

# College of Computer and Information Science

[www.ccs.neu.edu/undergraduate](http://www.ccs.neu.edu/undergraduate)

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The invention of powerful computers and the development of complex software programs have fundamentally transformed the way people work and live. Computers are now essential tools in business, industry, science, medicine, and human services. Computers also enhance the efforts of individuals and volunteer groups to meet their goals. In addition, the most sophisticated work in music, film, and video often makes use of computer technology. The College of Computer and Information Science believes that computing is one of the most exciting fields of study and that its applications are limitless.

The college offers undergraduate degree programs in computer science (BS and BA) and information science (BS), and dual majors with biology, business administration, cognitive psychology, mathematics, multimedia studies, music with concentration in music technology, and physics, as well as a dual major in computer science and information science. The BS in computer science emphasizes strong technical competence in computer science, mathematics, science, and electrical engineering while the BA in computer science combines computer science with a broad-based liberal arts education. The BS in information science integrates studies in computer science, information science, business, psychology, and social science. Each of the dual majors offers the opportunity for intense study in two disciplines. The BS in computer science follows the ACM-IEEE Curriculum 2001 recommendations and is accredited by the Computing Accreditation Commission of ABET.

See pages 299–302 for computer science course descriptions and pages 363–364 for information science course descriptions.

## Academic Progression Standards

The following are the minimum requirements for freshmen to achieve sophomore status.

- At least 25 SHs of credit
- A minimum overall GPA of 1.800
- A minimum computer science GPA of 1.800
- Successful completion of the following required courses:
  - CS U211 and CS U200, each with a grade of at least C–
  - ENG U111 or equivalent ENG U102
  - An arts and sciences core course

The minimum overall GPA values required for students to advance to the next rank and to graduate are:

Middler	2.000
Junior	2.000
Senior	2.000
To graduate	2.000

In addition, students must achieve a minimum overall GPA of 2.000 and a minimum overall GPA in CS/IS courses of 2.000 for graduation.

## Computer Science

Computer science involves the application of theoretical concepts in the context of software development to the solution of problems that arise in almost every human endeavor. Computer science as a discipline draws its inspiration from mathematics, logic, science, and engineering. From these roots, computer science has fashioned paradigms for program structures, algorithms, data representations, efficient use of computational resources, robustness and security, and communication within computers and across networks. The ability to frame problems, select computational models, design program structures, and develop efficient algorithms is as important in computer science as software implementation skill. Computer science is concerned with bringing together all of the intellectual resources needed to enable the rapid and effective development of software to meet the needs of business, research, and end users.

The goal of the undergraduate program in computer science is to teach students the conceptual and practical skills that will enable them to contribute to the development of computational principles and to play a productive role in the software community. To that end, the undergraduate program focuses on the fundamentals of program design including object-oriented design, software development, computer organization, systems and networks, theory of computation, principles of languages, and advanced algorithms and data. The program also offers a variety of electives at the upper undergraduate and beginning graduate levels ranging from more theoretical courses to those that focus on important applications.

## BSCS—Bachelor of Science in Computer Science

### COMPUTER SCIENCE MAJOR REQUIREMENTS

#### Computer Science Overview

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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#### Computer Science Fundamental Courses

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH

CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

#### Computer Science Required Courses

Complete the following seven courses:

CS U370	Object-Oriented Design	4 SH
CS U380	Computer Organization	4 SH
CS U390	Theory of Computation	4 SH
CS U480	Systems and Networks	4 SH
CS U660	Programming Languages	4 SH
CS U670	Software Development	4 SH
CS U690	Algorithms and Data	4 SH

#### Computer Science Senior Seminar

Complete the following course:

CS U600	Senior Seminar	1 SH
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#### Computer Science Capstone

Complete one of the following courses (thus satisfying the NU Core capstone requirement):

CS U520	Artificial Intelligence	4 SH
CS U540	Computer Graphics	4 SH
CS U610	Honors Senior Seminar	4 SH
CS U675	Web Development	4 SH

#### Computer Science Upper-Division Electives

Complete two computer science upper-division electives. With advisor approval, directed study, project study, and appropriate graduate-level courses may also be taken as upper-division electives.

CS U400 to CS U999		
IS U535	Information Retrieval	4 SH
IS U570	Human Computer Interaction	4 SH

### ADDITIONAL COURSES

#### Mathematics Courses

Complete the following four courses. A grade of C– or higher is required in MTH U241 and MTH U242:

MTH U241	Calculus 1 for Science and Engineering	4 SH
MTH U242	Calculus 2 for Science and Engineering	4 SH
MTH U371	Linear Algebra	4 SH
MTH U481	Probability and Statistics	4 SH

#### Computers and Society

Complete the following course:

SOC U528	Computers and Society	4 SH
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#### Science Requirement

Complete two courses with corresponding labs and recitations for one of the following sciences:

##### BIOLOGY

Complete the following course with corresponding lab:

BIO U111	General Biology 1	4 SH
with BIO U112	Lab for BIO U111	1 SH

and complete a second course with corresponding lab from the following list:

BIO U113	General Biology 2	4 SH
with BIO U114	Lab for BIO U113	1 SH
BIO U301	Genetics and Molecular Biology	4 SH
with BIO U302	Lab for BIO U301	1 SH

**CHEMISTRY**

Complete the following two courses with corresponding labs:

CHM U211	General Chemistry 1	4 SH
with CHM U212	Lab for CHM U211	1 SH
CHM U214	General Chemistry 2	4 SH
with CHM U215	Lab for CHM U214	1 SH

**GEOLOGY/ENVIRONMENTAL SCIENCE (OPTION 1)**

Complete the following two courses with corresponding labs:

ENV U200	Dynamic Earth	4 SH
with ENV U201	Lab for ENV U200	1 SH
ENV U220	History of Earth and Life	4 SH
with ENV U221	Interpreting Earth History	1 SH

**GEOLOGY/ENVIRONMENTAL SCIENCE (OPTION 2)**

Complete the following course with corresponding lab:

ENV U200	Dynamic Earth	4 SH
with ENV U201	Lab for ENV U200	1 SH

and complete an additional course with corresponding lab from the following list:

ENV U310	Earth Materials	4 SH
with ENV U311	Lab for ENV U310	1 SH
ENV U340	Earth Landforms and Processes	4 SH
with ENV U341	Lab for ENV U340	1 SH
ENV U520	Applied Hydrogeology	4 SH
with ENV U521	Lab for ENV U520	1 SH
ENV U544	Sedimentation	4 SH
with ENV U545	Lab for ENV U544	1 SH
ENV U546	Coastal Processes	4 SH
with ENV U547	Lab for ENV U546	1 SH
ENV U560	Geographic Information Systems	4 SH
with ENV U561	Lab for ENV U560	1 SH

**GEOLOGY/ENVIRONMENTAL SCIENCE (OPTION 3)**

Complete the following two courses with corresponding labs:

ENV U220	History of Earth and Life	4 SH
with ENV U221	Interpreting Earth History	1 SH
ENV U542	Fossils and Paleoecology	4 SH
with ENV U543	Lab for ENV U542	1 SH

**PHYSICS**

Complete one of the following sequences of courses:

**SEQUENCE A**

PHY U161	Physics 1	4 SH
with PHY U162	Lab for PHY U161	1 SH
PHY U165	Physics 2	4 SH
with PHY U166	Lab for PHY U165	1 SH

**SEQUENCE B**

PHY U145	Physics for Life Sciences 1	4 SH
with PHY U146	Lab for PHY U145	1 SH
PHY U147	Physics for Life Sciences 2	4 SH
with PHY U148	Lab for PHY U147	1 SH

**SEQUENCE C**

PHY U151	Physics for Engineering 1	4 SH
with PHY U152	Lab for PHY U151	1 SH
PHY U155	Physics for Engineering 2	4 SH
with PHY U156	Lab for PHY U155	1 SH

**Electrical Engineering**

Complete the following course:

ECE U230	Computer Architecture for Computer Scientists	4 SH
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**ELECTIVES OUTSIDE COMPUTER AND INFORMATION SCIENCE****Depth or Breadth Elective Requirement**

Complete three courses from either the depth option or the breadth option:

**DEPTH**

Complete three courses in one department outside CS and IS with at least one at the intermediate level. *Note:* For the purposes of this requirement, all business courses are considered to be in a single department.

**BREADTH**

Complete three courses in the arts, humanities, or social sciences.

**Remaining Electives**

Complete five elective courses. Two of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement and the NU Core social science level 1 requirement as described on page 24. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**COMPUTER SCIENCE CREDIT REQUIREMENTS**

Complete 60 semester hours in the major.

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

134 total semester hours required

Minimum 2.000 GPA required

**BACS—Bachelor of Arts in Computer Science****COMPUTER SCIENCE MAJOR REQUIREMENTS****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

**Computer Science Required Courses**

Complete the following six courses:

CS U370	Object-Oriented Design	4 SH
CS U380	Computer Organization	4 SH
CS U390	Theory of Computation	4 SH
CS U480	Systems and Networks	4 SH
CS U670	Software Development	4 SH
CS U690	Algorithms and Data	4 SH

**Computer Science Senior Seminar**

Complete the following course:

CS U600	Senior Seminar	1 SH
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**Computer Science Capstone**

Complete one of the following courses (thus satisfying the University capstone requirement):

CS U520	Artificial Intelligence	4 SH
CS U540	Computer Graphics	4 SH
CS U610	Honors Senior Seminar	4 SH
CS U675	Web Development	4 SH

**ADDITIONAL COURSES FOR BA****Mathematics Courses**

Complete the following three courses. A grade of C– or higher is required in MTH U241 and MTH U242:

MTH U241	Calculus 1 for Science and Engineering	4 SH
MTH U242	Calculus 2 for Science and Engineering	4 SH
MTH U481	Probability and Statistics	4 SH

**Science Courses**

Complete one course with corresponding lab and recitation from one of the following groups:

**BIOLOGY**

BIO U111	General Biology 1	4 SH
with BIO U112	Lab for BIO U111	1 SH

**CHEMISTRY**

CHM U101	General Chemistry for Health Sciences	4 SH
with CHM U102	Lab for CHM U101	1 SH
CHM U151	General Chemistry for Engineers	4 SH
with CHM U152	Lab for CHM U151	1 SH

**GEOLOGY/ENVIRONMENTAL SCIENCE**

ENV U200	Dynamic Earth	4 SH
with ENV U201	Lab for ENV U200	1 SH
ENV U220	History of Earth and Life	4 SH
with ENV U221	Interpreting Earth History	1 SH

**PHYSICS**

PHY U145	Physics for Life Sciences 1	4 SH
with PHY U146	Lab for PHY U145	1 SH
PHY U151	Physics for Engineering 1	4 SH
with PHY U152	Lab for PHY U151	1 SH
PHY U161	Physics 1	4 SH
with PHY U162	Lab for PHY U161	1 SH

**Computers and Society**

Complete the following course:

SOC U528	Computers and Society	4 SH
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**UPPER-DIVISION ELECTIVE****Computer Science or Mathematics Upper-Division Elective**

Complete one upper-division course from the CS, IS, or MTH departments. With advisor approval, a directed study, project study, or appropriate graduate-level course may also be taken as a computer science elective.

CS U400 to CS U699

IS U535	Information Retrieval	4 SH
IS U570	Human Computer Interaction	4 SH
MTH U301 to MTH U581		

**REQUIRED GENERAL ELECTIVES**

Complete ten general electives. One of these electives must be used to satisfy the NU Core social science level 1 requirement. One of the electives must be an arts course from the NU Core arts/humanities level 1 domain, and one must be a humanities course from the NU Core arts/humanities level 1 domain. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives. *Note:* For this requirement, an arts course is defined to be any course in the NU Core arts/humanities level 1 domain, which is in the ARC, ART, MUS, or THE department or is cross-listed with a course in the ARC, ART, MUS, or THE department. A humanities course is defined to be any course in the NU Core arts/humanities level 1 domain that is not an arts course.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**COMPUTER SCIENCE CREDIT REQUIREMENT**

Complete 48 semester hours in the major.

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**COLLEGE REQUIREMENTS FOR BA**

Complete the College of Arts and Sciences college requirements for the BA degree, including the three required foreign language courses. See page 38 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

133 total semester hours required

Minimum 2.000 GPA required

## Minor in Computer Science

The requirements for the minor in computer science are shown below. Students who wish to take a particular course must have taken its prerequisites listed in the catalog.

*Note:* Electrical and computer engineering students should contact the College of Computer and Information Science about course substitutions that ease completion of the minor in computer science.

### REQUIRED COURSES

Complete the following two courses with corresponding labs.

A grade of C– or higher is required:

CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH

### COMPUTER SCIENCE ELECTIVES

Complete three courses from the following list:

CS U300 to CS U699

IS U535	Information Retrieval	4 SH
IS U570	Human Computer Interaction	4 SH

### GPA REQUIREMENT

2.000 GPA required in the minor

## Information Science

Making the most of information technology—ensuring that it serves the goals and needs of users, clients, and society—is a tremendous challenge, one that requires a unique blend of knowledge and skills. The field of information science (IS) focuses on the relationship between computers, the people who use them, and the contexts in which they operate. IS seeks to further our understanding of: (1) information itself: where it comes from, how it is organized, and how it is used; (2) the design of computer applications that are usable, socially acceptable, and achieve the goals for which they were created; (3) the impact of information technology (IT) on human life and work; and (4) how the nature of the information, the goals of the users, and the relevant social policies and laws both influence and are influenced by the technical aspects of computer systems.

Information science majors acquire a strong technical foundation by taking classes in mathematics, logic, and computer science. They also require a strong foundation in behavioral science by taking classes in cognitive psychology, economics, and statistics. A course in the principles of information science introduces students to important intellectual frameworks such as decision theory, general systems theory, and social informatics, and to topics of current importance such as digital copyright, trusted systems, and Internet privacy policy. Building on these foundations, the IS core develops expertise in the design, management, and evaluation of information technology-based resources and systems. Elective courses cover topics such as text/hypertext retrieval, artificial intelligence, information security, e-commerce, and data mining.

## BSIS—Bachelor of Science in Information Science

### COMPUTER SCIENCE COURSES

#### Computer Science Overview

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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#### Computer Science Fundamental Courses

Complete the following four courses, with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

#### Computer Science Required Courses

Complete the following four courses:

CS U370	Object-Oriented Design	4 SH
CS U380	Computer Organization	4 SH
CS U430	Database Design	4 SH
CS U480	Systems and Networks	4 SH

### INFORMATION SCIENCE COURSES

#### Required Courses in Information Science

Complete the following six courses:

IS U300	Principles of Information Science	4 SH
IS U470	Information System Design and Development	4 SH
IS U570	Human Computer Interaction	4 SH
IS U580	Empirical Research Methods	4 SH
IS U691	Information Science Field Study	1 SH
IS U692	Information Science Senior Project	5 SH

#### Managing Information

Complete the following course:

MIS U305	Information Resource Management	4 SH
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#### Computers and Society

Complete the following course:

SOC U528	Computers and Society	4 SH
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#### Information Science Electives

Complete two courses from the following list:

CS U300 to CS U999

IS U301 to IS U999

ACC U209	Financial Accounting and Reporting	4 SH
ACC U403	Accounting Information Systems	4 SH
CMN U231	Principles of Organizational Communication	4 SH

CMN U531	Advanced Organizational Communication	4 SH
CMN U532	Theories of Conflict and Negotiation	4 SH
ECN U560	Applied Econometrics	4 SH
ENG U450	Syntax	4 SH
ENG U452	Semantics	4 SH
LIN U450	Syntax	4 SH
LIN U452	Semantics	4 SH
LIN U464	Psychology of Language	4 SH
LIN U520	Language and the Brain	4 SH
LIN U610	Laboratory in Psycholinguistics	4 SH
MIS U408	Knowledge Management	4 SH
MIS U501	Business Systems Integration	4 SH
POL U390	Science, Technology, and Public Policy	4 SH
PSY U450	Learning and Motivation	4 SH
PSY U452	Sensation and Perception	4 SH
PSY U458	Psychobiology	4 SH
PSY U464	Psychology of Language	4 SH
PSY U520	Language and the Brain	4 SH
PSY U604	Laboratory in Learning and Motivation	4 SH
PSY U606	Laboratory in Psychobiology	4 SH
PSY U612	Laboratory in Cognition	4 SH
PSY U622	Laboratory in Sensation and Perception	4 SH

### MATHEMATICS REQUIREMENTS

#### Calculus

Complete the following course with a grade of C– or higher:

MTH U241	Calculus 1 for Science and Engineering	4 SH
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#### Statistics

Complete the following course:

ECN U350	Statistics	4 SH
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### BEHAVIORAL SCIENCE FOUNDATIONS

#### Economics

Complete the following course:

ECN U116	Principles of Microeconomics	4 SH
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#### Psychology

Complete the following two courses:

PSY U101	Foundations of Psychology	4 SH
PSY U466	Cognition	4 SH

#### Organizational Behavior

Complete the following course:

HRM U209	Organizational Behavior	4 SH
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### REQUIRED GENERAL ELECTIVES

#### Science Elective

One general elective must be a science course chosen from the NU Core science/technology level 1 domain. This course may not be a technology course. Corresponding lab must be taken with lecture where applicable. *Note:* For this requirement, a science course is defined to be any course in the NU Core science/technology level 1 domain that is not in the College of Computer and Information Science nor in the College of Engineering.

#### Additional General Electives

Complete six additional general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

### INFORMATION SCIENCE MAJOR CREDIT REQUIREMENT

Complete 73 semester hours in CS and IS courses for the major.

### MAJOR GPA REQUIREMENT

Minimum 2.000 GPA required in all CS and IS courses

### NU CORE REQUIREMENTS

See page 24 for requirement list.

### GENERAL ELECTIVES

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

### COOPERATIVE EDUCATION

### UNIVERSITY-WIDE REQUIREMENTS

133 total semester hours required

Minimum 2.000 GPA required

### Minor in Information Science

The requirements for the minor in information science are shown below. Students who wish to take a particular course must have taken its prerequisites listed in the catalog.

### REQUIRED COURSES

Complete the following three courses with corresponding labs, where applicable. A grade of C– or higher is required in CS U211 and CS U213:

CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
IS U300	Principles of Information Science	4 SH

### INFORMATION SCIENCE ELECTIVES

Complete two courses from the following list:

CS U430	Database Design	4 SH
IS U300 to IS U699		

### GPA REQUIREMENT

2.000 GPA required in the minor

### Dual Majors

The college offers dual majors with biology, business administration, cognitive psychology, mathematics, multimedia studies, music with concentration in music technology, and physics, as well as a dual major in computer science and information science. Each of the dual majors offers the opportunity for intense study in two disciplines with appropriate breadth in the liberal arts. Students take eight to twelve courses in each

discipline and two or three integrative courses that bind the disciplines together. These programs offer an excellent educational opportunity for the ambitious student.

## BS in Computer Science and Information Science

### COMPUTER SCIENCE COURSES

#### Computer Science Overview

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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#### Computer Science Fundamental Courses

Complete the following four courses, with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

#### Computer Science Required Courses

Complete the following eight courses:

CS U370	Object-Oriented Design	4 SH
CS U380	Computer Organization	4 SH
CS U390	Theory of Computation	4 SH
CS U430	Database Design	4 SH
CS U480	Systems and Networks	4 SH
CS U660	Programming Languages	4 SH
CS U670	Software Development	4 SH
CS U690	Algorithms and Data	4 SH

### INFORMATION SCIENCE COURSES

Required Courses in Information Science

Complete the following six courses:

IS U300	Principles of Information Science	4 SH
IS U470	Information System Design and Development	4 SH
IS U570	Human Computer Interaction	4 SH
IS U580	Empirical Research Methods	4 SH
IS U691	Information Science Field Study	1 SH
IS U692	Information Science Senior Project	5 SH

#### Computers and Society

Complete the following course:

SOC U528	Computers and Society	4 SH
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#### Managing Information

Complete the following course:

MIS U305	Information Resource Management	4 SH
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### BEHAVIORAL SCIENCE FOUNDATIONS

#### Economics

Complete the following course:

ECN U116	Principles of Microeconomics	4 SH
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#### Psychology

Complete the following course:

PSY U101	Foundations of Psychology	4 SH
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#### Organizational Behavior

Complete the following course:

HRM U209	Organizational Behavior	4 SH
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### MATHEMATICS AND STATISTICS REQUIREMENTS

#### Calculus

Complete the following two courses with a grade of C– or higher in MTH U241:

MTH U241	Calculus 1 for Science and Engineering	4 SH
MTH U371	Linear Algebra	4 SH

#### Statistics

Complete the following course:

ECN U350	Statistics	4 SH
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### REQUIRED GENERAL ELECTIVES

#### Science Elective

One general elective must be a science course chosen from the NU Core science/technology level 1 domain. This course may not be a technology course. Corresponding lab must be taken with lecture where applicable. *Note:* For this requirement, a science course is defined to be any course in the NU Core science/technology level 1 domain that is not in the College of Computer and Information Science nor in the College of Engineering.

#### Additional General Electives

Complete four additional general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

### MAJOR GPA REQUIREMENT

Minimum 2.000 GPA required in all CS and IS courses

### COMPUTER SCIENCE CREDIT REQUIREMENT

Complete 51 semester hours in computer science.

### INFORMATION SCIENCE CREDIT REQUIREMENT

Complete 30 semester hours in information science.

### NU CORE REQUIREMENTS

See page 24 for requirement list.

### GENERAL ELECTIVES

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

### COOPERATIVE EDUCATION

### UNIVERSITY-WIDE REQUIREMENTS

133 total semester hours required  
Minimum 2.000 GPA required

**BS in Computer Science and Biology****COMPUTER SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete one of the following sets:

CS U221	Computer/Information Science Overview 1	1 SH
and CS U222	Computer/Information Science Overview 2	1 SH
BIO U100	Biology/Biochemistry at Northeastern	1 SH
and BIO U106	Introduction to Experiential Education	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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**Computer Science Fundamental Courses**

Complete the following four courses with a grade of C– or higher:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

**Computer Science Required Courses**

Complete the following three courses:

CS U370	Object-Oriented Design	4 SH
CS U430	Database Design	4 SH
CS U670	Software Development	4 SH

**Senior Seminar**

Complete the following course:

CS U600	Senior Seminar	1 SH
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**Computer Science Integrative Courses**

Complete the following two courses:

CS U390	Theory of Computation	4 SH
CS U690	Algorithms and Data	4 SH

**BIOLOGY COURSES****Required Biology**

Complete one course with corresponding lab for Biology 1, Biology 2, and Genetics and Molecular Biology:

BIOLOGY 1		
BIO U101	Principles of Biology 1	4 SH
with BIO U102	Lab for BIO U101	1 SH
BIOLOGY 2		
BIO U103	Principles of Biology 2	4 SH
with BIO U104	Lab for BIO U103	1 SH
GENETICS AND MOLECULAR BIOLOGY		
BIO U301	Genetics and Molecular Biology	4 SH
with BIO U302	Lab for BIO U301	1 SH

**Biology Capstone**

Complete the following course:

BIO U701	Biology Capstone	4 SH
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**Biology Integrative Courses**

Complete one of the following courses with corresponding lab, where applicable:

BIO G308	Bio IT Methods 1—Genome and Proteome Analysis	4 SH
BIO G309	Bio IT Methods 2—Protein Structure and Systems	4 SH
BIO U521	Experimental Design Marine Ecology	4 SH
with BIO U522	Lab for BIO U521	1 SH

**Intermediate and Advanced Biology Electives**

Complete two biology courses (with labs if offered, 9–10 semester hours total) at level 311 or above. At least one course (with corresponding lab, 5 semester hours total) must be from the following list:

BIO U311	Ecology	4 SH
with BIO U312	Lab for BIO U311	1 SH
BIO U313	Plant Biology	4 SH
with BIO U314	Lab for BIO U313	1 SH
BIO U315	Invertebrate Zoology	4 SH
with BIO U316	Lab for BIO U315	1 SH
BIO U317	Vertebrate Zoology	4 SH
with BIO U318	Lab for BIO U317	1 SH
BIO U319	Regulatory Cell Biology	4 SH
with BIO U320	Lab for BIO U319	1 SH
BIO U321	Microbiology	4 SH
with BIO U322	Lab for BIO U321	1 SH
BIO U323	Biochemistry	4 SH
with BIO U324	Lab for BIO U323	1 SH

An additional course (with lab, if offered, 4–5 semester hours total) must be in the following range:

BIO U311 to BIO U699

**Chemistry Courses**

Complete the following four courses with corresponding labs:

CHM U211	General Chemistry 1	4 SH
with CHM U212	Lab for CHM U211	1 SH
CHM U214	General Chemistry 2	4 SH
with CHM U215	Lab for CHM U214	1 SH
CHM U311	Organic Chemistry 1	4 SH
with CHM U312	Lab for CHM U311	1 SH
CHM U313	Organic Chemistry 2	4 SH
with CHM U314	Lab for CHM U313	1 SH

**MATHEMATICS REQUIREMENTS**

Complete the following two calculus courses with a grade of C– or higher, and complete the probability and statistics course:

**Calculus**

MTH U151	Calculus and Differential Equations for Biology 1	4 SH
MTH U152	Calculus and Differential Equations for Biology 2	4 SH

**Probability and Statistics**

MTH U481	Probability and Statistics	4 SH
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**COMPUTERS AND SOCIETY**

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete six general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement and one must be used to satisfy the NU Core social science level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

140 total semester hours required

Minimum 2.000 GPA required

**BS in Computer Science and Business Administration****COMPUTER SCIENCE COURSES***Computer Science Overview*

Freshmen or freshmen transfers complete the following two courses:

CS U221 Computer/Information Science Overview 1 1 SH

CS U222 Computer/Information Science Overview 2 1 SH

Upper-level transfer students complete the following course:

CS U223 Computer/Information Science Co-op Preparation 1 SH

*Computer Science Fundamental Courses*

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200 Discrete Structures 4 SH

CS U211 Fundamentals of Computer Science 1 4 SH

with CS U212 Lab for CS U211 1 SH

CS U213 Fundamentals of Computer Science 2 4 SH

with CS U214 Lab for CS U213 1 SH

CS U290 Logic and Computation 4 SH

*Computer Science Required Courses*

Complete the following six courses:

CS U370 Object-Oriented Design 4 SH

CS U380 Computer Organization 4 SH

CS U390 Theory of Computation 4 SH

CS U430 Database Design 4 SH

CS U480 Systems and Networks 4 SH

CS U670 Software Development 4 SH

*Computer Science Senior Seminar*

Complete the following course:

CS U600 Senior Seminar 1 SH

*Upper-Division CS Elective*

Complete one upper-division CS elective. With advisor approval, a directed study, project study, or appropriate graduate-level course may also be taken as a computer science elective:

CS U400 to CS U999

IS U535 Information Retrieval 4 SH

IS U570 Human Computer Interaction 4 SH

**BUSINESS COURSES***Required Business Courses*

Complete the following seven courses:

ACC U201 Financial Accounting and Reporting 4 SH

ACC U301 Managerial Accounting 4 SH

FIN U201 Financial Management 4 SH

HRM U201 Organizational Behavior 4 SH

MGT U501 Strategy in Action 4 SH

MKT U201 Introduction to Marketing 4 SH

MSC U201 Business Statistics 4 SH

**BUSINESS CONCENTRATION**

Complete a four-course business concentration other than management information systems from the list “BSBA Business Concentrations” on page 187.

**INFORMATION RESOURCE MANAGEMENT***Information Resource Management*

Complete the following course. *Note:* MIS U305 is an integrative course:

MIS U305 Information Resource Management 4 SH

**MATHEMATICS AND GENERAL REQUIREMENTS***Mathematics*

Complete one of the following courses with a grade of C– or better:

MTH U131 Calculus for Business and Economics 4 SH

MTH U241 Calculus 1 for Science and Engineering 4 SH

*Economics*

Complete the following two courses:

ECN U115 Principles of Macroeconomics 4 SH

ECN U116 Principles of Microeconomics 4 SH

*Computers and Society*

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete three general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives. *Note:* Computer science/business administration dual majors may satisfy the latter requirement by completing the following course:

INB U203 International Business and Global Social Responsibility 4 SH

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

132 total semester hours required

Minimum 2.000 GPA required

**BS in Computer Science and Cognitive Psychology****COMPUTER SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

**Computer Science Required Courses**

Complete the following five courses. *Note:* CS U520, CS U670, and IS U570 are integrative courses:

CS U370	Object-Oriented Design	4 SH
CS U390	Theory of Computation	4 SH
CS U520	Artificial Intelligence	4 SH
CS U670	Software Development	4 SH
IS U570	Human Computer Interaction	4 SH

**Computer Science Senior Seminar**

Complete the following course:

CS U600	Senior Seminar	1 SH
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**Computer Science Elective Courses**

Complete two upper-division computer science courses. With advisor approval, directed study, project study, and appropriate graduate-level courses may also be taken as computer science electives:

CS U380 to CS U999		
IS U535	Information Retrieval	4 SH

**PSYCHOLOGY COURSES****Required Courses**

Complete the following four courses:

PSY U101	Foundations of Psychology	4 SH
PSY U320	Statistics in Psychological Research	4 SH
PSY U464	Psychology of Language	4 SH
PSY U466	Cognition	4 SH

**Advanced Psychology**

Complete one course from the following list:

PSY U452	Sensation and Perception	4 SH
PSY U458	Psychobiology	4 SH

**Laboratory in Psychology**

Complete one course from the following list:

PSY U610	Laboratory in Psycholinguistics	4 SH
PSY U612	Laboratory in Cognition	4 SH
PSY U622	Laboratory in Sensation and Perception	4 SH

**Seminar in Psychology**

Complete one course from the following list:

PSY U658	Seminar in Psycholinguistics	4 SH
PSY U660	Seminar in Cognition	4 SH
PSY U668	Seminar in Sensation and Perception	4 SH

**Psychology Electives**

Complete two courses from the following list: *Note:* Courses satisfying the categories above cannot be reused:

PSY U402	Social Psychology	4 SH
PSY U450	Learning and Motivation	4 SH
PSY U452	Sensation and Perception	4 SH
PSY U458	Psychobiology	4 SH
PSY U520	Language and the Brain	4 SH
PSY U522	Psychology of Reading	4 SH
PSY U524	Cognitive Development	4 SH
PSY U526	Categorization and Reasoning	4 SH
PSY U610	Laboratory in Psycholinguistics	4 SH
PSY U612	Laboratory in Cognition	4 SH
PSY U622	Laboratory in Sensation and Perception	4 SH
PSY U652	Seminar in Ethics in Psychology	4 SH
PSY U658	Seminar in Psycholinguistics	4 SH
PSY U660	Seminar in Cognition	4 SH
PSY U668	Seminar in Sensation and Perception	4 SH
PSY U970	Junior/Senior Project 1	4 SH
with PSY U971	Junior/Senior Project 2	4 SH

**ADDITIONAL REQUIREMENTS****Calculus**

Complete the following course with a grade of C– or better:

MTH U241	Calculus 1 for Science and Engineering	4 SH
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**Computers and Society**

Complete the following course:

SOC U528	Computers and Society	4 SH
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**REQUIRED GENERAL ELECTIVES**

Complete eight general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

132 total semester hours required

Minimum 2.000 GPA required

**BS in Computer Science and Digital Arts**

*Note:* "TBD" stands for "to be determined." Courses so marked are pending approval.

**COMPUTER SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
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CS U222	Computer/Information Science Overview 2	1 SH
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Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
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CS U211	Fundamentals of Computer Science 1	4 SH
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with CS U212	Lab for CS U211	1 SH
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CS U213	Fundamentals of Computer Science 2	4 SH
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with CS U214	Lab for CS U213	1 SH
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CS U290	Logic and Computation	4 SH
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**Computer Science Required Courses**

Complete the following four courses:

CS U370	Object-Oriented Design	4 SH
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CS U390	Theory of Computation	4 SH
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CS U430	Database Design	4 SH
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CS U670	Software Development	4 SH
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**Computer Science Senior Seminar**

Complete the following course:

CS U600	Senior Seminar	1 SH
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**Integrative Courses**

Complete the following two courses:

CS U540	Computer Graphics	4 SH
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IS U570	Human Computer Interaction	4 SH
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**Computer Science Elective Courses**

Complete two upper-division computer science courses. With advisor approval, directed study, project study, and appropriate graduate-level courses may also be taken as computer science electives:

CS U380 to CS U999

IS U535	Information Retrieval	4 SH
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**DIGITAL ARTS COURSES****Required Digital Arts Courses**

Complete the following five courses with corresponding labs, as indicated:

ART U130	Visual Studies Foundation 1	4 SH
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with ART U123	2D Tools: Imaging Basics	1 SH
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ART U131	Visual Studies Foundation 2	4 SH
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with ART U125	3D Tools: Form Basics	1 SH
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TBD	4D Foundation	4 SH
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with TBD	4D Tools: Motion Basics	1 SH
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TBD	Ideation Foundation	4 SH
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ART U575	Animation Studio 4	4 SH
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or ART U710	Senior Project in Photography 1	6 SH
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**Digital Arts Electives**

Complete six courses, with corresponding labs, as indicated, from the five categories below:

**BASICS**

ART U160	Photography 1	4 SH
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with TBD	2D Tools: Imaging Advanced	1 SH
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ART U175	Animation Basics	4 SH
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with TBD	3D Tools: Form Advanced	1 SH
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ART U180	Video Basics	4 SH
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with TBD	4D Tools: Motion Advanced	1 SH
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MTH U131	Calculus for Business and Economics	4 SH
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**PHOTOGRAPHY**

ART U360	Photography 2	4 SH
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ART U385	Still Digital Imaging	4 SH
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ART U601	Alternative Analog and Digital Processes	4 SH
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TBD	Alternative Photo Processes	4 SH
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**ANIMATION**

ART U275	Animation Studio 1	4 SH
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ART U375	Animation Studio 2	4 SH
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ART U475	Animation Studio 3	4 SH
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**VIDEO**

ART U381	Video Project	4 SH
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TBD	Video 2	4 SH
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TBD	Video 3	4 SH
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**CONTEMPORARY DIRECTIONS**

TBD	Contemporary Directions in Digital Arts	4 SH
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**GENERAL REQUIREMENTS****Social Science Level 1**

Complete the following course. *Note:* PSY U101 is required:

PSY U101	Foundations of Psychology	4 SH
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**Mathematics**

Complete the following course:

MTH U371 Linear Algebra 4 SH

**Computers and Society**

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete four general electives. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

135 total semester hours required

Minimum 2.000 GPA required

**BS in Computer Science and Mathematics****COMPUTER SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221 Computer/Information Science Overview 1 1 SH

CS U222 Computer/Information Science Overview 2 1 SH

Upper-level transfer students complete the following course:

CS U223 Computer/Information Science Co-op Preparation 1 SH

**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200 Discrete Structures 4 SH

CS U211 Fundamentals of Computer Science 1 with CS U212 Lab for CS U211 4 SH 1 SH

CS U213 Fundamentals of Computer Science 2 with CS U214 Lab for CS U213 4 SH 1 SH

CS U290 Logic and Computation 4 SH

**Computer Science Required Courses**

Complete the following five courses. *Note:* CS U540 is an integrative course:

CS U370 Object-Oriented Design 4 SH

CS U390 Theory of Computation 4 SH

CS U540 Computer Graphics 4 SH

CS U670 Software Development 4 SH

CS U690 Algorithms and Data 4 SH

**Computer Science Senior Seminar**

Complete the following course:

CS U600 Senior Seminar 1 SH

**Computer Science Elective Courses**

Complete two upper-division computer science courses. With advisor approval, directed study, project study, and appropriate graduate-level courses may also be taken as computer science electives.

CS U380 to CS U999

IS U535 Information Retrieval 4 SH

IS U570 Human Computer Interaction 4 SH

**MATHEMATICS COURSES****Calculus Courses**

Complete the following three courses with a grade of C– or higher in MTH U241 and MTH U242:

MTH U241 Calculus 1 for Science and Engineering 4 SH

MTH U242 Calculus 2 for Science and Engineering 4 SH

MTH U341 Calculus 3 for Science and Engineering 4 SH

**Mathematics Courses**

Complete the following five courses:

MTH U345 Ordinary Differential Equations 4 SH

MTH U371 Linear Algebra 4 SH

MTH U430 Number Theory 4 SH

MTH U481 Probability and Statistics 4 SH

MTH U575 Group Theory 4 SH

**Co-op Seminar Computers and Society**

Complete the following course after the first co-op is completed:

MTH U300 Co-op Reflections Seminar 1 1 SH

**Mathematics Electives**

Complete three upper-division mathematics courses:

MTH U401 to MTH U699

**COMPUTERS AND SOCIETY**

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete seven general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement and one must be used to satisfy the NU Core social science level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses.

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION**

**UNIVERSITY-WIDE REQUIREMENTS**

133 total semester hours required

Minimum 2.000 GPA required

**BS in Computer Science and Multimedia Studies**

Note: "TBD" stands for "to be determined." Courses so marked are pending approval.

**COMPUTER SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

**Computer Science Required Courses**

Complete the following four courses:

CS U370	Object-Oriented Design	4 SH
CS U390	Theory of Computation	4 SH
CS U430	Database Design	4 SH
CS U670	Software Development	4 SH

**Computer Science Senior Seminar**

Complete the following course:

CS U600	Senior Seminar	1 SH
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**Integrative Courses**

Complete the following two courses:

IS U570	Human Computer Interaction	4 SH
MMS U500	Multimedia Studies History	4 SH

**Computer Science Elective Courses**

Complete two upper-division computer science courses. With advisor approval, directed study, project study, and appropriate graduate-level courses may also be taken as computer science electives:

CS U380 to CS U999		
IS U535	Information Retrieval	4 SH

**MULTIMEDIA STUDIES COURSES****Required Courses**

Complete the following eight courses:

ART U130	Visual Studies Foundation 1	4 SH
with ART U123	2D Tools: Imaging Basics	1 SH
TBD	4D Foundation	4 SH
with TBD	4D Tools: Interactive Basics	1 SH
MMS U300	Narrative for Multimedia	4 SH
MMS U305	Programming for Multimedia	4 SH
MMS U400	Hypermedia	4 SH
MMS U700	Multimedia Capstone 1	4 SH
MMS U701	Multimedia Capstone 2	4 SH
MUS U220	Music and Technology 1	4 SH

**Multimedia Studies Electives**

Complete three additional courses from one or more of the following areas:

**MULTIMEDIA STUDIES**

MMS U450	Special Topics in Hypermedia	4 SH
MMS U460	Special Topics in Multimedia	4 SH
MMS U600	Business, Law, and Multimedia	4 SH
MMS U500 to MMS U999		

**ANIMATION AND VIDEO**

ART U131	Visual Studies Foundation 2	4 SH
with ART U125	3D Tools: Form Basics	1 SH
ART U175	Animation Basics	4 SH
with TBD	3D Tools: Form Advanced	1 SH
ART U180	Video Basics	4 SH
ART U275	Animation Studio 1	4 SH
ART U375	Animation Studio 2	4 SH
ART U381	Video Project	4 SH
ART U475	Animation Studio 3	4 SH
with TBD	4D Tools: Motion Advanced	1 SH
TBD	Video 2	4 SH
TBD	Video 3	4 SH

**PHOTOGRAPHY**

ART U160	Photography 1	4 SH
TBD	2D Tools: Imaging Advanced	1 SH
ART U360	Photography 2	4 SH
ART U385	Still Digital Imaging	4 SH
TBD	Studio Photography	4 SH
ART U601	Alternative Analog and Digital Processes	4 SH

**GRAPHIC DESIGN**

ART U333	Design 1 and Drawing	4 SH
ART U334	Typography 1	4 SH
with TBD	2D Tools: Composition Basics	1 SH
ART U635	Time-Based Design	4 SH
ART U644	Interactive Design	4 SH

**MUSIC TECHNOLOGY**

MUS U221	Music and Technology 2	4 SH
MUS U232	Music Recording 1	4 SH
MUS U320	Sound Design	4 SH
MUS U421	Digital Audio Processing	4 SH

**GENERAL REQUIREMENTS****Social Science Level 1**

Complete the following course:

PSY U101 Foundations of Psychology 4 SH

**Computers and Society**

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete five general electives. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA/GRADE REQUIREMENT**

Minimum 2.670 GPA required in all CS and IS courses

A grade of C or higher is required in all major courses.

See page 199 for additional grade and progression requirements.

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

134 total semester hours required

Minimum 2.000 GPA required

**BS in Computer Science and Music with Concentration in Music Technology****COMPUTER SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221 Computer/Information Science Overview 1 1 SH

CS U222 Computer/Information Science Overview 2 1 SH

Upper-level transfer students complete the following course:

CS U223 Computer/Information Science Co-op Preparation 1 SH

**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200 Discrete Structures 4 SH

CS U211 Fundamentals of Computer Science 1 4 SH  
with CS U212 Lab for CS U211 1 SH

CS U213 Fundamentals of Computer Science 2 4 SH  
with CS U214 Lab for CS U213 1 SH

CS U290 Logic and Computation 4 SH

**Computer Science Required Courses**

Complete the following four courses:

CS U370 Object-Oriented Design 4 SH

CS U390 Theory of Computation 4 SH

CS U430 Database Design 4 SH

CS U670 Software Development 4 SH

**Computer Science Senior Seminar**

Complete the following course:

CS U600 Senior Seminar 1 SH

**Computer Science Integrative Course**

Complete the following course:

IS U570 Human Computer Interaction 4 SH

**Computer Science Elective Courses**

Complete two upper-division computer science courses. With advisor approval, directed study, project study, and appropriate graduate-level courses may also be taken as computer science electives:

CS U380 to CS U999

IS U535 Information Retrieval 4 SH

**MUSIC TECHNOLOGY COURSES****Music Theory**

Complete the following two courses with corresponding musicianship courses:

MUS U201 Music Theory 1 4 SH

with MUS U241 Musicianship 1 1 SH

MUS U202 Music Theory 2 4 SH

with MUS U242 Musicianship 2 1 SH

**Music Literature and History**

Complete the following two courses. *Note:* MUS U308 is a prerequisite for MUS U315:

MUS U308 Principles of Music Literature 4 SH

MUS U315 History of Electronic Music 4 SH

**Music Technology**

Complete the following four courses in the order indicated:

MUS U220 Music and Technology 1 4 SH

MUS U221 Music and Technology 2 4 SH

MUS U422 Music Composition Seminar 2 4 SH

MUS U520 Interactive Real-Time Performance 4 SH

**Electronic Composition and Performance**

Complete the following two courses in the order indicated:

MUS U610 Composition for Electronic Instruments 4 SH

MUS U611 Music Technology Capstone/Senior Recital 4 SH

**Music Technology Integrative Course**

Complete the following course:

MUS U421 Digital Audio Processing 4 SH

**Music Lessons**

Complete the following (repeatable) course four times:

MUS U903 Composition Lessons 1 SH

**Music Elective Requirements**

Complete two additional courses from the following list.

*Note:* MUS U303 is a prerequisite for MUS U304; MUS U308 is a prerequisite for MUS U311, MUS U312, and MUS U313:

MMS U305 Programming for Multimedia 4 SH

MUS U233 Music Production for Radio and Web 4 SH

MUS U303	Music Theory 3	4 SH
with MUS U343	Musicianship 3	1 SH
MUS U304	Music Theory 4	4 SH
with MUS U344	Musicianship 4	1 SH
MUS U311	Historical Traditions 1: America	4 SH
MUS U312	Historical Traditions 2: Classical	4 SH
MUS U313	Historical Traditions 3: World	4 SH
MUS U320	Sound Design	4 SH
MUS U699	Advanced Television Production	4 SH

### GENERAL REQUIREMENTS

#### *Foundations of Psychology*

Complete the following course:

PSY U101	Foundations of Psychology	4 SH
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#### *Computers and Society*

Complete the following course:

SOC U528	Computers and Society	4 SH
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### REQUIRED GENERAL ELECTIVES

Complete four general electives. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must be one of the general electives.

### MAJOR GPA REQUIREMENT

Minimum 2.000 GPA required in all CS and IS courses

### NU CORE REQUIREMENTS

See page 24 for requirement list.

### GENERAL ELECTIVES

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

### COOPERATIVE EDUCATION

### UNIVERSITY-WIDE REQUIREMENTS

138 total semester hours required

Minimum 2.000 GPA required

## BS in Computer Science and Physics

### COMPUTER SCIENCE COURSES

#### *Computer Science Overview*

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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#### *Computer Science Fundamental Courses*

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH

CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

#### *Computer Science Required Courses*

Complete the following four courses:

CS U370	Object-Oriented Design	4 SH
CS U390	Theory of Computation	4 SH
CS U670	Software Development	4 SH
CS U690	Algorithms and Data	4 SH

#### *Computer Science Senior Seminar*

Complete the following course:

CS U600	Senior Seminar	1 SH
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#### *Computer Science Elective Course*

Complete one upper-division computer science course. Either this course or one physics elective must satisfy the NU Core capstone requirement. With advisor approval, a directed study, project study, or appropriate graduate-level course may also be taken as a computer science elective:

CS U380 to CS U999		
IS U535	Information Retrieval	4 SH
IS U570	Human Computer Interaction	4 SH

### PHYSICS COURSES

#### *Required Courses*

Complete the following two courses with corresponding labs:

PHY U161	Physics 1	4 SH
with PHY U162	Lab for PHY U161	1 SH
PHY U165	Physics 2	4 SH
with PHY U166	Lab for PHY U165	1 SH

#### *Intermediate Physics*

Complete the following three courses:

PHY U303	Modern Physics	4 SH
PHY U305	Thermodynamics and Statistical Mechanics	4 SH
PHY U371	Electronics	4 SH

#### *Advanced Physics*

Complete the following two courses:

PHY U600	Advanced Physics Laboratory 1	4 SH
PHY U602	Electricity and Magnetism	4 SH

#### *Physics Electives*

Complete two upper-division courses from the PHY department. One of these courses or one computer science elective must satisfy the NU Core capstone requirement:  
PHY U400 to PHY U699

### MATHEMATICS INTEGRATIVE COURSES

#### *Calculus*

Complete the following three courses with a grade of C– or higher in MTH U241 and MTH U242:

MTH U241	Calculus 1 for Science and Engineering	4 SH
MTH U242	Calculus 2 for Science and Engineering	4 SH
MTH U341	Calculus 3 for Science and Engineering	4 SH

#### *Additional Math Requirements*

Complete the following two courses:

MTH U345	Ordinary Differential Equations	4 SH
MTH U525	Applied Analysis	4 SH

**COMPUTERS AND SOCIETY**

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete six general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement and one must be used to satisfy the NU Core social science level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

134 total semester hours required

Minimum 2.000 GPA required

**BS in Information Science and Business Administration****COMPUTER SCIENCE COURSES***Computer Science Overview*

Freshmen or freshmen transfers complete the following two courses:

CS U221 Computer/Information Science Overview 1 SH

CS U222 Computer/Information Science Overview 2 1 SH

Upper-level transfer students complete the following course:

CS U223 Computer/Information Science Co-op Preparation 1 SH

*Computer Science Fundamental Courses*

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200 Discrete Structures 4 SH

CS U211 Fundamentals of Computer Science 1 4 SH

with CS U212 Lab for CS U211 1 SH

CS U213 Fundamentals of Computer Science 2 4 SH

with CS U214 Lab for CS U213 1 SH

CS U290 Logic and Computation 4 SH

*Computer Science Required Courses*

Complete the following two courses:

CS U370 Object-Oriented Design 4 SH

CS U430 Database Design 4 SH

*Computer Science Senior Seminar*

Complete the following course:

CS U600 Senior Seminar 1 SH

*Information Science Required Courses*

Complete the following three courses:

IS U300 Principles of Information Science 4 SH

IS U470 Information System Design and Development 4 SH

IS U580 Empirical Research Methods 4 SH

*Integrative Courses*

Complete the following two courses:

MIS U305 Information Resource Management 4 SH

MIS U404 Business Data Communications 4 SH

*IS Elective*

Complete one upper-division IS elective. With advisor approval, a directed study, project study, or appropriate graduate-level course may also be taken as an information science elective.

IS U400 to IS U999

CS U380 to CS U999

**BUSINESS COURSES***Required Business Courses*

Complete the following seven courses:

ACC U201 Financial Accounting and Reporting 4 SH

ACC U301 Managerial Accounting 4 SH

FIN U201 Financial Management 4 SH

HRM U201 Organizational Behavior 4 SH

MGT U501 Strategy in Action 4 SH

MKT U201 Introduction to Marketing 4 SH

MSC U201 Business Statistics 4 SH

**BUSINESS CONCENTRATION**

Complete a four-course business concentration other than management information systems from the list “BSBA Business Concentrations” on page 187.

**MATHEMATICS AND GENERAL REQUIREMENTS***Mathematics*

Complete one of the following courses with a grade of C– or better:

MTH U131 Calculus for Business and Economics 4 SH

MTH U241 Calculus 1 for Science and Engineering 4 SH

*Economics*

Complete the following two courses:

ECN U115 Principles of Macroeconomics 4 SH

ECN U116 Principles of Microeconomics 4 SH

*Computers and Society*

Complete the following course:

SOC U528 Computers and Society 4 SH

**REQUIRED GENERAL ELECTIVES**

Complete three general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives. *Note:* Information science/business administration dual majors may satisfy the latter requirement by completing the following course:

INB U203 International Business and Global Social Responsibility 4 SH

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

132 total semester hours required

Minimum 2.000 GPA required

**BS in Information Science and Cognitive Psychology****COMPUTER AND INFORMATION SCIENCE COURSES****Computer Science Overview**

Freshmen or freshmen transfers complete the following two courses:

CS U221	Computer/Information Science Overview 1	1 SH
CS U222	Computer/Information Science Overview 2	1 SH

Upper-level transfer students complete the following course:

CS U223	Computer/Information Science Co-op Preparation	1 SH
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**Computer Science Fundamental Courses**

Complete the following four courses with corresponding labs, as indicated. A grade of C– or higher is required in each course:

CS U200	Discrete Structures	4 SH
CS U211	Fundamentals of Computer Science 1	4 SH
with CS U212	Lab for CS U211	1 SH
CS U213	Fundamentals of Computer Science 2	4 SH
with CS U214	Lab for CS U213	1 SH
CS U290	Logic and Computation	4 SH

**Computer Science Required Courses**

Complete the following three courses. *Note:* CS U520 is an integrative course:

CS U370	Object-Oriented Design	4 SH
CS U390	Theory of Computation	4 SH
CS U520	Artificial Intelligence	4 SH

**Information Science**

Complete the following six courses, including field study and senior project. *Note:* IS U570, IS U691, and IS U692 are integrative courses:

IS U300	Principles of Information Science	4 SH
IS U470	Information System Design and Development	4 SH
IS U570	Human Computer Interaction	4 SH
IS U580	Empirical Research Methods	4 SH
IS U691	Information Science Field Study	1 SH
IS U692	Information Science Senior Project	5 SH

**PSYCHOLOGY COURSES****Required Courses**

Complete the following four courses:

PSY U101	Foundations of Psychology	4 SH
PSY U320	Statistics in Psychological Research	4 SH
PSY U464	Psychology of Language	4 SH
PSY U466	Cognition	4 SH

**Advanced Psychology**

Complete one course from the following list:

PSY U452	Sensation and Perception	4 SH
PSY U458	Psychobiology	4 SH

**Laboratory in Psychology**

Complete one course from the following list:

PSY U610	Laboratory in Psycholinguistics	4 SH
PSY U612	Laboratory in Cognition	4 SH
PSY U622	Laboratory in Sensation and Perception	4 SH

**Seminar in Psychology**

Complete one course from the following list:

PSY U658	Seminar in Psycholinguistics	4 SH
PSY U660	Seminar in Cognition	4 SH
PSY U668	Seminar in Sensation and Perception	4 SH

**Psychology Electives**

Complete two courses from the following list. *Note:* Courses satisfying the categories above cannot be reused:

PSY U402	Social Psychology	4 SH
PSY U450	Learning and Motivation	4 SH
PSY U452	Sensation and Perception	4 SH
PSY U458	Psychobiology	4 SH
PSY U520	Language and the Brain	4 SH
PSY U522	Psychology of Reading	4 SH
PSY U524	Cognitive Development	4 SH
PSY U526	Categorization and Reasoning	4 SH
PSY U610	Laboratory in Psycholinguistics	4 SH
PSY U612	Laboratory in Cognition	4 SH
PSY U622	Laboratory in Sensation and Perception	4 SH
PSY U652	Seminar in Ethics in Psychology	4 SH
PSY U658	Seminar in Psycholinguistics	4 SH
PSY U660	Seminar in Cognition	4 SH
PSY U668	Seminar in Sensation and Perception	4 SH
PSY U970	Junior/Senior Project 1	4 SH
with PSY U971	Junior/Senior Project 2	4 SH

**ADDITIONAL REQUIREMENTS****Calculus**

Complete the following course with a grade of C– or better:

MTH U241	Calculus 1 for Science and Engineering	4 SH
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**Computers and Society**

Complete the following course:

SOC U528	Computers and Society	4 SH
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**REQUIRED GENERAL ELECTIVES**

Complete seven general electives. One of these electives must be used to satisfy the NU Core arts/humanities level 1 requirement. If the NU Core comparative study of cultures requirement is to be satisfied by taking a course, then it must also be one of the general electives.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**NU CORE REQUIREMENTS**

See page 24 for requirement list.

**GENERAL ELECTIVES**

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION****UNIVERSITY-WIDE REQUIREMENTS**

133 total semester hours required

Minimum 2.000 GPA required

**BS/MS in Computer Science**

Undergraduate students apply to the combined program through the graduate school. Once admitted, students may count a limited amount of graduate credit toward the undergraduate degree. For degree requirements, please visit the myNEU Web Portal ([myneu.neu.edu](http://myneu.neu.edu)), click on the “Self-Service” tab, then on “My Degree Audit.”

**Program Length**

Normally, the undergraduate program is five years, with seven full academic semesters and two to three six-month periods of cooperative education. Some students may complete the program in four years with a reduced cooperative education component. The college is strongly committed to the cooperative education program since it believes that the opportunity to integrate academic learning with practical experience in industry can greatly contribute to a student’s personal and professional development.