is available in the Department of Music Performance Studies office. For additional information about instruction, inquire in person at the School of Music's Office of Student Affairs.

University Ensembles

Students from all schools of the University are encouraged to audition for the following ensembles: Philharmonia, Concert Band, Wildcat Marching Band, University Chorus, and Early Music Ensemble. Nonmusic majors may occasionally be placed in other ensembles based on their audition.

Class Instruction

A limited number of students in any Northwestern school may take class instruction in beginning piano without credit.

Private Lessons for Credit

Nonmusic majors may take half-hour private music lessons for .5 course credit in GEN MUS 115 Applied Piano/Organ, 120 Applied Strings, and 125 Applied Winds/Percussion. A registration fee of \$200 (for 2003–04) is billed to the student's tuition and fees account. Nonmusic majors may take voice classes or private 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 of \$175 for voice classes, \$210 for beginning private voice lessons, or \$260 for intermediate or advanced private voice lessons (for 2003–04) is billed to the student's tuition and fees account. Students are accepted for private 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 Harmony, followed by Form and Analysis and/or Composition. The music literature sequence is designed to permit students with limited background to start with 170. Students may then enroll in certain 300-level musicology and music theory courses when space is available. For courses with Weinberg students may earn distribution requirement credits, the distribution area is indicated in parentheses.

GEN MUS 115-0 Applied Piano/Organ (.5) Eight half-hour private lessons for nonmajors; audition required.

GEN MUS 120-0 Applied Strings (.5) Eight half-hour private lessons for nonmajors; audition required.

GEN MUS 125-0 Applied Winds/Percussion (.5) Eight half-hour private lessons for nonmajors; audition required.

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 134-0 Nonmajor Class Voice, Intermediate/Advanced (.5) Audition required.

GEN MUS 160-0 Nonmajor Private Voice, Beginning (.5) Eight half-hour private lessons for nonmajors; audition required.

GEN MUS 170-0 Introduction to Music Principles of musical organization. Score study and recognition of what is heard in all music, including classic, jazz, rock, and popular. (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 Masterpieces 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 231-0 Nonmajor Vocal Performance Seminar, Intermediate/Advanced (.5) Must be concurrently registered for 134, 160, 260, or 360.

GEN MUS 241-0 Beginning Guitar Group lessons in guitar techniques for beginners.

GEN MUS 252-0 Harmony 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 the 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) Eight half-hour 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 330-0 Black Sacred Music: History Evolution of black sacred music from its roots; examination of earliest musical forms, styles, and techniques; influences of psalm singing, hymnody, work songs, Negro spirituals. Prerequisite: consent of instructor.

GEN MUS 340-1,2,3 Performance Ensemble: Styles and Techniques of Black Sacred Music Evolution and development of performance practices within the black sacred music tradition. Anthem Negro spirituals, hymns, improvisations, jubilees, praise songs, and traditional and contemporary gospel music performed publicly each quarter. Prerequisite: consent of instructor.

GEN MUS 360-0 Nonmajor Private Voice, Advanced (.5) Eight half-hour private lessons for nonmajors; audition required.

Interdepartmental Courses for Majors

The music theory, musicology, aural skills, keyboard skills, and ensembles sequences are required for all undergraduates in the School of Music. Ensembles listed under Conducting and Ensembles are available by audition to all students in the University.

Courses Open to Undergraduates

MUSIC 110-0 Introduction to Theory (.5)

MUSIC 111-1,2,3 Music Theory I (.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. Separate sections for pianists and nonpianists.

MUSIC 211-1,2,3 Music Theory II (.5) Continuation of 111. Prerequisite: 111-1,2,3 or consent of instructor.

MUSIC 212-1,2,3 Music History (.5) Principles, materials, and concepts of the historical study of Western art traditions.

MUSIC 213-0 Introduction to Music Cultures of the World (.5) Introduction both to the world's musical variety and to common issues related to music production worldwide.

MUSIC 226-1,2,3 Aural Skills IV, V, VI (.5) Continuation of 126.

MUSIC 227-0 Keyboard Skills (.5) Continuation of 127.

MUSIC 326-0 Advanced Aural Skills (.5) Error detection, rhythmic skills, aural analysis of harmony and form, refinement of other listening skills. Based on Western art music.

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 348-0 Recital Preparation (.5)

MUSIC 350-0 Alexander Technique (.5) Methods of using the body efficiently to reduce unnecessary tension and stress in instrumental and vocal performance. Sections: 20, piano; 21, strings; 22 and 23, wind and percussion; 24 and 25, voice.

MUSIC 398-0 Internship Field experience as an intern.

Music Studies

This department consists of the Music Composition, Music Education, Musicology, Music Technology, and Music Theory and Cognition Programs.

Bachelor of music specializations are available in music cognition, music composition, music education, musicology, music technology, and music theory. These specializations are described on the following pages. An additional specialization option, involving general academic studies, requires one course from each of the five programs and seven 300-level courses selected from any of the Department of Music Studies offerings. Most 300-level courses in this department require junior standing.

Music Composition

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 20th-century compositional materials. Students intending to major in composition may substitute composition for applied studies during their freshman and sophomore years.

Major Studies Requirement

For a major in composition, 19 course units are required:

- 112, 212 Composition (6 units) (some credit may be given for applied instrument or voice lessons)
- 312 Composition (6 units)
- 314-1 Instrumentation (1 unit)
- 314-2 Orchestration (1 unit)
- 316 Baroque Counterpoint (1 unit)
- 317 Renaissance Counterpoint (1 unit)
- 322-1,2 Materials of Modern Music (1 unit)
- Music theory courses in analysis (2 units) (1 unit must be in 20th-century analysis)
- 390 Composition Colloquium (0 units)
- Recital (0 units)

Courses Open to Undergraduates

MUS COMP 112-0,212-0,312-0 Composition Original composition; individual instruction.

MUS COMP 278-0 Contemporary Music Ensemble

Performance of contemporary works: avant-garde music, new notation systems, electronic music.

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. Prerequisite: preceding quarters of 311 or consent of instructor.

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 316-0 Baroque Counterpoint Baroque dance suite, chorale prelude, invention, fugue, chiefly involving the music of J. S. Bach. Melodic, harmonic, structural characteristics; contrapuntal techniques.

MUS COMP 317-0 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 COMP 322-1,2,3 Materials of Modern Music Writing projects; analysis of scores. 20th-century stylistic techniques, performers, and composers. Contemporary materials; in-class performances of original work. Prerequisite: preceding quarter of 322 or consent of instructor.

MUS COMP 335-0 Selected Topics in Music Composition Topics vary; announced before registration. May be repeated for credit.

MUS COMP 390-0 Composition Colloquium (0) Discussion of contemporary compositional techniques.

MUS COMP 399-0 Independent Study (.5-1)

Music Education

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. All music education majors are required to complete 100 hours of clinical observation.

Professional Studies in Music Education (24.5-27 units)

- Private lessons (7.5-9 units)
- Additional keyboard skills (as needed by track) (1.5-3 units)
- Additional large ensemble (eight quarters) (4 units)
- 258 Philosophy of Music Education
- 260 The Music Teacher as Communicator
- MUS TECH 262 Technology in the Music Classroom
- MUS TECH 320 Physics of Sound
- CONDUCT 326 Basic Conducting
- 368 Teaching Composition in the Schools
- 369 Research and Evaluation in Music Education
- 380-387 Student Teaching (3 units)
- Additional course in non-Western music

Instrumental Track (8 units)

- 7 of the following 8 instrumental classes:
 - 230 Flute Class (.5 unit)
 - 233 Clarinet and Saxophone Class (.5 unit)
 - 234 Double Reed Class (.5 unit)
 - 235 High Brass Class (.5 unit)
 - 236 Low Brass Class (.5 unit)
 - 237 String Class I (.5 unit)
 - 238 String Class II (.5 unit)
 - 239 Percussion Class (.5 unit)
- 232 Voice Class (.5 unit)
- CONDUCT 340-1 Advanced Conducting
- 361 Teaching General Music I or 362 Teaching General Music II
- 364 Teaching Instrumental Music I
- 365 Teaching Instrumental Music II

Choral Track (5.5 units)

- 231-1 Guitar Class I (.5 unit)
- 232 Voice Class (.5 unit)
- CONDUCT 340-2 Advanced Conducting
- 362 Teaching General Music II
- 366 Teaching Choral Music I
- 367 Teaching Choral Music II
- Instrumental class elective (.5 unit)

General Track (5 units)

- 231-1,2 Guitar Class I, II
- 232 Voice Class (.5 unit)
- 240 Recorder Class (.5 unit)
- 361 Teaching General Music I
- 362 Teaching General Music II
- 366 Teaching Choral Music I
- Instrumental class elective (.5 unit)

General Education (11 units)

- ENGLISH 105 Expository Writing or 205 Intermediate Composition
- SESP 201 Human Development: Childhood and Adolescence, SESP 403 Early Childhood Development, or SESP 404 Adolescent Development
- TEACHED 327 Educating Exceptional Children or SPCHLNG 336 The Field of Special Education
- Weinberg distribution area I (natural sciences) (2 units)
- Weinberg distribution area III (social and behavioral sciences) (2 units)
- Weinberg distribution area IV (historical studies) (2 units)
- Weinberg distribution area V (values) (2 units)

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 Reed Class (.5)

MUSIC ED 235-0 High Brass Class (.5)

MUSIC ED 236-0 Low Brass Class (.5)

MUSIC ED 237-0 String Class I (.5)

MUSIC ED 238-0 String Class II (.5)

MUSIC ED 239-0 Percussion Class (.5)

MUSIC ED 240-0 Recorder Class (.5)

MUSIC ED 241-0 Guitar Techniques (.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 335-0 Selected Topics in Music Education
Topics vary; announced before registration. May be repeated.

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.

MUSIC ED 362-0 Teaching General Music II For grades 6–8, effective teaching of general music classes in the middle school. Available curriculum materials; innovative approaches.

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 school instrumental music programs. Rehearsal dynamics, conducting, rehearsal room management, and pedagogy for secondary school instrumentalists.

MUSIC ED 365-0 Teaching Instrumental Music II Application of teaching concepts consistent with aesthetic education to the instrumental music program. Jazz pedagogy and pedagogy for young instrumentalists. Prerequisite: 364.

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. Hardware and software in classroom settings.

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 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 380-0 Student Teaching in the Elementary School:General Music (1–4)

MUSIC ED 381-0 Student Teaching in the Middle School/Junior High School:General Music,Choral (1–4)

MUSIC ED 383-0 Student Teaching in the Senior High School:Choral and Nonperformance Courses (1–4)

MUSIC ED 385-0 Student Teaching in the Elementary School:Instrumental (1–4)

MUSIC ED 386-0 Student Teaching in the Middle School/Junior High School:Instrumental (1–4)

MUSIC ED 387-0 Student Teaching in the Senior High School:Instrumental and Nonperformance Courses (1–4)

Musicology

An undergraduate major in musicology is available within the bachelor of music degree or as a concentration within the bachelor of arts. 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 academic year.

Major Studies Requirement

For a major in musicology, 19 course units are required:

- 350–355 History of Music (6 units)
- Music theory (3 units) selected from MUS THRY 321-1,2, 331, 352
- Additional keyboard skills (1.5 units)
- MUSIC 326 Advanced Aural Skills (.5 unit)
- German (3 units)

- Instrumental or vocal applied lessons (3 units)
- Senior project or thesis (1 unit) by fall quarter of senior year
- Elective (1 unit)

Courses Open to Undergraduates

MUSICOL 323-0 Proseminar 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 diverse peoples of the Americas.

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, post-colonial 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 334-0 Jazz:Its Roots and Elements The basic elements of jazz from its roots in African and early African American music to the present. Prerequisite: consent of instructor.

MUSICOL 335-0 Selected Topics in Musicology Topics vary; announced before registration. May be repeated.

MUSICOL 336-0 Learning and Creativity among

Improviser/Composer Interdisciplinary and cross-cultural perspective of the American jazz community. Analysis of improvisation as a compositional process. Prerequisites: INTGART 190 and 291-3 or consent of instructor.

MUSICOL 337-0 Improvisation and World Musicianship

Improvisation in Western art music, jazz, Indian, and African music; performance workshops in African drumming, Indian solfeggio, and rhythmic mnemonics.

MUSICOL 338-0 African Mbira Music The mbira, one of the most popular and ancient melodic instruments in black Africa. Construction; development of basic playing skills. Prerequisite: consent of instructor.

MUSICOL 340-0 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 350-0 History of Music to 1499 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 History of Music:The 16th Century Middle and late Renaissance and early manifestations of the baroque, from Josquin through the Gabriellis.

MUSICOL 352-0 History of Music:The 17th Century The baroque from Monteverdi through Bach and Handel.

MUSICOL 353-0 History of Music:The 18th Century Representative works and critical studies of European art music from the Arcadian reform of opera through the Napoleonic era.

MUSICOL 354-0 History of Music:The 19th Century Representative works and critical studies of European art music from the Congress of Vienna to the death of Mahler.

MUSICOL 355-0 History of Music:The 20th Century Representative works and critical studies of art music from Debussy to the present.

MUSICOL 391-0 Early Music Ensemble Performance of choral, solo, and instrumental music of the Middle Ages through the early baroque.

MUSICOL 399-0 Independent Study (.5-1)

Music Technology

The major in music technology offers a unique professional preparation for a career in the technological sectors of the musical world — from games and Web-based multimedia to programming and composing for electronic media. Music technology students are engaged in creating music content for media as well as building technological tools for musical tasks.

Major Studies Requirement

For a major in music technology, 19.5 course units are required:

- 259 Introduction to Music Technology (1 unit)
- 325 Electronic Music I: Classic Analog Studio Techniques (1 unit)
- 338-1 Programming (1 unit)
- 340 Composing with Computers (1 unit)
- 300-level courses in music technology (4 units)
- 385 Senior Project (1 unit)
- Courses related to senior project (3 units)
- Departmental distribution (3 units)
 - 1 300-level course from three of the following programs: music education, musicology, music theory and cognition, music composition
- Instrumental, vocal, and/or composition lessons and/or additional ensemble (4.5 units)

Courses Open to Undergraduates

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 320-0 Physics of Sound Principles of physical acoustics. Acoustics of musical instruments, the human voice, and concert halls. Fundamentals of psychoacoustics.

MUS TECH 321-0 Producing in the Virtual Studio

Strategies for writing, recording, and producing music in the context of an integrated MIDI/digital audio production environment. Topics include MIDI data entry, recording live sound sources, editing, plug-ins, mixing, mastering, generating MP3s, mixing for picture. Assignments include creative projects and listening to and discussing relevant “popular” and “art” music. Prerequisites: 259, 262, or equivalent experience and permission of instructor.

MUS TECH 325-0 Electronic Music I: Classic Analog Studio Techniques Theory and practical application of analog synthesis and tape manipulation. Basic MIDI

concepts, historical perspective, and analog recording techniques. Projects demonstrate understanding and creative use of equipment. Prerequisite: interest in music composition and permission of instructor.

MUS TECH 326-0 Electronic Music II: Techniques and Composition I Theory and practical application of MIDI systems used to control synthesizers and samplers through various software programs. Class and individual instruction in composition and analysis. Prerequisite: 325 or permission of instructor.

MUS TECH 327-0 Electronic Music III: Techniques and Composition II Theory and practical application of equipment used to control analog and digital devices. Digital and analog recording techniques. Class and individual sessions involve discussions of students’ creative work. Prerequisite: 326 or permission 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 site maintenance with a focus on the design of multimedia intended for distribution via the Internet. Content will be generated using a mixture of graphical user interfaces and object-oriented scripting languages. Prerequisite: 259, 262, or equivalent experience.

MUS TECH 338-1,2 Programming 1. Syntax of programming language, program development, user interfaces, and music-specific algorithms. **2.** Techniques for creating musical applications; music-specific algorithms and programming techniques, music and sound representation. 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, real-time interaction, sound processing, analysis of electroacoustic music. Assignments include student compositions. Prerequisite: 259, 262, or equivalent experience.

MUS TECH 342-0 Computer Sound Synthesis Simulation of musical instruments, the voice, room acoustics; digital filtering, effects processing; digital recording, mixing, editing. Prerequisite: 259, 262, or equivalent experience.

MUS TECH 343-0 Sound Design for New Media Creative projects for the Web and DVD. Authoring of sonically rich Web sites using Flash. Creation of DVDs integrating 5.1 surround sound and image. Discussion of exemplar sites, nonlinear sound design concepts, surround mixing techniques. Prerequisites: ability to use an audio program for soundfile creation/mixing, permission of instructor.

MUS TECH 344-0 Advanced Projects in Music Technology Individual instruction in projects related to music technology. Prerequisite: permission of instructor.

MUS TECH 345-0 Technology-Based Performance Creation, rehearsal, and performance of technology-based music in

an ensemble setting. Focus on real-time interaction, technological performance interfaces, application of chance and algorithmic methods. Prerequisite: permission 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, computer-human interfaces, and virtual reality applications. Prerequisite: fundamental knowledge of acoustics.

MUS TECH 385-0 Senior Project Independent project in music technology. Prerequisite: permission of department.

MUS TECH 399-0 Independent Study (.5–1)

Music Theory and Cognition

Undergraduates majoring in theory receive training in a variety of advanced analytical methods, including rhythmic analysis, tonal and atonal analysis, and Schenkerian analysis. Courses in perception and music technology are encouraged.

Undergraduates majoring in music cognition receive a broad education in music and the cognitive sciences. The emphasis is on “cognitive musicology,” whereby music is studied as an important aspect of human ability and society, using the tools and insights of cognitive science and musical research.

Major Studies Requirement (Music Theory)

For a major in music theory, 20.5 course units are required:

- MUSIC 227-1,2,3 Advanced Keyboard Skills (1.5 units)
- 300- and 400-level courses in music theory and cognition (6 units)
- Instrumental, vocal, and/or composition lessons (6 units)
- Music technology (1 unit)
- Senior project (1 unit)
- Departmental distribution (2 units)
 - 1 300-level course from two of the following programs: music education, musicology, music technology, music composition
- Cognate areas (3 units)
- 390 Theory Colloquium (0 units)

Major Studies Requirement (Music Cognition)

For a major in music cognition, 19.5 course units are required:

- 351-1,2 Music Cognition (2 units)
- Analysis and technology (3 units)
- PSYCH 201 Statistical Methods (1 unit)
- PSYCH 205 Research Methods (1 unit)
- Cognate areas (3 units)
 - Courses in psychology, linguistics, and communication sciences and disorders
- Instrumental, vocal, and/or composition lessons (3 units)
- Electives (6.5 units)
- Senior project (0 units)

Courses Open to Undergraduates

MUS THRY 321-1,2 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 322-0 Rhythm and Performance Rhythmic analysis, focusing on those components of rhythm most likely to affect a performer's shaping of a musical work: durational rhythm, accent, grouping, meter, phrase rhythm, and rhythmic shape. Prerequisite: MUSIC 211-2 or permission of instructor.

MUS THRY 323-0 Aesthetics of Music An introduction to theories of musical aesthetics. Readings are drawn from primary sources and include the writings of philosophers, theorists, critics, and composers. Course is divided into three segments: history of musical aesthetics from the ancient Greeks to the 19th century, formal versus expressive values, and aesthetic issues of the 20th century. Prerequisite: MUSIC 211-2 or equivalent.

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 332-0 Rhythmic Analysis Recent theoretical work on rhythm; analytical methodologies dealing with music primarily as a temporal process.

MUS THRY 333-0 Pattern and Meaning in Music Practical and innovative analytic techniques intended to focus on the expressive dimensions of musical meaning. These techniques are based on theories in the cognitive sciences that explain how musical meaning arises through the mapping of musical patterns onto patterns stored in memory. Prerequisite: MUSIC 211-2 or permission of instructor.

MUS THRY 335-0 Selected Topics in Music Theory Topics vary; announced before registration. May be repeated.

MUS THRY 351-1,2 Music Cognition Survey of issues and research methods in music cognition. Music listening, memory for music, development of skills.

MUS THRY 352-0 Score Analysis Skills Recognition of the character and succession of tonalities. Exploration of the expressive potentials residing in the conventional tonal system.

MUS THRY 355-1,2 Atonal Analysis Techniques for analysis of atonal and nonfunctional tonal music, including set-theoretic, serial, 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 Theory Colloquium (0) Discussion of current research in music theory.

MUS THRY 399-0 Independent Study (.5–1)

Music Performance Studies

This department consists of the Conducting and Ensembles; Jazz Studies and Pedagogy; Piano, Organ, and Church Music; String Instruments; Voice and Opera; and Wind and Percussion Instruments Programs.

Conducting and Ensembles

Courses in the Conducting and Ensembles Program are available to all majors. While an ad hoc major in conducting (for which courses are selected in consultation with the department chair) is available to undergraduates, students are urged to consider majoring in conducting at the graduate level.

Courses Open to Undergraduates

CONDUCT 320-0 Band Arranging Transcriptions, arrangements, and composition for concert and symphonic bands. Editing, rescoring, and arranging for performance.

CONDUCT 321-0 Writing for Choral Ensembles

Composing and arranging for choral ensembles; selected choral repertoire; techniques and resources.

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 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 Advanced Choral Literature A comprehensive examination of choral music literature from the Renaissance through the 20th century.

CONDUCT 364-0 Choral Organizations University Chorale, University Singers, University Chorus, and Women's Chorus. Open to all qualified students.

CONDUCT 368-0 Chapel Choir Open to all qualified students.

CONDUCT 374-0 Band Organizations Marching Band, Concert Band, Symphonic Band, Symphonic Wind Ensemble. Open to all qualified students.

CONDUCT 377-0 Jazz Ensembles Membership by audition in jazz ensembles.

CONDUCT 378-0 Contemporary Music Ensemble (0–5) Membership by audition.

CONDUCT 380-0 Senior Recital (0)

CONDUCT 393-0 Orchestral Organizations Membership by audition in Symphony Orchestra, Chamber Orchestra, or Philharmonia.

CONDUCT 399-0 Independent Study (1)

Jazz Studies and Pedagogy

The major in jazz studies combines courses in jazz improvisation, composition/arranging, history, and ensembles with a menu of electives. In addition to jazz lessons, students take two years of applied lessons, with further applied study available on an elective basis (as are Wind Ensemble and other nonjazz ensembles). Candidates must demonstrate by audition that they can meet the expectations of the applied studio as well as the jazz curriculum.

Major Studies Requirement

For a major in jazz studies, 19.5 to 20.5 course units are required:

- 100-level performance study (1.5 units)
- 110 Jazz Perspectives (1 unit)
- 162 Applied Jazz Improvisation (1.5 units)
- 200-level performance study (1.5 units)
- 262 Applied Jazz Improvisation (1.5 units)
- 300-level applied jazz studies (6 units)
 - 330 Writing for Jazz Ensembles (1 unit)
 - 331 Advanced Jazz Writing (1–2 units)
 - MUSICOL 334 Jazz: Its Roots and Elements (1 unit)
 - 362 Applied Jazz Improvisation (3–4 units)
- 361-1,2 Jazz Piano for the Non-Keyboard Player (0–1 unit)
- 380 Senior Recital (0 units)
- Jazz Ensembles (6 units)
 - CONDUCT 377 Jazz Ensembles (3–3.5 units)
 - WIND PER 391 Chamber Music (3–3.5 units)

Courses Open to Undergraduates

JAZZ ST 110-0 Jazz Perspectives Overview of jazz training (history, improvisation, theory) and career development (music industry). Introduction to jazz texts and recorded resources. Prerequisite: consent of instructor.

JAZZ ST 162-0 Applied Jazz Improvisation (.5) Individual study focused on the practical application of melodic, rhythmic, harmonic, formal, and textural elements applied to the aural tradition of jazz improvisation. May be repeated for credit. Prerequisite: consent of instructor.

JAZZ ST 262-0 Applied Jazz Improvisation (.5) Continuation of 162 for sophomores. May be repeated for credit. Prerequisite: consent of instructor.

JAZZ ST 301-0 Applied Jazz Classical Lessons (.5) Applied classical lessons for jazz majors.

JAZZ ST 330-0 Writing for Jazz Ensembles Composing and arranging for jazz ensemble. Score study and rehearsal techniques with jazz groups and stage bands.

JAZZ ST 331-0 Advanced Jazz Writing Continuation of 330. Emphasis on creative scoring, composition, and commercial writing.

JAZZ ST 332-0 Jazz Improvisation for Music Educators Individual instruction and hands-on performing. Whether learning from scratch or improving rusty skills, everyone

can improvise. Accompaniment will include a jazz trio. Vocalists and instrumentalists are equally welcome and may observe the jazz instruction in the concurrent National High School Music Institute.

JAZZ ST 333-0 Jazz Theory Chord symbols, melodic and harmonic structures, and other theoretical analyses as applied to jazz improvisation, composition, and arranging. Designed for music educators. Prerequisite: classical theory background.

JAZZ ST 335-0 Selected Topics in Jazz Studies Topics vary. May be repeated for credit as topics change.

JAZZ ST 336-0 Basic Jazz Improvisation Basic elements of jazz improvisation, including harmony, modes, and basic progressions. For nonjazz majors. Prerequisite: consent of instructor.

JAZZ ST 337-0 Advanced Jazz Improvisation Continuation of development of jazz improvisation skills. Prerequisite: 336 or consent of instructor.

JAZZ ST 361-1,2 Jazz Piano for the Non-Keyboard Player (0-1) Jazz voicing, harmonization, analysis, and technique through keyboard instruction. Prerequisites: basic keyboard proficiency, jazz performance and harmonic background.

JAZZ ST 362-0 Applied Jazz Improvisation Advanced elements of jazz improvisation, including harmony, modes, and progressions. Prerequisite: consent of instructor.

JAZZ ST 380-0 Senior Recital (0)

Piano, Organ, and Church Music

The Piano, Organ, and Church Music Program offers majors in piano performance and organ performance and a concentration in church music.

A major in piano performance combines a strong musical basis for a professional career with the broad humanistic interests embodied in a liberal arts education. The course of instruction focuses on the studio and includes private lessons, studio classes, a thorough course in piano repertoire, piano pedagogy, and accompanying classes. Electives are available in chamber music and other areas, allowing students to tailor a program to their individual needs. 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 programs.

A major in organ performance and church music studies provides students with a solid foundation for a professional career in performance and in liturgical settings. In addition to a core liberal arts curriculum, the course of instruction includes private lessons, studio class, organ literature, service playing, and organ pedagogy. The Chicago area offers numerous opportunities for service playing experience. A junior recital is optional; a senior recital is required.

For a concentration in church music, consult the coordinator of organ and church music.

Major Studies Requirement in Piano Performance

For a major in piano performance, 20 course units are required:

- PIANO 161 Piano Performance (3 units)
- PIANO 261 Piano Performance (3 units)
- PIANO 361 Piano Performance (6 units)
- PIANO 313-1,2,3 Piano Repertoire (3 units)
- PIANO 315-1,2,3 Piano Pedagogy (3 units)
- PIANO 391 Chamber Music or 392 Chamber Music: Trios (.5 unit)
- PIANO 328 Beginning Collaborative Piano (1.5 units)
- Junior Recital (0 units)
- PIANO 380 Senior Recital (0 units)

Students enrolled in a five-year double-degree program may substitute three 300-level musicology and/or music theory electives for the pedagogy requirement.

Major Studies Requirement in Organ Performance

For a major in organ performance, 20 course units are required:

- ORGAN 163 Organ Performance (3 units)
- ORGAN 263 Organ Performance (3 units)
- ORGAN 363 Organ Performance (6 units)
- Appropriate course work (8 units)
- ORGAN 380 Senior Recital (0 units)

Piano Courses Open to Undergraduates

PIANO 161-0,261-0,361-0 Piano Performance

PIANO 230-0 Class Organ (0) Primarily for sophomore pianists.

PIANO 313-1,2,3 Piano Repertoire 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 328-0 Beginning Collaborative Piano (.5)

Piano students work with a singer and instrumentalist in the preparation and performance of mainstream recital repertoire.

PIANO 335-0 Selected Topics in Piano Topics vary; announced before registration. May be repeated.

PIANO 380-0 Senior Recital (0)

PIANO 391-0 Chamber Music (.5) For juniors and seniors.

PIANO 392-0 Chamber Music: Trios

PIANO 399-0 Independent Study (.5-1)

Organ Courses Open to Undergraduates

ORGAN 163-0,263-0,363-0 Organ Performance

ORGAN 310-1,2,3 Keyboard Harmony/Improvisation

ORGAN 311-0 Professional Concerns (.5)

ORGAN 312-0 Voice

ORGAN 313-0 Harpsichord Class Harpsichord lessons for piano or organ majors. Other students accepted with permission of instructor.

ORGAN 315-0 Organ Maintenance

ORGAN 316-0 Organ Pedagogy (.5) Comparative methods, practice techniques; repertoire for various levels.

ORGAN 335-0 Selected Topics in Organ and Church Music Topics vary; announced before registration. May be repeated.

ORGAN 371-0 German Organ Literature The German organ school pre-J. S. Bach to present.

ORGAN 372-0 French Organ Literature The French organ school from 1600 to present.

ORGAN 380-0 Senior Recital (0)

String Instruments

Majors in string instruments prepare for professional performance and teaching as well as for advanced study. The curriculum is built around individual performance study and ensemble participation, including chamber music and orchestra, with orchestral 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, string bass, harp, or classical guitar.

Major Studies Requirement

For a major in string performance, 19.5 to 21 course units are required:

Violin, viola, cello, string bass performance

- 100-level performance study (3 units)
- 200-level performance study (3 units)
- 300-level performance study (6 units)
- 300-level string pedagogy (1.5 units)
- 319-1,2,3 Orchestral Studies (1.5 units)
- 380 Senior Recital (0 units)
- 391 Chamber Music (1.5 units)
- CONDUCT 393 Orchestral Organizations (additional 4.5 units)

Harp Performance

- 100-level performance study (3 units)
- 200-level performance study (3 units)
- 300-level performance study (6 units)
- Large ensemble (additional 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

- 100-level performance study (3 units)
- 200-level performance study (3 units)
- 300-level performance study (6 units)
- 374 Guitar Ensemble (additional 4.5 units)
- 375-1,2,3 Lute and Guitar Literature (1.5 units)
- 376-1,2,3 Guitar Pedagogy (1.5 units)
- 380 Senior Recital (0 units)

Courses Open to Undergraduates

STRINGS 141-0,241-0,341-0 Violin Performance

STRINGS 142-0,242-0,342-0 Viola Performance

STRINGS 143-0,243-0,343-0 Cello Performance

STRINGS 144-0,244-0,344-0 String Bass Performance

STRINGS 151-0,251-0,351-0 Harp Performance

STRINGS 171-0,271-0, 371-0 Classical Guitar Performance

STRINGS 311-0 Suzuki Pedagogy (.5) Fundamental principles of Suzuki philosophy and materials. Available to violin, viola, cello, and double bass players with emphasis on application to violin and cello.

STRINGS 312-0 String Class Pedagogy (.5) Group teaching strategies, program administration, materials and techniques, and pedagogy for violin, viola, cello, and double bass. For performance and pedagogy majors; secondary instruments and pedagogical applications to school settings and/or college-level techniques classes.

STRINGS 313-0 History of String Pedagogy (.5) Historical survey of the major violin, viola, cello, and double bass pedagogues from the early baroque through the 20th century; study of publications and contributions of contemporary schools. Lecture and seminar format.

STRINGS 314-0 Comprehensive String Pedagogy (.5) Comparative study and application of the principles of successful string teaching. Communication skills, observations, comparison of contemporary approaches of Suzuki, Rolland, Havas, et al. Lecture, discussion, and demonstration format. Open to all string players.

STRINGS 315-1,2,3 Beginning Violin and Viola Pedagogy (.5) Developmental approach to individual and group teaching of elementary-level violin and viola students. Includes Rolland and Suzuki approaches, apprenticeship teaching, and observations. Open to all string players.

STRINGS 316-1,2,3 Beginning Cello and Double Bass Pedagogy (.5) Developmental approach to individual and group teaching of elementary-level cello and double bass students. Open to all string players.

STRINGS 317-0 Principles of Advanced/College-Level Studio Teaching (.5) In-depth analysis of individual instrument pedagogy for violin, viola, cello, or double bass according to major instrument. 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, String Bass, Harp) (.5)

STRINGS 327-0 Interpretation of Instrumental Chamber Music Analysis of performance practices and interpretation

of selected chamber works; emphasis on string performance, but may include winds and keyboard.

STRINGS 335-0 Selected Topics in Strings Topics vary; announced before registration. May be repeated.

STRINGS 372-0 Guitar Literature and Ensemble

Concurrent registration in 374 and 375-1,2,3 required for three consecutive quarters. Alternates yearly with 373.

STRINGS 373-0 Guitar Pedagogy and Ensemble

Concurrent registration in 374 and 376-1,2,3 required for three consecutive quarters. Alternates yearly with 372.

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 391-0 Chamber Music (.5) Performance of string quartet literature with the addition of some works for piano and strings. For freshmen and sophomores.

STRINGS 399-0 Independent Study (.5–1)

Voice and Opera

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 musicology, vocal science, conducting, opera workshop, repertoire, and foreign language. A senior recital is required, and students are urged to take advantage of the numerous other performance opportunities offered by the school.

The Northwestern Opera Center is supported by a generous endowment in memory of the famous American soprano Edith Mason Ragland. The internationally acclaimed Edith Mason and William E. Ragland Opera Theater presents scene recitals and full-scale productions.

Major Studies Requirement

For a major in voice performance, 21 course units are required:

- 110 Voice Performance (3 units)
- 210 Voice Performance (3 units)
- 310 Voice Performance (6 units)
- Major choral ensemble (additional 4.5 units)

- 323 Study of the Vocal Mechanism (.5 unit)
- CONDUCT 326 Basic Conducting (1 unit)
- 351-1,2,3 Opera Workshop for Juniors (1.5 units)
- 352-1,2,3 Opera Workshop for Seniors (1.5 units)
- 111-1,2,3 Phonetics and Diction (0 units)
- 211 Sophomore Practicum (0 units)
- 212 Opera Crew (0 units)
- 311 Vocal Solo Class (12 quarters, 0 units)
- 380 Senior Recital (0 units)

It is recommended that voice performance majors take three units of one foreign language and achieve a level-five competency in Keyboard Skills. See the voice coordinator concerning the honors program in voice performance.

Courses Open to Undergraduates

VOICE 102-0 Beginning Voice Class instruction for Music Theatre Certificate students. Basic music skills required. Prerequisite: admission to the Music Theatre Program.

VOICE 110-0,210-0,310-0 Voice Performance Lessons consist of private 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 202-0 Intermediate Voice Private instruction for Music Theatre Certificate students. Prerequisites: admission to the Music Theatre Program and 102 or equivalent.

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 311-0 Vocal Solo Class (0) Weekly recital hour. Required for any student registered for full-credit private voice lessons.

VOICE 323-0 Study of the Vocal Mechanism (.5) Lectures, readings, discussions, and demonstrations of basic vocal physiology, common vocal problems, and use of exercises and songs for vocal improvement. Prerequisite: major in voice with junior or senior standing, or consent of instructor.

VOICE 335-0 Selected Topics in Voice (.5–1) Topics vary; announced before registration. May be repeated.

VOICE 351-1,2,3 Opera Workshop for Juniors (.5) Advanced techniques for the performance of arias and songs; methods of text and character analysis; audition techniques; study of opera and musical theater repertoire. Must be taken sequentially.

VOICE 352-1,2,3 Opera Workshop for Seniors (.5) Performance and audition techniques of operatic repertoire; character analysis and scene study. Repertoire ranges from baroque opera through contemporary opera and musical theater. Prerequisite: 351-1,2,3. Must be taken sequentially.

VOICE 357-0 The German Lied (.5) Schubert and Schumann song cycles and Brahms, Berg, Mahler, Strauss, and Wagner songs. Incorporation of chamber music and study of original poetry.

VOICE 380-0 Senior Recital (0)

VOICE 399-0 Independent Study (.5–1) Permission of instructor and department required.

Wind and Percussion Instruments

Designed to prepare students for professional performance and teaching as well as for advanced study, the major in wind and percussion instruments offers a concentrated curriculum emphasizing performance studies, frequent master classes, required participation in large and small ensembles, and a required senior recital. Students anticipating graduate study in wind or percussion performance are advised to elect additional courses in 300-level theory and history.

Major Studies Requirement

For a major in wind and percussion performance, 19.5 course units are required:

- 111–31 Performance study (3 units)
- 211–31 Performance study (3 units)
- 311–31 Performance study (6 units)
- Large ensemble (additional 4.5 units)
- 391 Chamber Music (3 units)
- 380 Senior Recital (0)

Courses Open to Undergraduates

WIND PER 111-0,211-0,311-0 Flute Performance

WIND PER 112-0,212-0,312-0 Oboe Performance

WIND PER 113-0,213-0,313-0 Clarinet Performance

WIND PER 114-0,214-0,314-0 Saxophone Performance

WIND PER 115-0,215-0,315-0 Bassoon Performance

WIND PER 121-0,221-0,321-0 Trumpet Performance

WIND PER 122-0,222-0,322-0 French Horn Performance

WIND PER 123-0,223-0,323-0 Euphonium Performance

WIND PER 124-0,224-0,324-0 Trombone Performance

WIND PER 125-0,225-0,325-0 Tuba Performance

WIND PER 131-0,231-0,331-0 Percussion Performance

WIND PER 335-0 Selected Topics in Winds and Percussion Topics vary; announced before registration. May be repeated.

WIND PER 336-0 Woodwind Orchestral Repertoire Wind section performance practices and performance techniques in the standard orchestra literature.

WIND PER 337-0 Interpretation of Instrumental Chamber Music Coaching in the preparation and rehearsal of chamber music for strings, winds, keyboard, and voice.

WIND PER 338-0 Brass Orchestral Repertoire Study of brass section performance practice and performance techniques in the 19th- and 20th-century orchestral repertoire.

Limited to junior, senior, and graduate students. May be repeated once.

WIND PER 339-0 Performance Practices and Criticism Performance and criticism of woodwind, brass, and percussion repertoire in a master class setting. Team-taught.

WIND PER 341-0 Woodwind Instrument Repertoire Survey of woodwind literature and performance practices; solos and chamber music for various performance levels.

WIND PER 342-0 Brass Instrument Repertoire Brass literature and performance practices; solos, pedagogical materials, and chamber music for various levels of performance.

WIND PER 347-0 Percussion Pedagogy and Performance Methods, materials, and writings related to percussion playing and teaching. Prerequisite: 300-level standing in percussion performance or consent of instructor.

WIND PER 352-0 Preparing for an Audition

WIND PER 353-0 Introduction to the Harp

WIND PER 354-0 Woodwind Instrument Repair

WIND PER 355-0 Freelance Musician

WIND PER 356-0 Making Musicianship Audible

WIND PER 357-0 Reedmaking for Single Reed Instruments

WIND PER 359-0 Brass Teaching Techniques

WIND PER 380-0 Senior Recital (0)

WIND PER 391-0 Chamber Music Percussion and mallet ensembles, brass ensembles, woodwind quintets, saxophone quartets, clarinet quartets, and jazz combos.

WIND PER 399-0 Independent Study (.5–1)

Other Undergraduate Programs

Art and Technology Program

Undergraduates who wish to focus their interest in art and technology may earn a minor/certificate in art and technology while simultaneously pursuing a departmental major in the School of Music, Department of Art Theory and Practice, Department of Computer Science, or Department of Radio/Television/Film. Exceptions may be made for students from other departments with adequate art and/or technology backgrounds.

Minor/Certificate in Art and Technology

Students qualify for the minor/certificate in art and technology by satisfactorily completing seven course units: the three core courses plus a minimum of four electives. These four electives, chosen in consultation with an adviser in the Center for Art and Technology, may be drawn from the list below or may be other courses that have substantial content in art and technology. At least two of the electives must be at the 300 level or above. For additional information visit www.cat.northwestern.edu.

Core courses: CAT 380, 390-1,2,3, 393

Elective courses: ART 124,140,150,224,240,250,252, 340,350,360; COMP SCI 110,395; MUS TECH 259,321, 325,326, 327,335, 337,338-1,2, 340,342,343,344,345, 348; R/TV/F 180,280,379,393; THEATRE 363, 373

Courses

CAT 380-0 Topics in Film/Video/Audio Production:Art and Technology Project A faculty-led creative and research project with students as collaborators. The class will produce and exhibit a work of art centrally involving technology in its creation and display and will make the work accessible to the public.

CAT 390-1,2,3 Art and Technology Colloquium A seminar providing a forum for students, faculty, and visiting artists to present technical or aesthetic research topics of relevance to contemporary technological art practice. Topics will vary each quarter the course is offered and may range from critical theory to technical presentations to reviews of participants' current work. Must be repeated three times to earn one credit. Prerequisite: junior standing or permission of instructor.

CAT 393-0 History of Art and Technology The influence of new technologies on 20th- and 21st-century art. Issues explored include artists' use of video, film, and animation;

virtual reality and telepresence; the history of recording and its influence on popular music; artists' use of hypertext; body art involving technology; and the experience of interactive artworks.

International Studies Program

International studies is an undergraduate major open to students in all schools. It does not replace any major but complements it as an adjunct major that may be taken only in conjunction with a departmental major.

Through an integrated combination of area studies, comparative studies, and international relations, the international studies major describes our interconnected world system and addresses such issues as how the contemporary world is politically structured and economically organized; what social problems, policy issues, and ethical choices confront us as individual and collective participants in the world system; and how cultural diversity, conflict, diffusion, and exchange characterize the world system and shape responses to it. In addition to inquiring into larger conceptual issues, students focus on the history, art, literature, music, beliefs, and social systems of one particular geographical/cultural region.

Program of Study

Eleven quarter-courses are required for the major as well as proficiency in a language other than English at a level equivalent to two full years of instruction. Three of the courses are a yearlong core sequence; four are core electives; three are regional (area studies) electives; and one is an upper-level seminar or research project.

Core sequence: INTL ST 201-1,2,3

Core electives (1 from each of the following 4 groups):

- International politics: POLI SCI 240, 340, 342, 344-1,2, 345, 349
- International economics: ECON 305, 325, 326, 361, 362; POLI SCI 341, 348, 372
- Approaches to culture: ANTHRO 211, 215, 235; LING 220, 310; PERF ST 216; RELIGION 110
- International ethics and cooperation: INTL ST 202; POLI SCI 343, 347

Regional electives: three quarter-courses concerning either one geographical area listed below or a comparative category with designated courses. Students choose one course from each of the thematic groups, also listed below; if no course is available for a combination of area and

group, students may, in consultation with a program adviser, substitute a course from another thematic group. Advisers have the lists of appropriate courses.

- Geographical areas: Africa, Asia, Europe, Latin America, Middle East, and the nongeographical comparative area
- Thematic groups: historical studies, literature and the arts, and beliefs and social systems

Upper-level seminar or research project: Each year several options are offered through International Studies or other departments. Students may do an independent research project (399) based on a proposal approved in advance by their international studies adviser.

Advising: Each student's major has a different combination of courses. Because international studies majors must show a minimum of nine courses not double-counted in any other major(s), students should see an international studies adviser when designing their programs.

Courses

INTL ST 201-1,2,3 Introduction to the World System

Three-quarter sequence investigating the origins and nature of contemporary global economic, political, and cultural interdependence. The first two quarters concern the historical evolution of the international system with focus on state formation, the rise of markets, and the creation of the interstate system. The third quarter highlights 20th-century problems. **1.** International system in the 18th and 19th centuries. **2.** Origins of the global system. **3.** International system in the 20th century.

INTL ST 202-0 International Ethics Explores whether states can pursue moral ends in world politics; whether citizens can hold governments to moral standards in foreign policy. Various approaches and topics, e.g., the Holocaust and human rights.

INTL ST 399-0 Independent Research Advanced research carried out under the supervision of a professor in a department related to the area of study. Consent of the director of the undergraduate's major required, following submission of a written proposal.

Legal Studies Program

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

Legal studies is an undergraduate major open to students in all schools. It does not replace any major but complements it as an adjunct major that may be taken only in conjunction with a departmental major.

Students are required to have completed or be in the process of completing at least two legal studies-related courses prior to admission to the program. Students apply for the adjunct major and admission to the Advanced Research Seminar (398-1,2,3) in the spring of their sophomore year. The adjunct major requires completion of all three quarters of 398, typically during the junior year.

In addition to the Advanced Research Seminar, adjunct majors are required to complete a total of eight approved law-related electives taught in legal studies or drawn from other departments, including one course from each of five categories of electives.

Core courses: LEGAL ST 398-1,2,3

Electives: Courses that fulfill the elective requirement for the adjunct major may be chosen from the following five categories: argument and communication; global and comparative studies; institutions, organizations, economics; law and inequality; theory and philosophy. All five categories must be represented among the eight courses chosen. A list of approved courses for the adjunct major is available on the Legal Studies Program Web site, www.northwestern.edu/legalstudies.

Minor in Legal Studies

Students may earn a minor in legal studies while concurrently pursuing a departmental major in any undergraduate school. Students qualify for the minor by satisfactorily completing a total of eight approved law-related courses taught in legal studies or drawn from other departments, including one course from each of five categories of electives.

Minor course requirements: The eight courses for the minor may be chosen from the five categories of electives listed under the Adjunct Major in Legal Studies. All five categories must be represented among the eight courses to be counted toward the minor.

Honors in Legal Studies

Students who achieve a grade point average of 3.5 or higher in courses completed for the adjunct major and who write a research seminar thesis of distinction may be considered for honors. For more information about guidelines and requirements for earning honors, consult the program director.

Courses

LEGALST 376-0 Topics in Legal Studies Topics such as McCarthyism and free speech, antitrust law and economics, and community policing. May be repeated for credit with consent of instructor or program director.

LEGALST 398-1,2,3 Advanced Research Seminar

Exposure to theoretical and empirical approaches to the study of law and legal institutions and their relationship to society; emphasis on analytic skills and interdisciplinary research experience. Readings in legal studies; preparation and presentation of research projects and papers. Varying class format incorporating meetings, group exercises, and small tutorials led by faculty-supervised graduate teaching fellows. Consecutive enrollment in all three courses in the sequence required. Prerequisite: Acceptance to program as adjunct major.

LEGALST 399-0 Independent Study Readings and conferences on special subjects for students pursuing a specific area of interest in legal studies.

Military Studies Programs

The military studies programs are not departments of any school; they are administered by the Office of the Provost.

Naval Science

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 (PNS), who chairs Northwestern's Department of Naval Science, and department faculty members are commissioned officers serving on active duty in the United States 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

The Naval Reserve Officers Training Corps offers young men and women the opportunity to obtain leadership and management experience as commissioned officers in the United States 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, although 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 for summer training at sea or ashore. NROTC students are required to abide by the Midshipmen Regulations issued by the unit. Under certain conditions, 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, 230, 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 will gain a fundamental understanding of the formal and informal structures of the main warfare communities and how each contributes to attaining the U.S. Navy and Marine Corps mission.

NAV SCI 120-0 Seapower and Maritime Affairs A survey of U.S. naval and maritime history in the context of world maritime development, including the historical evolution of American sea power and the role of U.S. naval forces in an era of geopolitical change.

***NAV SCI 210-0 Marine Navigation** Theory underlying marine navigation. Basic piloting; dead reckoning, terrestrial lines of position, set and drift, extensive chart work; elements of celestial navigation; solution of the navigational triangle; use of the sun, moon, stars, and planets in position finding at sea; actual sextant observations of the sun/moon (weather permitting).

***NAV SCI 220-0 Naval Ship Systems II (Naval Weapons Systems)** Theory and concepts of naval weapons systems. Ballistics of both powered and free-flight modes in single or multiple environments; theory of target acquisition, identification and tracking; command and control systems. Development of ability to analyze, synthesize, and critically evaluate representative naval weapons systems.

***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. Taken concurrently with IEMS 342 Organizational Behavior.

***NAV SCI 331-0 Naval Operations** Furthering of skills developed in 210. Students examine or practice nautical rules of the road, use of the maneuvering board, deck seamanship, basic shiphandling theory, and weather systems.

NAV SCI 336-0 Evolution of Warfare (Marine Corps option only) Evolution of warfare from the Alexandrian period to the present; broad coverage of history of warfare. Actions and decisions of opposing commanders evaluated in terms of classic theoretical principles of war.

NAV SCI 341-0 Naval Leadership and Ethics Examines the ethical underpinnings of leadership and its relevance to a profession that employs military force at the direction of the national command authority. Prepares prospective officers for their initial job responsibilities and considers ethical issues related to large and diverse organizations, just war theory, the military justice system, and leadership accountability in naval organizations.

***NAV SCI 345-0 Naval Ship Systems I (Naval Engineering)** Introduction to thermodynamics and basic power cycles used in naval propulsion and nonpropulsion auxiliary systems. Basics of electrical theory and shipboard electrical systems. Elements of ship design to achieve safe operations and ship stability characteristics.

NAV SCI 346-0 History of Amphibious Warfare (Marine Corps option only) Evolution of amphibious warfare; development of amphibious concepts and principles. Major amphibious operations from Gallipoli to present.

NAV SCI 350-0 Naval Science Laboratory One two-hour lab weekly, required each quarter for all midshipmen. Emphasizes professional development and skills as well as drill and physical fitness.

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

Aerospace Studies

Northwestern students may participate in the programs of the Air Force Reserve Officers Training Corps through a cross-enrollment agreement with the Illinois Institute of Technology (IIT). Within the limits of the Northwestern school in which the student is registered, credits earned in approved aerospace studies courses at IIT may be counted toward the degree requirements at Northwestern. Further information can be obtained from Air Force ROTC Detachment 195, Illinois Institute of Technology, 10 West 31st Street, Chicago, Illinois 60616, phone 312-567-3525. For course descriptions, see www.iit.edu/~afrotc/courses.

Military Science

Northwestern students may participate in the programs of the Army Reserve Officers Training Corps through a cross-enrollment agreement with the University of Illinois at Chicago (UIC). Credits earned in approved military science

courses at UIC may be counted toward degree requirements within the limits of the Northwestern school in which the student is registered. Further information can be obtained from the Department of Military Science, University of Illinois at Chicago, 115 South Sangamon Street, M/C 252, Chicago, Illinois 60607, phone 312-996-3451.

Music Theatre Program

The Certificate in Music Theatre provides the opportunity for School of Music students majoring in voice and School of Communication students majoring in theater to create a second area of specialization that is important to their development as musical theater artists. For voice majors, the program provides training in acting and other theater courses. Theater majors have weekly voice classes and exposure to other music offerings.

The prescribed sequence of courses is only open to students accepted into the program through audition. The auditions are held annually in the spring quarter and are limited to freshman and sophomore theater and voice majors. Auditioners are required to perform a vocal selection and a monologue and to participate in a dance audition.

Certificate Requirements for Voice Majors

Voice majors must take seven units of credit and four noncredit courses:

- THEATRE 243-1,2,3 Acting I: Principles of Characterization (3 units)
- THEATRE 352-1,2 Music Theatre Techniques (2 units)
- THEATRE 367 History of the Lyric Theatre (1 unit)
- Design or dance elective (1 unit)
- THEATRE 119 Production Laboratory (1 quarter, no credit)
- Dance (3 classes, no credit)

Certificate Requirements for Theatre Majors

Theatre majors must take seven units of credit and six noncredit courses:

- VOICE 102 Beginning Voice (1.5 units)
- MUSIC 127 Keyboard Skills (1 unit)
- VOICE 202 Intermediate Voice (1.5 units)
- THEATRE 352-1,2 Music Theatre Techniques (2 units)
- THEATRE 367 History of the Lyric Theatre (1 unit)
- Dance (minimum of 6 classes, no credit)

Partnership through the Arts Program

Students in the School of Education and Social Policy and the School of Music may participate in the Partnership through the Arts Program. Consisting of course work and a four-quarter guided internship, the program fosters understanding of arts partnerships with public schools. To earn the Partnership through the Arts certificate, students complete two required courses, MUSIC ED 335 Selected Topics in Music Education: Creating Partnerships through the Arts and TEACH ED 304 Seminar on Teaching;

Introduction to Schooling in Communities; one elective focusing on the arts or service learning; and a four-quarter internship at an approved site. In the second year of the program, students complete a professional portfolio and poster project that illustrates central learning and makes a contribution to the partnership with the internship site.

Required courses

- MUSIC ED 335 Selected Topics in Music Education: Creating Partnerships through the Arts
- TEACH ED 304 Introduction to Schooling in Communities

Elective courses: MUSIC ED 258; MUSIC ED 260; MUSIC ED 368; MUSIC ED 369; selected courses in the School of Education and Social Policy

Service Learning Certificate Program

Students across the University may earn a certificate in service learning through a two-year program that connects volunteer experience with an academic component to increase understanding of community needs. Three courses are required — SESP 202 Introduction to Community Development and two others selected from an approved list — along with 50 hours of volunteer service in each of two years and participation in facilitated discussions to reflect on the experience. In the second year of the program, students complete a capstone project resulting in a research paper or study analyzing a community issue. For more information and an application, contact the Office of Student Affairs in the School of Education and Social Policy.

Transportation and Logistics Program

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

Passenger and freight transportation represents nearly a fifth of the U.S. 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 has offered relevant courses through the Departments of Civil and Industrial Engineering and Management Sciences in the McCormick School of Engineering and Applied Sciences and the Department of Economics and other social science departments in the Weinberg College of Arts and Sciences. This minor now offers undergraduates the opportunity to obtain a more rounded education in transportation and logistics than that offered within their selected major. 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 that has previously specialized in graduate education. The

center's jointly appointed faculty is 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 seven courses, of which one is a required course. The other six courses must include at least three core courses, at least two of which must be outside the school in which the student is majoring.

Students are not allowed to double-count courses that are part of their major but can count courses that fulfill related-course, distribution, or social science and humanities requirements. It is assumed that students will already have taken courses in calculus and in probability and statistics as part of their major.

Required course: TRANS 310

Core courses: ECON 310-1,355; CIV ENG 371,372, 376; IEMS 310 or 313, IEMS 381. No substitutions will be allowed for core courses.

Elective courses: ECON 309, 337, 349, 350, 354, 361, 370, ECON 381-1,2; GEOG 341, 343; HISTORY 322-2; POLI SCI 221,321,371; SOCIOLOGY 301,312; CIV ENG 338,360; IEMS 315,317; either IEMS 326 or ECON 360; IEMS 382; one unit of approved independent study. Other courses will be considered for credit toward the minor if appropriate to the student's program of study and approved by the Program Committee. A full list of approved elective courses is available from the program office.

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 will receive one credit in the spring quarter of their senior year.

TRANS 390-0 Technology in Perspective The role of technology and innovation, beginning with the Industrial Revolution. Examination of the resources necessary to develop technology and to exploit it — through, and beyond, the process of innovation — in the marketplace.

TRANS 399-0 Independent Study Advanced work chosen by mutual agreement with a faculty member. No more than one unit may count toward the minor. Consent of faculty required.

Undergraduate Leadership Program

The Undergraduate Leadership Program is an interschool certificate program open to Northwestern first- and second-year undergraduates. The program helps students understand the nature of leadership and prepares them to become leaders on campus, in the community, and in their professions. Through course work, small group activities, seminar discussions, lectures, off-campus retreats, and involvement in campus and community organizations, participants learn

the theories of leadership, experience the challenge of leading others, and create a sense of community with each other and members of participating organizations.

Certificate Requirements

The program combines theoretical, historical, practical, and experiential knowledge into a two-phase course of study. In the first phase, freshmen and sophomores begin the program by attending an outdoor leadership retreat and then taking two required courses on leadership. After successfully completing both courses, students enter the second phase. The activities in the second phase are primarily extracurricular and include a community connections retreat, seminars, lectures, and externships.

The Office of the Provost awards a certificate to each student who successfully completes both phases of the Undergraduate Leadership Program, usually by the end of the junior year. Beyond the formal program, certificate holders may draw on their course work and experiences to enrich community life at Northwestern and in the surrounding community, fulfilling the program's goal of engaging constructively in civic and professional leadership activities.

Courses

Two courses are required for the first phase of the Undergraduate Leadership Program. GENCMN 204 offers conceptual models of leadership and experience in leading group analyses of case studies, which are videotaped and reviewed by group members. A second course — chosen from a list of preapproved courses illustrating the consequences of the success or failure of leadership — proceeds from the assumption that leaders and leadership are uniquely related to their constituency and their historical context.

GENCMN 204-0 Paradigms and Strategies of Leadership
See Introductory and Related Courses in the School of Communication.

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. The center sponsors a number of programs, including courses for advanced creative writers taught by distinguished visiting writers-in-residence, innovative writing-intensive courses for freshmen, and a variety of colloquia for the entire campus community on topics related to writing.

Courses

Writing arts courses 301, 302, and 303 are taught by a visiting writer-in-residence. For more information about writing arts courses and admission requirements, consult with a member of the Center for the Writing Arts.

WRITING 115-5,6 Modes of Writing A team-taught course, designed specifically for freshmen, that combines rigorous exploration of a lively intellectual theme with close attention to helping students become strong writers. The format alternates between large-group lecture and discussion sessions led by an accomplished lecturer and small, intensive seminar meetings led by a skillful teacher of writing.

Themes explored typically have the spark of controversy and sharp focus characteristic of topics for successful freshman seminars, but also the broader historical or theoretical scope characteristic of distribution requirement courses. Recent themes have included time and chance, the Bible and its transformations, and language and social policy. Weinberg students earn distribution requirement credit for the first quarter and freshman seminar credit for the second quarter. Students are expected to enroll for both quarters; the first quarter is a prerequisite for the second. May not be taken P/N.

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 Expository Prose Writing as a fundamental skill in a particular field such as science, law, journalism, literature, or political commentary. Extensive writing exercises. Prerequisites: background in writing, a writing-intensive course, and submission of a manuscript of 5–15 pages.

Administration and Faculty

University Administration

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Undergraduate Schools

The following faculty listing, which is current as of spring 2003, shows the highest academic or professional degree and the institution granting the degree. *University* and *College* are usually omitted; familiar abbreviations and short forms are used when appropriate. Faculty rank within the department is given; the word *also* indicates a joint appointment in another department, affiliation with a University center, or an administrative assignment. The department chair is designated when the appointment was known at the time the catalog went to press.

Judd A. and Marjorie Weinberg College of Arts and Sciences

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Associate Professor; also Institute for Policy Research

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Professor; also Board of Lady Managers of the Columbian Exposition Professor (Anthropology), Gender Studies

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Associate Professor; also English, Theatre

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Associate Professor

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Chuck Kleinhans (PhD Indiana)
Associate Professor

Newton N. Minow (JD Northwestern)

*Annenberg University Professor of Communications;
also Communication Studies, Management*

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*Associate Professor; also Communication Studies; Associate Dean,
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Associate Professor

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Interdisciplinary PhD Program in Theatre and Drama; also
English, Performance Studies*

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*Professor and Head, Dance Program; also Education and
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Toni-Marie Montgomery, PhD

Dean of the School of Music and Professor of Music

Peter R. Webster, PhD

Associate Dean for Academic Affairs, John W. Beattie Professor of Music Education and Technology, Interim Chair of Music Studies, and Interim Coordinator of Music Composition

René E. Machado, MM

Associate Dean for Administration and Finance

Heather A. Landes, MM

Assistant Dean of Music Admissions and Financial Aid

Linda A. Garton, MM

Director of Student Affairs

Richard Ashley, DMA

Codirector of Graduate Studies, Coordinator of Music Cognition Program, and Associate Professor of Music Cognition and Music Theory

Marcia Bosits, DM

Codirector of Graduate Studies and Associate Professor of Piano

Robert Barris, MM

Cochair of Music Performance Studies and Associate Professor of Bassoon

Frederick Ockwell, MA

Cochair of Music Performance Studies, Associate Professor of Voice and Opera, and Opera Conductor

Margaret Gholson, BA

Assistant Director of Music Admissions and Financial Aid

Music Studies

Music Composition

Stephen L. Syverud (PhD Iowa)

Associate Professor; also Music Technology

Augusta Read Thomas (MM Yale)

Professor

Peter R. Webster (PhD Eastman)

John W. Beattie Professor of Music Education and Technology and Interim Coordinator of Music Composition; also Music Theory and Cognition; Associate Dean of Academic Affairs and Interim Chair of Music Studies

Amy Williams (PhD SUNY Buffalo)

Senior Lecturer

Jay Alan Yim (PhD Harvard)

Associate Professor

Music Education

Janet Barrett (PhD Wisconsin)

Associate Professor

Bernard J. Dobroski (PhD Northwestern)

John Evans Professor in Music

Maud Hickey (PhD Northwestern)

Assistant Professor and Coordinator of Music Education Program; also Music Technology

James Kjelland (PhD Texas)

Associate Professor; also String Instruments

Scott Lipscomb (PhD UCLA)

Associate Professor; also Music Theory and Cognition

Peter R. Webster (PhD Eastman)

John W. Beattie Professor of Music Education and Technology; also Music Theory and Cognition; Associate Dean for Academic Affairs, Interim Chair of Music Studies, and Interim Coordinator of Music Composition

Musicology

Linda P. Austern (PhD Chicago)

Associate Professor

Thomas Bauman (PhD California Berkeley)

Professor and Coordinator of Musicology Program

Paul F. Berliner (PhD Wesleyan)

Professor of Ethnomusicology; also Jazz Studies and Pedagogy, Performance Studies

Virginia Gorlinski (PhD Wisconsin)
Assistant Professor

Stephen Hill (PhD Illinois)
Assistant Professor; Clinical

Inna I. Naroditskaya (PhD Michigan)
Assistant Professor

Jesse Rosenberg (PhD NYU)
Associate Professor; Clinical

Judith L. Schwartz (PhD NYU)
Associate Professor

Music Technology

Maud Hickey (PhD Northwestern)
Assistant Professor; also Coordinator, Music Education Program

Gary S. Kendall (PhD Texas)
Associate Professor and Coordinator of Music Technology Program; also Music Theory and Cognition

Virgil Moorefield (PhD Princeton)
Assistant Professor

Stephen L. Syverud (PhD Iowa)
Associate Professor; also Music Composition

Peter R. Webster (PhD Eastman)
John W. Beattie Professor of Music Education and Technology; also Music Theory and Cognition; Associate Dean of Academic Affairs, Interim Chair of Music Studies, and Interim Coordinator of Music Composition

Music Theory and Cognition

Richard Ashley (DMA Illinois)
Associate Professor of Music Cognition and Music Theory, Coordinator of Music Cognition Program, and Codirector of Graduate Studies

Candace Brower (PhD SUNY Stony Brook)
Associate Professor of Music Theory

John S. Buccheri (PhD Eastman)
Associate Professor of Music Theory and Charles Deering McCormick Professor of Teaching Excellence

Robert Gjerdingen (PhD Pennsylvania)
Associate Professor of Music Cognition and Music Theory and Coordinator of Music Theory Program

Gary S. Kendall (PhD Texas)
Associate Professor of Music Theory and Coordinator of Music Technology Program

Scott Lipscomb (PhD UCLA)

Associate Professor of Music Cognition; also Music Education

Susan Piagentini (PhD Northwestern)
Senior Lecturer in Music Theory

Peter R. Webster (PhD Eastman)
Professor of Music Cognition and John W. Beattie Professor of Music Education and Technology; Associate Dean of Academic Affairs, Interim Chair of Music Studies, and Interim Coordinator of Music Composition

Music Performance Studies

Conducting and Ensembles

Stephen Alltop (DM Northwestern)
Senior Lecturer; also Piano, Organ, and Church Music; Director of Music, Alice Millar Chapel

Daniel J. Farris (MMed Illinois)
Senior Lecturer and Director of Athletic Bands

Robert A. Harris (PhD Michigan State)
Professor and Director of Choral Organizations

Ryan Nelson (DMA North Texas)
Assistant Professor and Associate Director of Bands

Frederick Ockwell (MA Washington)
Associate Professor; also Voice and Opera; Cochair of Music Performance Studies and Opera Conductor

Don L. Owens (MM Illinois)
Associate Professor and Director of Contemporary Music Ensemble; also Coordinator of Jazz Studies and Pedagogy Program

Mallory Thompson (DMA Eastman)
Professor, Director of Band Organizations, Coordinator of Conducting and Ensembles Program, and Charles Deering McCormick Professor of Teaching Excellence

Victor Yampolsky (Dipl Moscow Conservatory)
Carol R. and Arthur L. Rice University Professor of Music Performance and Director of Orchestras

Jazz Studies and Pedagogy

Ruben Alvarez
Lecturer; also Wind and Percussion

Paul F. Berliner (PhD Wesleyan)
Professor; also Musicology

Michael Kocour (MM Northwestern)
Lecturer in Jazz Studies

Don L. Owens (MM Illinois)

Associate Professor and Coordinator of Jazz Studies and Pedagogy Program; also Conducting and Ensembles; Director of Contemporary Music Ensemble

Joel Spencer (BS, Illinois)

Lecturer

Paul Wertico

Lecturer; also Wind and Percussion

Piano, Organ, and Church Music

Stephen Alltop (DM Northwestern)

Senior Lecturer in Organ and Church Music; also Conducting and Ensembles; Director of Music, Alice Millar Chapel

Marcia Bosits (DM Northwestern)

Associate Professor of Piano and Codirector of Graduate Studies

Elizabeth Buccheri (DMA Eastman)

Senior Lecturer in Piano

Alan Chow (MM Juilliard)

Associate Professor of Piano

Douglas R. Cleveland (MM Indiana)

Assistant Professor of Organ

James Giles (DMA Manhattan)

Assistant Professor of Piano

Margaret Kemper (MM Northwestern)

Adjunct Associate Professor of Organ and Church Music and Coordinator of Organ and Church Music Program

Christine Kraemer (DM Northwestern)

Lecturer in Organ and Church Music

Ursula Oppens (MM Juilliard)

John Evans Professor in Piano

Sylvia Wang (DMA Eastman)

Associate Professor of Piano and Coordinator of Piano Program

Richard Webster (MM Northwestern)

Lecturer in Organ and Church Music

String Instruments

Elizabeth Cifani (MM Northwestern)

Lecturer in Harp

Michael Hovnanian (BFA California Inst Arts)

Lecturer in Double Bass

Hans Jørgen Jensen (Dipl Royal Academy of Music, Denmark)

Professor of Cello

James Kjelland (PhD Texas)

Associate Professor; also Music Education

Claudia Lasareff-Mironoff (MM Northwestern)

Lecturer and Coordinator of String Chamber Music

Blair Milton (MM Indiana)

Assistant Professor of Violin

Jonathan Pegis (MM Eastman)

Lecturer in Cello Orchestral Studies

Gerardo Ribeiro (Dipl Lucerne Music Conservatory)

Professor of Violin and Coordinator of String Instruments Program

Stacia C. Spencer

Senior Lecturer in String Pedagogy

Almita Vamos (MA Western Illinois)

Professor of Violin

Roland Vamos (DMA Juilliard)

Professor of Viola

Anne Waller (MM Southern Methodist)

Lecturer in Guitar

Voice and Opera

Richard L. Boldrey (MDiv Trinity)

Senior Lecturer in Voice

Theresa A. Brancaccio (MM Northwestern)

Lecturer in Voice

Karen Brunssen (BM Luther)

Associate Professor and Coordinator of Voice and Opera Program

Richard Drews (MM Nebraska)

Assistant Professor, Clinical, of Voice

Elizabeth Fischer-Monastero (MM Dominican, Florence)

Professor of Voice

Bruce Hall (MM Michigan)

Senior Lecturer in Voice

Kurt R. Hansen (MM Northwestern)

Senior Lecturer in Voice

Noel Koran (DMA Texas)

Associate Professor and Director of Opera

Sunny Joy Langton (BM Indiana)

Adjunct Assistant Professor of Voice

Rhoda Levine (BA Bard)

Adjunct Professor of Opera

Marie Michuda (MM DePaul)

Lecturer in Voice

Sherrill Milnes (MMEd Drake)

John Evans Professor in Voice

Dominic E. Missimi (MA Wayne State)

Professor and Head of Music Theatre Program; also Theatre

Frederick Ockwell (MA Washington)

Associate Professor and Opera Conductor; also Conducting and Ensembles; Cochair of Music Performance Studies

William Woodruff (MM Northwestern)

Lecturer in Voice

Wind and Percussion Instruments

Ruben Alvarez

Lecturer in Percussion; also Jazz Studies and Pedagogy

William Barnewitz

Lecturer in Horn

Robert Barris (MM Michigan)

Associate Professor of Bassoon; also Cochair of Music Performance Studies

J. Lawrie Bloom (MM Arizona State)

Assistant Professor of Clarinet

Michael Burritt (MM Eastman)

Associate Professor of Percussion and Coordinator of Wind and Percussion Instruments Program

Barbara Butler (BM Northwestern)

Professor of Trumpet

Russell Dagon (MM Northwestern)

Professor of Clarinet

Charles Geyer (MM Northwestern)

Professor of Trumpet

Richard Graef (MM Indiana)

Associate Professor of Flute

Leslie A. Grimm (MM Northwestern)

Senior Lecturer in Clarinet

Frederick L. Hemke (AMD Wisconsin)

Louis and Elsie Snyder Eckstein Professor of Music and Professor of Saxophone

John Henes (Cert Soc Teachers of Alexander Method)

Lecturer in Alexander Technique

Walfrid Kujala (MM Eastman)

Professor of Flute

Rex Martin (MM Northwestern)

Professor of Tuba and Euphonium

Michael J. Mulcahy (ASCM New South Wales)

Professor of Trombone

James Ross (MM Northern Illinois)

Lecturer in Percussion

Carl Sonik (BS Roosevelt)

Lecturer in Chamber Music

Charles Vernon

Lecturer in Bass Trombone

Paul Wertico

Lecturer in Percussion; also Jazz Studies and Pedagogy

Gail Williams (MM Northwestern)

Professor of Horn

University at Large

David F. Bishop (MSLS Catholic)

Charles Deering McCormick Distinguished Professor of Research Librarianship; University Librarian

Newton N. Minow (JD Northwestern)

Annenberg University Professor of Communications; also Communication Studies, Management, Radio/Television/Film

Naval Science

Daniel E. Moore Jr., Captain USN (MA Salve Regina, MA Naval War College)

Professor and Chair

Joseph P. Abbott Jr., Lieutenant USNR (BS USNA)

Assistant Professor

Jacob M. Barton, Lieutenant USN (BS Northwestern)

Assistant Professor

Thomas E. Frayne IV, Lieutenant USNR (BS USNA)

Assistant Professor

William J. Kellerhals, Commander USN (MEM Northwestern)

Associate Professor

Douglas N. Wolfe, Captain USMC (BS Taylor)

Assistant Professor

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