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 315–319 for computer science course descriptions and pages 379–380 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 grade-point averages required for students to advance to the next rank and to graduate are:

<table>
<thead>
<tr>
<th>Rank</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middler</td>
<td>2.000</td>
</tr>
<tr>
<td>Junior</td>
<td>2.000</td>
</tr>
<tr>
<td>Senior</td>
<td>2.000</td>
</tr>
<tr>
<td>To graduate</td>
<td>2.000</td>
</tr>
</tbody>
</table>

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. For additional information, consult the College of Computer and Information Science Undergraduate Student Guidebook.
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.

College of Computer and Information Science
Approved Courses: Diversity

Each College of Computer and Information Science degree program references the following list of approved diversity courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR U109</td>
<td>Foundations of Black Culture 1</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U128</td>
<td>Music of Africa</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U131</td>
<td>Music of Latin America and the Caribbean</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U140</td>
<td>Introduction to African-American History</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U180</td>
<td>African History</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U185</td>
<td>Gender in the African Diaspora</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U212</td>
<td>History of Race</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U261</td>
<td>The Modern Caribbean</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U270</td>
<td>Economic Status of Ethnic Minorities</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U307</td>
<td>Africa Today</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U320</td>
<td>The Black Family</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U325</td>
<td>African-American Women</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U337</td>
<td>African-American History before 1900</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U338</td>
<td>African-American History since 1900</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U365</td>
<td>Blacks and Jews</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U391</td>
<td>Modern African Civilization</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U392</td>
<td>African Diaspora</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U399</td>
<td>Black Community and Social Change</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U460</td>
<td>Contemporary Government and Politics in Africa</td>
<td>4 SH</td>
</tr>
<tr>
<td>AFR U609</td>
<td>History of South Africa</td>
<td>4 SH</td>
</tr>
<tr>
<td>ASL U150</td>
<td>Deaf People in Society</td>
<td>4 SH</td>
</tr>
<tr>
<td>ASL U350</td>
<td>Deaf History and Culture</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U240</td>
<td>Latin American Film</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U255</td>
<td>Chinese Film: Gender and Ethnicity</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U260</td>
<td>Japanese Film</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U265</td>
<td>Spanish Civil War on Film</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U270</td>
<td>Modern German Film and Literature</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U280</td>
<td>French Film and Culture</td>
<td>4 SH</td>
</tr>
<tr>
<td>CIN U460</td>
<td>Jewish Film</td>
<td>4 SH</td>
</tr>
<tr>
<td>CJ U102</td>
<td>Ethics, Values, and Diversity</td>
<td>4 SH</td>
</tr>
<tr>
<td>CJ U522</td>
<td>Comparative Criminal Justice</td>
<td>4 SH</td>
</tr>
<tr>
<td>ECN U270</td>
<td>Economic Status of Ethnic Minorities</td>
<td>4 SH</td>
</tr>
<tr>
<td>ENG U671</td>
<td>Multiethnic Literature of the U.S.</td>
<td>4 SH</td>
</tr>
<tr>
<td>ENG U672</td>
<td>Asian-American Literature</td>
<td>4 SH</td>
</tr>
<tr>
<td>ENG U673</td>
<td>U.S. Latino/Latina Literature</td>
<td>4 SH</td>
</tr>
<tr>
<td>ENG U674</td>
<td>American Indian Literature</td>
<td>4 SH</td>
</tr>
<tr>
<td>ENG U675</td>
<td>Gay and Lesbian Literature</td>
<td>4 SH</td>
</tr>
<tr>
<td>HNR U300</td>
<td>Topics in Research and Inquiry: A Diversity PersPECTive</td>
<td>4 SH</td>
</tr>
<tr>
<td>HNR U320</td>
<td>Topics in Urban Experience: A Diversity PersPECTive</td>
<td>4 SH</td>
</tr>
<tr>
<td>HNR U340</td>
<td>Topics in Contemporary Issues: A Diversity PersPECTive</td>
<td>4 SH</td>
</tr>
<tr>
<td>HS U350</td>
<td>Ethnic Relations, Cultural Identity, and Human Services</td>
<td>4 SH</td>
</tr>
<tr>
<td>HS U560</td>
<td>Religion, Human Services, and Diversity in the United States</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U103</td>
<td>Women's Studies</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U140</td>
<td>Introduction to African-American History</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U150</td>
<td>East Asian Studies</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U180</td>
<td>African History</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U204</td>
<td>Third World Women</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U212</td>
<td>History of Race</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U242</td>
<td>Women in America</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U256</td>
<td>Chinese Civilization in Her Eyes</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U261</td>
<td>The Modern Caribbean</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U290</td>
<td>Modern Middle East</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U337</td>
<td>African-American History before 1900</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U338</td>
<td>African-American History since 1900</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U350</td>
<td>Modern China</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U351</td>
<td>Japan since 1850</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U372</td>
<td>Gender and Society in Modern Europe</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U391</td>
<td>Modern African Civilization</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U392</td>
<td>African Diaspora</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U393</td>
<td>Islam and Empires</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U394</td>
<td>Islamic Nationalism</td>
<td>4 SH</td>
</tr>
<tr>
<td>HST U432</td>
<td>Latin America in Boston</td>
<td>4 SH</td>
</tr>
<tr>
<td>INT U285</td>
<td>Jewish Religion and Culture</td>
<td>4 SH</td>
</tr>
<tr>
<td>INT U560</td>
<td>Religion, Human Services, and Diversity in the United States</td>
<td>4 SH</td>
</tr>
<tr>
<td>LNC U150</td>
<td>Backgrounds of Chinese Culture</td>
<td>4 SH</td>
</tr>
<tr>
<td>LNC U255</td>
<td>Chinese Film: Gender and Ethnicity</td>
<td>4 SH</td>
</tr>
<tr>
<td>LNC U256</td>
<td>Chinese Civilization in Her Eyes</td>
<td>4 SH</td>
</tr>
<tr>
<td>LNF U150</td>
<td>Introduction to French Culture</td>
<td>4 SH</td>
</tr>
<tr>
<td>LNJ U150</td>
<td>Introduction to Japanese Pop Culture</td>
<td>4 SH</td>
</tr>
<tr>
<td>LNR U285</td>
<td>Russian Civilization</td>
<td>4 SH</td>
</tr>
</tbody>
</table>
Academic Programs and Curriculum Guide

LNS U150 Spanish Culture 4 SH
LNS U160 Latin American Culture 4 SH
LNS U170 Caribbean Literature and Culture 4 SH
MTH U201 History of Mathematics 4 SH
MUS U106 Women in Music 4 SH
MUS U128 Music of Africa 4 SH
MUS U130 Music of Asia 4 SH
MUS U131 Music of Latin America and the Caribbean 4 SH
MUS U132 Music of the Jewish People 4 SH
PHL U103 Women's Studies 4 SH
PHL U130 Ethics: East and West 4 SH
PHL U270 Western Religions 4 SH
PHL U275 Eastern Religions 4 SH
PHL U280 Islam 4 SH
PHL U285 Jewish Religion and Culture 4 SH
PHL U290 Chinese Philosophy and Religion 4 SH
POL U375 Gender and Politics 4 SH
POL U380 Latino Politics in the United States 4 SH
POL U460 Government and Politics in Africa 4 SH
POL U465 Government and Politics in the Middle East 4 SH
POL U470 Arab-Israeli Conflict 4 SH
POL U475 Government and Politics in Latin America 4 SH
POL U480 Government and Politics in Japan 4 SH
POL U485 Government and Politics in China 4 SH
POL U487 Politics of Developing Nations 4 SH
SOA U101 Peoples and Cultures 4 SH
SOA U200 Peoples and Cultures of the Middle East 4 SH
SOA U210 Hot Button Issues in the Middle East 4 SH
SOA U220 Latino, Latin American, and Caribbean Studies 4 SH
SOA U302 Gender and Sexuality: A Cross-Cultural Perspective 4 SH
SOA U307 Social Movements in the Third World 4 SH
SOA U310 Individual Culture 4 SH
SOA U315 Religion and Modernity 4 SH
SOA U400 Muslims, Jews, and Christians in the Middle East 4 SH
SOA U500 Latin American Society and Development 4 SH
SOA U505 Native North Americans 4 SH
SOC U215 Society and Culture in Russia 4 SH
SOC U260 Gender in a Changing Society 4 SH
SOC U270 Race and Ethnic Relations 4 SH
SOC U460 Sociology of Latino Society 4 SH
SOC U520 Race, Class, and Gender 4 SH

BSCS—Bachelor of Science in Computer Science

ENGLISH REQUIREMENT
Complete the following two courses:
ENG U111 College Writing 4 SH
ENG U302 Advanced Writing in the Technical Professions 4 SH

With prior permission, the following course may be substituted for ENG U302:
ENG U301 Advanced Writing in the Disciplines 4 SH
A grade of C or higher is required in ENG U111 and in the advanced writing course.

MATHEMATICS, SCIENCE, AND SOCIAL SCIENCE CORE FOR BS

Sociology
Complete the following course:
SOC U528 Computers and Society 4 SH

Symbolic Logic
Complete the following course with a grade of C– or higher:
PHL U215 Symbolic Logic 4 SH

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

Science Requirement
Complete a pair of courses with corresponding lab and recitation for one of the following sciences:

BIOLOGY
Complete the lecture/lab from the Biology 1 section and then complete an additional lecture/lab:
BIOLOGY 1
BIO U111 General Biology 1 4 SH
with BIO U112 Lab for BIO U111 1 SH
ADDITIONAL BIOLOGY
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
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
Complete two sets of lecture/labs from one group:
GROUP 1
GEO U200 Dynamic Earth 4 SH
with GEO U201 Lab for GEO U200 1 SH
GEO U220 History of Earth and Life 4 SH
with GEO U221 Interpreting Earth History 1 SH

GROUP 2
GEO U200 Dynamic Earth 4 SH
with GEO U201 Lab for GEO U200 1 SH
GEO U310 Earth Materials 4 SH
with GEO U311 Lab for GEO U310 1 SH
GEO U340 Earth Landforms and Processes 4 SH
with GEO U341 Lab for GEO U340 1 SH
GEO U520  Applied Hydrogeology  4 SH
with GEO U521  Lab for GEO U520  1 SH
GEO U544  Sedimentation  4 SH
with GEO U545  Lab for GEO U544  1 SH
GEO U546  Coastal Processes  4 SH
with GEO U547  Lab for GEO U546  1 SH
GEO U560  Geographic Information Systems  4 SH
with GEO U561  Lab for GEO U560  1 SH

GROUP 3
GEO U220  History of Earth and Life  4 SH
with GEO U221  Interpreting Earth History  1 SH
GEO U542  Fossils and Paleoeology  4 SH
with GEO U543  Lab for GEO U542  1 SH

PHYSICS
Complete one group of courses:

GROUP 1
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

GROUP 2
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

GROUP 3
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  4 SH
for Computer Scientists

COMPUTER SCIENCE MAJOR REQUIREMENTS

Computer Science Overview
Freshmen or freshman 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 must complete the following course:
CS U223  Computer/Information Science Co-op Preparation  1 SH
and must also make up 1 semester hour of credit.

Computer Science Fundamental Courses
Complete the following three 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  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 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 Capstone
The computer science capstone is an extended activity that demands a significant individual effort, although it may be a team project as long as each student contributes substantial work. It generally consists of (1) a substantial programming or design project of at least one month in duration or (2) a research survey project in which the student explores and critically analyzes material beyond what is covered in a course and prepares a document to disseminate publicly what is learned to other members of the college. The requirement is usually satisfied through a course that is designated as a capstone course. See the college for a list of capstone courses.

Computer Science Senior Seminar
Complete the following course:
CS U600  Senior Seminar  1 SH

Computer Science Elective Courses
Complete three CS elective courses, including one capstone course. With adviser approval, directed study, project study, and appropriate graduate-level courses may also be taken as computer science electives.
CS U400 to CS U999
IS U535  Information Retrieval  4 SH
or IS U570  Human Computer Interaction  4 SH

DIVERSITY
Satisfy the diversity course option, the residence-abroad option, the international co-op/study-abroad option, or the community service option.

Diversity Course Option
Complete one course from the list “College of Computer and Information Science Approved Courses: Diversity” on page 203.

Residence-Abroad Option
Provide documentation that you lived in a country other than the United States or Canada for at least two years after your tenth birthday.

International Co-Op/Study-Abroad Option
Participate in a six-month international co-op assignment or study abroad in a country other than Canada.

Community Service Option
Complete one hundred hours of preapproved diversity-related community service and file a report describing the work completed.
ARTS AND SCIENCES CORE REQUIREMENTS

Complete two courses from either the foreign language option or from the arts, humanities, and social sciences option.

**Foreign Language Option**

Complete two courses in the same language with a grade of C or higher. Proficiency at elementary-level two or higher is required.

**Arts, Humanities, and Social Sciences Option**

Complete two courses from the following lists. Note that the following courses are unacceptable: PHL U114, PHL U115, PHL U215, and SOC U528; any courses from the BIO, CHM, GEO, MTH, or PHY departments; and any courses that are explicitly required for the major.

“Approved Courses: Methods of Inquiry—Arts Context” on page 52.
“Approved Courses: Methods of Inquiry—Humanities Context” on page 52.
“Approved Courses: Methods of Inquiry—Social World Context” on page 53.
“College of Computer and Information Science Approved Courses: Diversity” on page 203.
“Approved Courses: Historical, Ethical, and Aesthetic Perspectives” on page 54.
“Approved Courses: Analysis” on page 55.

**ELECTIVES OUTSIDE COMPUTER AND INFORMATION SCIENCE**

Complete three courses from either the depth option or the breadth option, and complete three open electives.

**Depth Option**

Complete three courses in one department outside CS and IS, with at least one course at the intermediate level (300 level or above). For the purposes of this requirement, all business courses are considered to be in a single department.

**Breadth Option**

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

**Open Electives**

Complete three courses from any department provided the courses are not more elementary than the courses taken to satisfy other requirements in the program.

**MAJOR GPA REQUIREMENT**

Minimum 2.000 GPA required in all CS and IS courses

**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

---

**BACS—Bachelor of Arts in Computer Science**

**ENGLISH REQUIREMENT**

Complete the following two courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG U111</td>
<td>College Writing</td>
</tr>
<tr>
<td>ENG U302</td>
<td>Advanced Writing in the Technical Professions</td>
</tr>
</tbody>
</table>

With prior permission, the following course may be substituted for ENG U302:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG U301</td>
<td>Advanced Writing in the Disciplines</td>
</tr>
</tbody>
</table>

A grade of C or higher is required in ENG U111 and in the advanced writing course.

**BA CORE REQUIREMENTS**

**Foreign Language**

Complete two courses in the same language. Proficiency at elementary-level two or higher required.

**Methods of Inquiry**

Complete one course for each of the contexts below. Courses in the major may not be used.

**ARTS CONTEXT**

Complete one course from the list “Approved Courses: Methods of Inquiry—Arts Context” on page 52.

**HUMANITIES CONTEXT**

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL U215</td>
<td>Symbolic Logic</td>
</tr>
</tbody>
</table>

**SOCIAL WORLD CONTEXT**

Complete one course from the list “Approved Courses: Methods of Inquiry—Social World Context” on page 53.

**Diversity**

Complete two courses from the list “College of Computer and Information Science Approved Courses: Diversity” on page 203.

**Historical, Ethical, and Aesthetic Perspectives**

Complete two courses from the list “Approved Courses: Historical, Ethical, and Aesthetic Perspectives” on page 54.

**Analysis**

Complete the following course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOC U528</td>
<td>Computers and Society</td>
</tr>
</tbody>
</table>

**General Electives**

Complete five general electives.

**MATHEMATICS AND SCIENCE CORE FOR BA**

**Mathematics Courses**

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTH U241</td>
<td>Calculus 1 for Science and Engineering</td>
</tr>
<tr>
<td>MTH U242</td>
<td>Calculus 2 for Science and Engineering</td>
</tr>
<tr>
<td>MTH U481</td>
<td>Probability and Statistics</td>
</tr>
</tbody>
</table>

**Science Courses**

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

**BIOLOGY**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO U111</td>
<td>General Biology 1</td>
</tr>
</tbody>
</table>

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
GEO U200 Dynamic Earth 4 SH
with GEO U201 Lab for GEO U200 1 SH
GEO U220 History of Earth and Life 4 SH
with GEO 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

COMPUTER SCIENCE MAJOR REQUIREMENTS

Computer Science Overview
Freshmen or freshman transfers complete the following two courses:
CS U221 Computer/Information Science 1 SH
Overview 1
CS U222 Computer/Information Science 1 SH
Overview 2
Upper-level transfer students must complete the following course:
CS U223 Computer/Information Science 1 SH
Co-op Preparation
and must also make up 1 semester hour of credit.

Computer Science Fundamental Courses
Complete the following three courses with any applicable labs
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

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 Elective Courses
Complete two upper-division courses from the CS, IS, or MTH departments. Only one course may be selected from the MTH department. With adviser approval, directed study courses, project study courses, and appropriate graduate-level courses may also be taken as computer science electives.
CS U400 to CS U699
IS U535 Information Retrieval 4 SH
IS U570 Human Computer Interaction 4 SH
MTH U300 to MTH U699

Computer Science Senior Seminar
Complete the following course:
CS U600 Senior Seminar 1 SH

MAJOR GPA REQUIREMENT
Minimum 2.000 GPA required in all CS and IS courses

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

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.

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**

**ENGLISH REQUIREMENT**
Complete the following two courses:
- ENG U111 College Writing 4 SH
- ENG U302 Advanced Writing in the Technical Professions 4 SH

With prior permission, the following course may be substituted for ENG U302:
- ENG U301 Advanced Writing in the Disciplines 4 SH

A grade of C or higher is required in ENG U111 and in the advanced writing course.

**BEHAVIORAL SCIENCE FOUNDATIONS**

**Sociology**
Complete the following course:
- SOC U528 Computers and Society 4 SH

**Psychology**
Complete the following two courses:
- PSY U101 Foundations of Psychology 4 SH
- PSY U466 Cognition 4 SH

**Economics**
Complete the following course:
- ECN U116 Principles of Microeconomics 4 SH

**Organizational Behavior**
Complete the following course:
- HRM U209 Organizational Behavior 4 SH

**MATHEMATICS AND SCIENCE REQUIREMENTS**

**Statistics and Calculus**
Complete the following two courses. A grade of C– or higher is required in MTH U241:
- ECN U350 Statistics 4 SH
- MTH U241 Calculus 1 for Science and Engineering 4 SH

**Symbolic Logic**
Complete the following course with a grade of C– or higher:
- PHL U215 Symbolic Logic 4 SH

**Science Elective**
Complete one course, with corresponding lab if applicable, from the natural world context option or the science option.

**NATURAL WORLD CONTEXT OPTION**
Excluding CS U101 and CS U211, courses in the MTH department, and courses intended for students in specific colleges, complete one course with any corresponding lab from the list “Approved Courses: Methods of Inquiry—Natural World Context” on page 53.

**SCIENCE OPTION**
Complete one course with the 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**
- GEO U200 Dynamic Earth 4 SH
  with GEO U201 Lab for GEO U200 1 SH
- GEO U220 History of Earth and Life 4 SH
  with GEO 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

**COMPUTER SCIENCE COURSES**

**Computer Science Overview**
Freshmen or freshman transfers must 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 must complete the following course:
- CS U223 Computer/Information Science Co-op Preparation 1 SH

and must also make up 1 semester hour of credit.

**Computer Science Fundamental Courses**
Complete the following three 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

**Computer Science Required Courses**
Complete the following two courses:
- CS U370 Object-Oriented Design 4 SH
- CS U380 Computer Organization 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

Databases and Networks
Complete the following two courses:
CS U430  Database Design  4 SH
CS U480  Systems and Networks  4 SH

Managing Information
Complete the following course:
MIS U305  Information Resource Management  4 SH

Information Science Electives
Complete two courses from the following list:
IS U301 to IS U999
CS U300 to CS U999
ACC U209  Financial Accounting and Reporting  4 SH
ACC U403  Accounting Information Systems  4 SH
CMN U231  Principles of Organizational Communication
CMN U331  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  Introduction to 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 U610  Laboratory in Psycholinguistics  4 SH
PSY U612  Laboratory in Cognition  4 SH
PSY U622  Laboratory in Sensation and Perception  4 SH

DIVERSITY
Satisfy the diversity course option, the residence-abroad option, the international co-op/study-abroad option, or the community service option.

Diversity Course Option
Complete one course from the list "College of Computer and Information Science Approved Courses: Diversity" on page 203.

Residence-Aboard Option
Provide documentation that you lived in a country other than the United States or Canada for at least two years after your tenth birthday.

International Co-Op/Study-Abroad Option
Participate in a six-month international co-op assignment or study abroad in a country other than Canada.

Community Service Option
Complete one hundred hours of preapproved diversity-related community service and file a report describing the work completed.

ARTS AND SCIENCES CORE REQUIREMENTS
Complete two courses from either the foreign language option or from the arts, humanities, and social sciences option.

Foreign Language Option
Complete two courses in the same language with a grade of C or higher. Proficiency at elementary-level two or higher is required.

Arts, Humanities, and Social Sciences Option
Complete two courses from the following lists. Note that the following courses are unacceptable:
PHL U114, PHL U115, PHL U215, and SOC U528; any courses from the BIO, CHM, GEO, MTH, or PHY departments; and any courses that are explicitly required for the major.
"Approved Courses: Methods of Inquiry—Arts Context" on page 52.
"Approved Courses: Methods of Inquiry—Humanities Context" on page 52.
"Approved Courses: Methods of Inquiry—Social World Context" on page 53.
"College of Computer and Information Science Approved Courses: Diversity" on page 203.
"Approved Courses: Historical, Ethical, and Aesthetic Perspectives" on page 54.
"Approved Courses: Analysis" on page 55.

REQUIRED GENERAL ELECTIVES
Complete four general electives.

MAJOR GPA REQUIREMENT
Minimum 2.000 GPA required in all CS and IS courses

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

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; a grade of C– or higher is required in CS U211 and CS U213:
CS U211  Fundamentals of Computer Science  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

ENGLISH REQUIREMENT
Complete the following two courses:
ENG U111  College Writing  4 SH
ENG U302  Advanced Writing in the Technical Professions  4 SH
With prior permission, the following course may be substituted for ENG U302:
ENG U301  Advanced Writing in the Disciplines  4 SH
A grade of C or higher is required in ENG U111 and in the advanced writing course.

COMPUTER SCIENCE MAJOR REQUIREMENTS

Computer Science Overview
Freshmen or freshman 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 must complete the following course:
CS U223  Computer/Information Science Co-op Preparation  1 SH
and must also make up 1 semester hour of credit.

Computer Science Fundamental Courses
Complete the following three 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

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 BEHAVIORAL SCIENCE FOUNDATIONS

Sociology
Complete the following course:
SOC U528  Computers and Society  4 SH

Psychology
Complete the following course:
PSY U101  Foundations of Psychology  4 SH

Economics
Complete the following course:
ECN U350  Statistics  4 SH

Organizational Behavior
Complete the following course:
HRM U209  Organizational Behavior  4 SH

MATHEMATICS AND SCIENCE REQUIREMENTS

Calculus and Statistics
Complete the following two courses. A grade of C– or higher is required in MTH U241:
ECN U350  Statistics  4 SH
MTH U241  Calculus 1 for Science and Engineering  4 SH

Symbolic Logic
Complete the following course with a grade of C– or higher:
PHL U215  Symbolic Logic  4 SH