NORTHWESTERN

Undergraduate Catalog 2007–08

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This catalog for the academic year beginning September 1, 2007, 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 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.

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Cross-School Programs

Each of Northwestern's six undergraduate schools has its own unique curriculum. In most of the schools, many majors and minors are open to all students, regardless of what school they are enrolled in. Several of the schools also have field studies opportunities open to all students. In addition, all six schools, as well as the graduate and professional schools and departments and programs within the schools, are continually developing new programs that build pedagogical and intellectual bridges between disciplines and across schools to create interdisciplinary opportunities for undergraduates.

Northwestern currently offers five kinds of cross-school programs:

- Interschool majors or minors
- Interschool certificates
- A center offering undergraduate courses
- Military programs
- Field study

INTERSCHOOL MAJORS OR MINORS

Animate Arts

Open to all Northwestern undergraduates, the adjunct major in animate arts provides an interdisciplinary approach to studying and creating new digital media. Its curriculum tightly integrates education in the arts and in technology, particularly computer programming. The program's flagship 4-quarter course sequence in computer-based art and new media introduces students to 2-D and 3-D design and visual literacy, acoustic theory, sound processing, and narrative theory, as well as computer science and cognitive science. A primary focus of this sequence is to provide students with multiple opportunities to actively integrate various art forms with technology in developing creative projects. Pieces are critiqued both as works of art and as engineering. The interaction between art practice and art theory is addressed through discussions, critiques, and readings, examining issues in the interpretation, understanding, and production of art and visual culture.

The goal of this major is to create a community of creative thinkers and makers that transcends cultural barriers between and among disciplines.

For courses taken for the adjunct major,

- No course may be taken P/N
- A grade of C or above is required in all courses used to fulfill major requirements
- Students may double-count 2 courses toward another or from another major or minor, provided that the rules of that major/minor allow the double-counting.

Requirements for the Adjunct Major (10 units)

- 4 core courses: ANIM ARTS 101, 201, 301, 302
- 2-quarter senior project: ANIM ARTS 396-1,2
- 4 electives chosen from a list published on the animate arts web site every academic year; other courses may be allowed upon petition by the student.

Courses

ANIM ARTS 101 Perceptual and Mathematical Spaces Emphasis on developing basic seeing, listening, and critiquing skills as well as the fundamentals of software design. Topics include visual design and sound design, functional programming and 2-D graphics, art theory and cultural theory, basic photography, and audio editing.

ANIM ARTS 201 Perception and Programming in Time Introduction to the basic principles and practice of time-based media. Topics include narrative theory, rhythm, composition of moving images, film and video editing, imperative programming, and computer game design.

ANIM ARTS 301 Interaction and Interactivity Introduction to the design of interactive 2-D and 3-D graphical systems. Topics include dynamical systems theory, animation, sculptural design, and 3-D modeling.

ANIM ARTS 302 Culture and Connectivity Seminar course in contemporary issues in culture and new media. Topics include mass culture and the avant-garde, the role of the market in art and media, computer networking protocols and technologies, web development, and C-style programming languages. Emphasis on projects and in-class discussion of readings.

ANIM ARTS 396-1,2 Senior Design Project A capstone course in which students develop a large-scale group or individual work over two quarters. Emphasis on outside project work. Class meetings involve group and individual critiques as well as issues in project planning and management. Prerequisite: 302 or consent of instructor.

Environmental Science, Engineering, and Policy

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 the Weinberg College of Arts and Sciences and the McCormick School of Engineering and Applied Science. It offers two majors:

- Environmental sciences (see the Weinberg College of Arts and Sciences section of this catalog for a detailed description)
- Environmental engineering (see the McCormick School of Engineering and Applied Science section of this catalog for a detailed description)

Transportation and Logistics

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 of Engineering and Applied Science and the Department of Economics and other social science departments in the Weinberg College of Arts and Sciences. 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 of Engineering and Applied Science 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

- **Required course:** TRANS 310
- **Core courses:** ECON 310-1, 355; CIV ENG 371, 376, 382; IEMS 310 or 313, 381, 383. No substitutions will be allowed for core courses.
- **Elective courses:** TRANS 390; 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 ENG 304, 338, 360; IEMS 315, 317; either IEMS 326 or ECON 360; IEMS 382; 1 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 1 credit in the spring quarter of their senior year.

TRANS 390-0 Perspectives in Transportation The industrial structure of transportation and its associated logistics activities. The effects of government regulation, globalization, and other contemporary challenges on carriers and their customers.

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.

INTERSCHOOL CERTIFICATES

Financial Economics and Managerial Analytics

The Kellogg School of Management offers two business-related undergraduate certificate programs in cooperation with the Weinberg College of Arts and Sciences and the McCormick School of Engineering and Applied Science. Both certificate programs consist of 4 courses taught at an advanced level by Kellogg professors. The programs build

on students' existing analytical skills and prepare them for careers in the financial services and consulting industries and/or for continuing their education in doctoral or professional school programs.

Acceptance to the certificate programs is through a competitive application process. To apply, students must be enrolled at Northwestern University and must meet a set of rigorous course prerequisite requirements in advanced calculus and linear algebra, intermediate probability and statistics, advanced econometrics, and microeconomics. Each program will accept about 50 students annually. Students may apply at the end of their sophomore or junior year for participation during the following school year. Applications are due at the end of the spring quarter.

In addition to taking the 4 certificate program courses, participating students who start the program during their junior year may spend the summer before their senior year conducting a research project with a Kellogg faculty member or completing an internship at a company. A dedicated career services professional helps certificate students with career planning and preparation and securing a summer internship.

Certificate Program in Financial Economics

This certificate program is offered in cooperation with the Weinberg College of Arts and Sciences, although all Northwestern students who meet the prerequisite requirements are eligible to apply; for the prerequisite requirements, see www.kellogg.northwestern.edu/certificate. All financial economics certificate students take the following 4 courses.

KELLG FE 310 Principles of Finance Foundation course for the program; 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; 2007–08 focus is on "value investing." Empirical support for the value approach to investing; quantitative methods for searching for value; balance sheet and earnings power approaches to assessing fundamental value; risk management; construction of portfolios using the value approach.

Certificate Program in Managerial Analytics

This certificate program is offered in cooperation with the McCormick School of Engineering and Applied Science, although all Northwestern students who meet the prerequisite requirements are eligible to apply; for the prerequisite requirements, see www.kellogg.northwestern.edu/certificate. *The program will first be offered in fall 2008.* All managerial analytics certificate students take the following 4 courses.

KELLG MA 320 Analytical Decision Modeling on Spreadsheets Foundation course for the program; 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 Program 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.

Music Theatre

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 that is important to their development as musical theatre artists. For voice majors the program provides training in acting and other theatre courses. Theatre majors have weekly voice classes and exposure to other music offerings.

The prescribed sequence of courses is open only to students accepted into the program through audition. The auditions are held annually in the spring quarter and are limited to freshman and sophomore theatre and voice majors. Auditionees are required to perform a vocal selection and a monologue and to participate in a dance audition.

Certificate Requirements for Voice Majors (8 units)
- 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, dance, or acting elective (1 unit)
- 3 dance classes (.33 unit each; 1 unit total)

It is also recommended that sophomores enroll in THEATRE 272 Special Topics: Music Theatre.

Certificate Requirements for Theatre Majors (9 units)
- 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)
- 6 dance classes (.33 unit each; 2 units total)

It is also recommended that sophomores enroll in THEATRE 272 Special Topics: Music Theatre.

Service Learning

The Service Learning Certificate Program (SLCP) is a two-year, five-academic-quarter program open to all undergraduate students. The program not only allows students to earn credit for their interest in community service but also provides a structured and effective approach for fostering continued civic engagement. The certificate program requires students to complete five credits of course work:
- SESP 202 Introduction to Community Development
- COMM ST 395 Topics in Communication Studies or SESP 351 Leadership and Community Decision Making
- 1 additional elective course that reflects the principles of the Service Learning Certificate
- SESP 299-1 Capstone Research and SESP 299-2 Capstone Project, independent study courses leading to completion of a capstone project

Students are required to perform 100 hours of community service and attend five quarters of biweekly facilitated reflection seminars. The certificate is awarded upon completion of a capstone project that requires both challenging scholarship and relevance to a community organization. For more information and an application, contact the Office of Student Affairs in the School of Education and Social Policy.

Sound Design

Funded by a cross-school initiative and involving faculty from the School of Communication, the School of Music, and Weinberg College of Arts and Sciences, the Program in Sound Design offers a certificate in sound design to School of Communication and School of Music students and a minor to Weinberg students who are accepted and who complete the required 7 courses (see below).

Among the visiting artists recently hosted by the program are Andre Pluess *(Eleven Rooms of Proust*, *I Am My Own Wife)*, Midge Costin *(Broken Arrow)*, Shawn Decker (professor of sound at the School of the Art Institute of Chicago), James O'Brien (*The Good Girl* and the BMW film series), Steven Streibig (president, iontank.com, and creative director of a schizophrenia VR environment featured on NPR), John Corbett (sound artist, critic, radio personality, and professor of sound at the School of the Art Institute of Chicago), and Mike Knobloch (vice president of film music for Fox). Additional information, an application, course listings, and samples of student work can be found at www.sounddesign.northwestern.edu. Applications may be submitted in November and May. The program is open to students of sophomore rank or higher. Up to 12 students per year are accepted.

Students are required to take 3 core courses to acquire a broad foundation in theory, production, and practice. Electives then allow them to specialize in a particular domain (sound design for film, sound design for theatre, sound design for radio, sound design for new media, sound design for installations), but students may opt to continue studying sound as it relates to a broad range of media.

Under the guidance of a faculty mentor, students may receive credit for designing the sound for film/video, new media, installation/exhibition, radio, and theatre projects. Pending faculty approval, students may receive credit for designing sound for Niteskool and Studio 22 film/video projects. Mentors are drawn from faculty listed as participating in the program or other interested faculty.

Practicums might also involve faculty-led research projects or artistic collaborations between a faculty member and student(s). Students may also participate in sound-oriented internships at a sound house, a theater company, a production house, a radio station, or another appropriate venue. With the approval of the program director, a practicum or internship or series of practicums or internships may be counted as one of the required electives.

Certificate Requirements (7 units)
- RTVF 384-0 Foundations of Sound Design
- 2 of the following courses in basic audio production and processing techniques:
  MUS TECH 321 Producing in the Virtual Studio
  MUS TECH 322 Recording and Basic Audio
  MUS TECH 340 Composing with Computers

MUS TECH 342-1,2 Computer Sound Synthesis
RTVF 383 Sound Production

- 4 electives (300 level or above); possible electives include (but are not limited to) production courses listed above that are not selected as part of the core sequence as well as ART 340, 390-1; CSD 306; EECS 330, 351; MUS TECH 337, 338, 343, 345, 348; RTVF 330, 341, 360, 379, 398; THEATRE 353, 363

Undergraduate Leadership

The Undergraduate Leadership Program (ULP) is an interschool certificate program open to first- and second-year undergraduates. Initially supported by the W. K. Kellogg Foundation, 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, retreats, and self-study, 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

Students are required to take the first ULP course, Paradigms and Strategies of Leadership, during their first or second year as undergraduates. Following that introductory course, a second macro-level course is required; this class complements Paradigms and Strategies of Leadership, providing students with a macro-level exploration of leadership. Students may choose from a preapproved list of courses that touch on macro-level leadership issues or may petition to take a related course of their choosing. The program also requires 2 quarters of the zero-credit Leadership Education Seminar.

In addition, students attend two retreats as part of the program. The first, an outdoor adventure education retreat, takes place during the Paradigms and Strategies of Leadership course. The second, a retreat in Chicago neighborhoods, takes place the following fall quarter. Finally, students engage in self-study consisting of two externships and a self-interview. This is designed so that students can reflect on their learning during the program and explore possible career opportunities. The program offers additional courses and opportunities to further explore leadership beyond the certificate.

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 a lab group with six peers. Students are videotaped taking turns facilitating lab meetings, discussing leadership concepts, and working to produce a final project. Students also attend an experiential education retreat. Extensive personal and group feedback is provided throughout the quarter.

GEN CMN 206-1,2 Leadership Education Seminar (0) Presents students with a number of experiences during fall and winter quarters from which they may draw whatever leadership lessons they choose. Students have the option of attending weekly lectures led by leaders from school, community, and corporate sectors; attending various workshops; or attending lectures by other speakers on campus and beyond.

CENTER OFFERING UNDERGRADUATE COURSES

Center for the 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 a visiting writer-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

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) chairs Northwestern's Department of Naval Science. 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** 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 One 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 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 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 www.iit.edu/admission/undergrad/programs/pdf/courses_ug.pdf.

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.

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, business, law, and social justice)
- 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 Kaplan Institute for the Humanities)
- Internships in Media Production (radio/television/film)

- Internship in Women's Services (gender studies)
- Journalism Residency (journalism)
- Los Angeles Internship Program (communication)
- New York Internship Program (communication)
- Northwestern Archaeological Field School (anthropology)
- Performance Studies Field Studies (performance studies)
- Political Campaigning (political science)
- Professional Apprenticeship in Music Education (music)
- Field study in San Francisco or Washington, D.C. (education and social policy; open to all majors)
- Teaching Practicum (education and social policy)
- Theatre Field Studies (theater)
- Walter P. Murphy Cooperative Engineering Education Program (engineering)