

NORTHWESTERN

Undergraduate Catalog 2009–10

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This catalog for the academic year beginning September 1, 2009, 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, and Henry and Leigh Bienen School of Music and about cross-school undergraduate programs. Failure to read this catalog does not excuse a student from knowing and complying with its content.

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

Cross-School Options

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

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

SCHOOL-BASED OPTIONS FOR ALL UNDERGRADUATES

In the Weinberg College of Arts and Sciences

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

In the School of Communication

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

- Adjunct major in animate arts
- Dance minor
- Film and media studies minor
- Human communication sciences minor
- Internship program
- Sound design minor
- Theatre minor

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

In the School of Education and Social Policy

The School of Education and Social Policy offers two programs that are open to Northwestern undergraduates regardless of school: the Civic Engagement Certificate Program and the Summer Field Studies programs in Chicago, Washington, D.C., and San Francisco. For more information on these programs, see the School of Education and Social Policy chapter of this catalog.

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

In the McCormick School of Engineering and Applied Science

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

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

In the Medill School of Journalism

The Medill School offers a certificate in integrated marketing communications open to undergraduates throughout Northwestern and including prerequisite courses from the other undergraduate schools. Details on prerequisites and requirements can be found in the Medill School chapter of this catalog.

In the Bienen School of Music

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

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

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

DUAL BACHELOR'S DEGREE PROGRAMS

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

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

Completion of any of these programs typically requires five years of full-time study, and students have an Undergraduate Residence Requirement (URR) of 15 quarters (see page 23 in the Undergraduate Education chapter of this catalog).

For information on applying to a dual bachelor's degree program, see Special Admission Programs on page 17 in the Undergraduate Education chapter of this catalog. Students receiving financial aid should also note the restrictions under Satisfactory Academic Progress and Financial Aid on page 21.

Liberal Arts and Engineering Program

Qualified Northwestern undergraduates with strong interests in the liberal arts as well as engineering may elect to earn both a bachelor of arts degree in a liberal arts discipline from Weinberg College and a bachelor of science degree in an engineering field from the McCormick School (BA/BS). Students may pursue any combination of majors from the two schools. They must complete all requirements of both schools and both majors and are subject to all regulations of both schools and a 15-quarter URR. The one exception is that students may be exempted — by decision of the Weinberg College associate dean for undergraduate academic affairs — from the rule that a maximum of 11 non-Weinberg College courses may be counted toward requirements for a Weinberg BA degree.

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

Liberal Arts and Music Program

Some Northwestern undergraduates choose to combine intensive study in music with a broad exploration of the liberal arts and a major in a liberal arts discipline. Students accepted into the Weinberg College–Bienen School of Music dual bachelor's degree program may simultaneously earn a bachelor of arts degree from Weinberg College and a bachelor of music degree from the Bienen School (BA/

BMus). They must complete all Weinberg College degree requirements, including at least 30 Weinberg courses, as well as all Bienen School degree requirements, including at least 30 music courses, and a 15-quarter URR.

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

Engineering and Music Program

Highly capable students who have a strong interest in and commitment to both engineering and music may apply to the McCormick School–Bienen School dual bachelor's degree program. Students accepted into this program may simultaneously earn a bachelor of science degree from the McCormick School and a bachelor of music or bachelor of arts in music degree from the Bienen School (BS/BMus or BS/BAMus). They must complete all McCormick School degree requirements, including at least 36 McCormick courses, as well as all Bienen School degree requirements, including at least 30 music courses, and a 15-quarter URR. Any field of study in engineering may be chosen, resulting in a bachelor of science degree in the chosen field.

The program may be entered no later than the beginning of the sophomore year, and admission requires concurrent approval of both the McCormick School and the Bienen School. Current students interested in this program should consult with the undergraduate engineering dean's office in the McCormick School and the assistant dean for admission and student affairs in the Bienen School.

Journalism and Music Program

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

The program requires completion of all Medill School degree requirements, including at least 35 Medill courses, as well as all Bienen school degree requirements, including at least 30 music courses, and a 15-quarter URR. Students must fulfill all minimum GPA requirements for journalism

classes and for the Journalism Residency. The three freshman journalism classes and core music classes are taken during the freshman year. Students complete the Journalism Residency and all prerequisite course work in a concentrated 1½-year time frame — either during their second and third years or during their third and fourth years of enrollment. Students should work with advisers from both schools to develop a timeline for completing all requirements.

COLLABORATIONS WITH THE GRADUATE AND MEDICAL SCHOOLS

Accelerated Master's Programs

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

In Weinberg College students receive permission to double-count some courses toward both bachelor's and master's degrees so that both degrees can be completed in four years. The following Weinberg College departments and programs have combined degree programs approved by the Graduate School: chemistry, earth and planetary sciences, economics, French, linguistics, and sociology. See the Weinberg College chapter of this catalog for the general information on accelerated master's programs (page 45) as well as the relevant department information.

In the McCormick School a BS/MS program in engineering allows advanced students to complete the BS requirements early (usually through Advanced Placement/International Baccalaureate or transfer credit) and to accelerate study toward a master's degree. For more information see Accelerated Master's Program in the McCormick School chapter of this catalog.

Students in the Medill School who exhibit exceptional ability in undergraduate work may apply to that school's graduate division for early admission to the graduate editorial program. This program allows students to qualify for bachelor of science in journalism and master of science in journalism degrees in 12 to 15 quarters of full-time study. For more information see Accelerated Master's Program in the Medill School chapter of this catalog.

Honors Program in Medical Education

www.feinberg.northwestern.edu/AWOME/HPME

The Honors Program in Medical Education (HPME) provides an opportunity for highly talented high school seniors to be admitted to an undergraduate program and to the Feinberg School of Medicine and to complete their formal premedical and medical studies in seven or eight years. Applicants should be able to qualify for advanced placement in chemistry and mathematics. Each year a small number of students are admitted to the program and

to Weinberg College, the School of Communication, or the McCormick School. Only candidates applying directly from high school are considered. For information on applying, see Special Admission Programs on page 17.

The first three or four years of the program are spent in undergraduate study, during which students must complete 36 courses that meet HPME requirements; these include required courses in chemistry, physics, and the biological sciences, as well as courses that meet the requirements for HPME students in an undergraduate school. To remain in the program, students must maintain designated grade point averages both in required science courses and overall. They must satisfy an Undergraduate Residence Requirement of 9 full-time quarters (see page 23 in the Undergraduate Education chapter of this catalog). Only courses taken at Northwestern or on an approved study abroad program may be used to satisfy this enrollment policy.

In addition to the required science courses, HPME students enrolled in Weinberg College fulfill the college's general education requirements by taking courses in the humanities, social sciences, and arts. In the first year they complete at least 1 freshman seminar. The third year is usually devoted to completing the requirements for a BA in Weinberg College by doing advanced course work in the major and/or to studying abroad in a Northwestern-affiliated program. Students may also take an additional undergraduate year at Northwestern.

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

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

MANAGEMENT CERTIFICATES FOR UNDERGRADUATES

www.kellogg.northwestern.edu/certificate

In cooperation with Weinberg College and the McCormick School, the Kellogg School administers a program leading to an undergraduate certificate in either financial economics or managerial analytics. The certificate requires completion of 4 courses taught at an advanced level by Kellogg professors. Building on students' existing analytical skills, the certificate curriculum serves as excellent preparation for careers in the financial services and consulting industries and/or for doctoral or professional school programs.

About 100 students each year are accepted into the certificates program through a competitive application process. They must meet rigorous course prerequisites in advanced calculus and linear algebra, intermediate probability and statistics, advanced econometrics/statistics, and microeconomics. Students apply at the end of their sophomore or junior year for participation during the following school year. Applications are due at the end of winter quarter.

In addition to course work, certificate students who start the program in their junior year may complete an internship at a company or conduct research with a Kellogg faculty member during the summer before their senior year. A dedicated career services professional helps certificate students in planning and preparing for their careers and securing both summer and full-time employment.

Certificate in Financial Economics (4 units)

Any Northwestern undergraduate who has completed the prerequisite courses — see www.kellogg.northwestern.edu/certificate for a list — is eligible to apply for this certificate, which is offered in cooperation with Weinberg College. The financial economics curriculum comprises the following 4 courses.

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

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

KELLG FE 314 Derivatives Use and pricing of forwards and futures, swaps and options. Strategies for speculation and risk management, no-arbitrage pricing for forward

contracts, the binomial and Black-Scholes option pricing models, and applications of pricing models in other contexts.

KELLG FE 316 Topics in Financial Economics Examines different topical finance issues each year.

Certificate in Managerial Analytics (4 units)

Any Northwestern undergraduate who has completed the prerequisite courses — see www.kellogg.northwestern.edu/certificate for a list — is eligible to apply for this certificate, which is offered in cooperation with the McCormick School. The managerial analytics curriculum comprises the following 4 courses.

KELLG MA 320 Analytical Decision Modeling Foundation course for the certificate; taken in the fall. Structuring, analyzing, and solving business decision problems on Excel spreadsheets and examining problems involving resource-allocation decisions and risk analysis of decisions under uncertainty. Some data analysis and demand forecasting. Topics include analysis of resource-allocation decisions by Solver optimization; risk analysis of decisions involving uncertainty by Monte Carlo simulation; modeling and analysis of sequential decisions by decision trees; data analysis by pivot tables and filters; demand forecasting by time series analysis.

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

KELLG MA 322 Pricing Comparison of the three main ways to set prices (haggling/negotiation, posted price, and auctions) and how to choose the best method in a given situation. Customizing the price of the same product or service to different segments, using optimization models to set prices when volume is uncertain, as well as pricing multiple products. Introduction to some of the main techniques (regression, conjoint analysis, EVC) for gathering information about buyer valuations and demands.

KELLG MA 324 Operations and Supply Chain Strategy

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

ADDITIONAL OPTIONS

Environmental Science, Engineering, and Policy www.wcas.northwestern.edu/esep

The program in environmental science, engineering, and policy is designed to provide students with an interdisciplinary understanding of the biological, chemical, and physical environment, the relations of humans to the environment, and the impacts of past, current, and

possible future interventions. Although many aspects of environmental problems lie within the purview of the natural sciences and engineering, others are addressed in the social sciences and humanities. Effectively confronting environmental issues requires broad training and collaboration among experts in diverse fields. Environmental science students are prepared to tackle complex environmental problems in a rigorous way and with an appreciation of the related science, engineering, and policy issues. Similarly, environmental engineering involves an understanding of engineering analysis and design combined with an understanding of human use of and effects on the environment. The development and implementation of effective environmental policy require understanding of relevant aspects of human behavior, the natural world, and their interactions.

The program in environmental science, engineering, and policy is coadministered by Weinberg College and the McCormick School. It offers two majors:

- Environmental sciences (see the Weinberg College section of this catalog for a detailed description)
- Environmental engineering (see the McCormick School section of this catalog for a detailed description)

Transportation and Logistics **<http://transportation.northwestern.edu>**

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

Passenger and freight transportation represents nearly a fifth of the 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 offers relevant courses through the Departments of Civil Engineering and Industrial Engineering and Management Sciences in the McCormick School and the Department of Economics and other social science departments in Weinberg College. This minor offers undergraduates the opportunity to obtain a more rounded education in transportation and logistics than that offered within their selected majors. The curriculum equips students with a broad understanding of the economics, engineering, and operations of transportation and logistics systems and the role of public policy.

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

Minor in Transportation and Logistics

Students are required to complete 7 courses, of which 1 is a required course. The other 6 courses must include at

least 3 core courses, at least 2 of which must be outside the school in which the student is majoring.

Students in the McCormick School may double-count a maximum of 2 courses from their major program toward the minor. Students from other schools are not allowed to double-count courses that are part of their major but may count courses that fulfill related course, distribution, or social science and humanities requirements. It is assumed that students will already have taken courses in calculus and in probability and statistics as part of their major.

Requirements for Minor in Transportation and Logistics (7 units)

- **Required course:** TRANS 310
- **Core courses:** ECON 310-1, 355; CIV ENV 371, 376, 382; IEMS 310 or 313, 381, 383. No substitutions are allowed for core courses.
- **Elective courses:** ECON 309, 337, 349, 350, 354, 361, 370, 381-1,2; GEOG 341, 343; HISTORY 322-2; POLI SCI 221, 321, 329; SOCIOL 301, 312; CIV ENV 304, 338, 360; IEMS 315, 317; either IEMS 326 or ECON 360; IEMS 382; 1 unit of approved independent study. Other courses may 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 receive 1 credit in the spring quarter of their senior year.

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

Undergraduate Leadership **www.northwestern.edu/ulp**

The interschool Undergraduate Leadership Program is a certificate program open to all Northwestern 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. Participants learn the theories of leadership, experience the challenge of leading others, and create a sense of community with each other and members of the participating organizations.

Certificate Requirements

Students are required to take GEN CMN 204 Paradigms and Strategies of Leadership. At any time following that introductory course, students take 1 elective course that complements GEN CMN 204, either choosing from a preapproved list of courses (found on the ULP web site) that provide a macro-level exploration of leadership or

petitioning to take a related course. The program also requires the 2-credit CRDV 369 Field Study in Leadership, in which students critically explore and engage leadership outside the classroom.

Courses

GEN CMN 204-0 Paradigms and Strategies of Leadership

This course introduces students to theoretical models of leadership and to research on related topics such as group vision, creative problem solving, and decision making. In addition to weekly lectures, students work in small groups, taking turns facilitating meetings, discussing leadership concepts, and working to produce a final project. Extensive personal and group feedback is provided throughout the quarter.

CRDV 369-0 Field Study in Leadership In this course students attempt to leave a positive “leadership footprint” by fostering the success of a group, organization, or community. Spending at least 16 hours outside the classroom, students undertake a leadership role, an internship or externship, or a community-service experience, exploring leadership models and concepts through application.

Center for the Writing Arts

www.northwestern.edu/writing-arts

The Center for the Writing Arts was established in 1994 to highlight Northwestern’s strengths in the teaching of writing and to provide a focal point for continuing efforts to fulfill the University’s commitment to excellence in writing. 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

Center for the Writing Arts courses 301, 302, and 303 are taught by visiting writers-in-residence. Consult with a member of the Center for the Writing Arts for more information about its courses and admission requirements.

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 Nonfiction 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.

MILITARY PROGRAMS

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

Naval Science

www.northwestern.edu/nrotc

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

Naval ROTC Programs

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

At Northwestern, NROTC midshipmen lead essentially the same campus life as other students. They make their own arrangements for room and board and participate in campus activities of their choice, including the opportunity for University-sponsored overseas study. There are no prescribed academic majors for NROTC students, though scientific and technical studies are encouraged. NROTC students are required to complete the naval science curriculum, attend a weekly two-hour laboratory, and participate in four to six weeks of

active-duty summer training at sea or ashore. NROTC students are required to abide by the Midshipmen Regulations issued by the unit. Students may enroll in the NROTC program at any time from the beginning of their freshman year until the end of their sophomore year.

Courses

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

With the exception of 110 and 355, Northwestern course credit is granted for successful completion of naval science courses; applicability to graduation requirements is subject to limitations imposed by the responsible University faculty committees and by the undergraduate schools. For more information on credit availability, consult the dean of each school. Naval science courses are open to non-NROTC students with department approval. Courses with an asterisk (*) are not required for Marine Corps option students.

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

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

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

***NAV SCI 220-0 Naval Ship Systems II (Naval Weapons Systems)** Theory and employment of the Navy's weapons,

navigation, and communications systems. Processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Topics include fire control systems and major weapons types, including capabilities and limitations; physical aspects of radar and underwater sound; tactical and strategic significance of command, control, communications, computers, and intelligence with respect to weapons system integration. Supplemental review/analysis of case studies involving the moral and ethical responsibilities of leaders in employing weapons.

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

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

NAV SCI 336-0 Evolution of Warfare (Marine Corps option only) Evolution of warfare from 600 B.C. to present.

Students develop understanding and knowledge of the classic principles of war, the changes in conduct of war through time, and the actions and decisions of battlefield commanders and their soldiers.

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

***NAV SCI 345-0 Naval Ship Systems I (Naval Engineering)**

Provides an elementary overview of naval engineering systems and a detailed knowledge of the principles behind ship construction. Taught from a systems engineering standpoint. Topics include ship design, stability, and structural engineering; hydrodynamic forces; air and water systems; electrical theory, generation, and distribution systems; thermodynamics; damage control; hydraulics and ship control; theory and design of steam, nuclear, gas turbine, and diesel propulsion.

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

NAV SCI 350-0 Naval Science Laboratory A two-hour weekly laboratory required each quarter for all NROTC students. The laboratories serve to develop students' professional leadership skills, provide a basic understanding of

the U.S. Navy and Marine Corps as part of the U.S. armed forces, and further challenge, test, and evaluate students on their potential to become commissioned officers in the U.S. Navy or Marine Corps.

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

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 may 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 <http://afrotc.iit.edu>.

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, 728 West Roosevelt Road, M/C 252, Chicago, Illinois 60607, phone 312-996-3451.