Computer Science, B.S.

The major in computer science provides students with the necessary training for employment in careers such as software development and information management. It provides good preparation for graduate study in a variety of disciplines.

The department encourages students majoring in computer science to consider earning a second major, certificate, or minor.

Students may declare a major in computer science when they are admitted to the University or afterward. All students begin as Bachelor of Arts majors but may switch to the Bachelor of Science programs at any time.

Undergraduates majoring in computer science develop competence in programming principles and methodologies, problem-solving techniques, mathematics, and computer systems. Computer science training is critical for many careers in science, engineering, business, and health care.

Computer science majors are advised at the Academic Advising Center until they have completed 24 s.h., at which point they are assigned a departmental advisor. Students being advised at the Academic Advising Center also can consult with a computer science faculty advisor.

Transfer students who have taken a course approved as equivalent to a required computer science or informatics course are exempt from that course. Transfer course grades are included in the computer science grade-point average.

Students should consult the Department of Computer Science website or visit the department's office for information about general policies, elective areas, and internships, scholarships, and student groups, such as the University's chapter of the Association for Computing Machinery (ACM) and Women in Informatics and Computer Science (WICS).

Advanced Placement

The Computer Science Advanced Placement Program test may be used to satisfy requirements. See "Advanced Placement" under Undergraduate Programs on the Department of Computer Science website.

Requirements

The Bachelor of Science with a major in computer science requires a minimum of 120 s.h., including at least 63 s.h. of work for the major. Students must maintain a g.p.a. of at least 2.00 in all courses for the major and in all UI courses for the major. They also must complete the College of Liberal Arts and Sciences General Education Program. A cumulative g.p.a. of at least 2.00 is required for graduation.

The Bachelor of Science program is more rigorous than that of the Bachelor of Arts program; it is designed to provide in-depth training for students who would like to acquire strength in math and science in order to enhance their skills and job prospects. It also is appropriate for those who plan to pursue graduate work in computer science, although it is not required for graduate study at most universities.

Course work for the major includes computer science courses as well as courses in mathematics, statistics, and other supporting disciplines. Work for the major may not be taken pass/nonpass.

Bachelor of Science students with a computer science major should choose their General Education Program's Natural Sciences courses carefully, since they may be able to use the same courses to satisfy the natural science sequences requirement; see "Natural Science Sequences" below.

Students who earn a B.S. in computer science must complete at least seven courses (minimum of 21 s.h.) at the University of Iowa from the following: CS:2630 Computer Organization or ECE:3350 Computer Architecture and Organization, CS:2820 Object-Oriented Software Development, CS:3330 Algorithms, or any other computer science course numbered CS:3620-CS:5890, but excluding CS:3910 and CS:3980.

The B.S. with a major in computer science requires the following course work.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science Core Courses</td>
<td>27</td>
</tr>
<tr>
<td>Mathematics Core Courses</td>
<td>15-16</td>
</tr>
<tr>
<td>Computation Theory Course</td>
<td>3</td>
</tr>
<tr>
<td>Advanced Technical Electives</td>
<td>12</td>
</tr>
<tr>
<td>Natural Sciences Sequences Courses</td>
<td>6-8</td>
</tr>
<tr>
<td>Total Hours</td>
<td>63-66</td>
</tr>
</tbody>
</table>

Computer Science Core

All of these:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:1210</td>
<td>Computer Science I: Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>CS:2210</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS:2230</td>
<td>Computer Science II: Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CS:2820</td>
<td>Object-Oriented Software Development</td>
<td>4</td>
</tr>
<tr>
<td>CS:3330</td>
<td>Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS:3820</td>
<td>Programming Language Concepts</td>
<td>3</td>
</tr>
</tbody>
</table>

One of these:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:2630</td>
<td>Computer Organization</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3350</td>
<td>Computer Architecture and Organization</td>
<td>3</td>
</tr>
</tbody>
</table>

One of these:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:3620</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS:3640</td>
<td>Introduction to Networks and Their Applications</td>
<td>3</td>
</tr>
<tr>
<td>CS:4640</td>
<td>Computer Security</td>
<td>3</td>
</tr>
</tbody>
</table>

Mathematics Core

Calculus I

One of these:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH:1550</td>
<td>Engineering Mathematics I: Single Variable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1850</td>
<td>Calculus I</td>
<td>4</td>
</tr>
</tbody>
</table>

Calculus II

One of these:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH:1560</td>
<td>Engineering Mathematics II: Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1860</td>
<td>Calculus II</td>
<td>4</td>
</tr>
</tbody>
</table>

Linear Algebra

This course:
**Computer Science, B.S.**

**Probability and Statistics**

One of these:

- STAT:2020 Probability and Statistics for the Engineering and Physical Sciences 3
- STAT:3120 Probability and Statistics 4

Other probability and statistics courses (prefix STAT) with a calculus prerequisite approved by the department

Students who take MATH:2550 Engineering Mathematics III: Matrix Algebra and MATH:2560 Engineering Mathematics IV: Differential Equations can use these courses together to satisfy the linear algebra requirement.

**Computation Theory**

Students must complete one of the following.

- CS:4330 Theory of Computation 3
- CS:4350 Logic in Computer Science 3

**Advanced Technical Electives**

Students must earn at least 12 s.h. (four courses) in advanced technical electives, as follows.

At least 6 s.h. from these:

- A computer science course (prefix CS) numbered 3620-5890, except CS:3910 and CS:3980
- A computer science course (prefix CS) numbered 5900 or above, with department approval

And:

- Advanced technical elective courses in computer science (prefix CS), or in other disciplines with department approval, to complete the required 12 s.h.

An approved list of courses in other departments that satisfy this requirement can be found on the Department of Computer Science website; see "Major Requirements" on the Undergraduate Programs page.

Students may count a maximum of 3 s.h. earned in CS:3990 Honors in Computer Science or Informatics toward the advanced technical elective requirement.

**Natural Science Sequences**

Students take two or more courses in a sequence (totaling at least 6 s.h.) in a cognate area of natural science. The natural science sequence is intended to enhance a student's perspective by providing a deeper understanding of the scientific method. Typically, it consists of a sequence of courses taken in the same science department. Students often choose courses that also fulfill the General Education Program Natural Sciences requirement. Some possible choices are listed below; the department may approve others.

CLEP/APP credit may be used to satisfy part or all of the natural science requirement only if the appropriate science department at the University of Iowa accepts the credit as equivalent to one or more of the specific courses listed below.

<table>
<thead>
<tr>
<th>Astronomy</th>
<th>Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR:1771 General Astronomy I 4</td>
<td>ASTR:1772 General Astronomy II 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Math and Statistics</th>
<th>Chemistry</th>
<th>Earth and Environmental Sciences</th>
<th>Geographical and Sustainability Sciences</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH:2700 Introduction to Linear Algebra</td>
<td>CHEM:1110 Principles of Chemistry I 4</td>
<td>EES:1030 Introduction to Earth Science 3-4</td>
<td>GEOG:1020 The Global Environment 3</td>
<td></td>
</tr>
<tr>
<td>BIOL:1411 Foundations of Biology 4</td>
<td>CHEM:1120 Principles of Chemistry II 4</td>
<td>or EES:1050 Introduction to Geology</td>
<td>GEOG:1050 Foundations of GIS 3</td>
<td></td>
</tr>
<tr>
<td>BIOL:1412 Diversity of Form and Function 4</td>
<td>EES:1080 Introduction to Environmental Science</td>
<td></td>
<td>PHYS:1611-1612 Introductory Physics I-II 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PHYS:1701-1702 Physics I-II 8</td>
<td></td>
</tr>
</tbody>
</table>

**Early Admission to the Graduate College**

Undergraduate computer science students who have 6 s.h. or less to earn toward graduation may apply for early admission to the Graduate College. Early admission allows students in their final undergraduate semester to take courses for graduate credit in addition to the courses they need to complete their bachelor's degrees.

**Joint B.S./M.C.S.**

Qualified computer science undergraduate students who plan to earn the Master of Computer Science degree may apply for the joint Bachelor of Science/Master of Computer Science program. The joint B.S./M.C.S. program allows students to earn both degrees in five years. The program requires a total of 140 s.h., which is 12 s.h. less than the total number of s.h. required for both degrees earned separately.

Students in the joint program must complete all requirements for each degree, but may count a maximum of 12 s.h. (four courses) toward both degrees. The four courses must be taken during the fourth year of undergraduate study, after admission to the joint program, and must satisfy degree requirements of both the B.S. and the M.C.S.

When students withdraw from the joint program before completing their bachelor's degree, credit earned in the four courses is counted only toward the undergraduate degree.

Students are granted a B.S. when they complete all requirements for the undergraduate degree.

Students apply for admission to the joint program during their third year as undergraduates and enter the program at the beginning of their fourth year. They usually complete the joint program comfortably in one year after completing the B.S. requirements.

Applicants to the joint program must:

- be enrolled as a B.S. student majoring in computer science at the University of Iowa;
have completed a minimum of 80 s.h. at the time of admission to the joint program, with at least 30 s.h. earned at the University of Iowa; and

have a cumulative University of Iowa g.p.a. of at least 3.25 and a g.p.a. of at least 3.25 in the computer science major (computed on math prerequisites and core computer science course work taken at the University of Iowa).

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations of the Graduate College.

Applicants must submit an application for admission to the program, a statement of purpose, three letters of recommendation, and transcripts from all colleges attended; they also must apply to the Graduate College. Graduate Record Examination (GRE) scores are not required. For more detailed information, see Prospective Students on the Department of Computer Science website.

Honors

Honors in the Major

Students majoring in computer science have the opportunity to graduate with honors in the major. They must maintain a minimum UI cumulative g.p.a. of 3.33 and complete 4-6 s.h. of CS:3990 Honors in Computer Science or Informatics which requires the submission of an acceptable honors thesis. Students are responsible for finding a faculty member willing to supervise their honors project. They can register for CS:3990 with the project supervisor's name once the faculty member approves the proposed project and a timetable for the work. For more details, see Honors on the Department of Computer Science website.

Honors students may count a maximum of 3 s.h. of CS:3990 Honors in Computer Science or Informatics toward the B.S. degree's advanced technical elective requirement. Students in the joint B.S./M.C.S. program may register for 4-6 s.h. of CS:5990 Individualized Research or Programming Project instead of CS:3990; this will allow them to receive graduate credit for the course while satisfying the course requirements to graduate with honors.

University of Iowa Honors Program

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the University’s honors program.

Membership in the UI Honors Program is not required to earn honors in the computer science major. However, the semester hours earned in CS:3990 Honors in Computer Science or Informatics or CS:5990 Individualized Research or Programming Project can be used to partially satisfy the UI Honors requirement of 12 s.h. of experiential learning course work.
Major: linear algebra or probability and statistics course 3-4
GE: Literary, Visual, and Performing Arts 3
GE: World Languages or elective course 3-5

Hours 15-18

Fourth Year
Fall
Major: computer science advanced elective course 3
Major: computer science advanced elective course 3
GE: Historical Perspectives 3
GE: Natural Sciences with a lab 4
Elective course 2-3

Hours 15-16

Spring
GE: Social Sciences 3
Elective course 3
Elective course 3
Elective course 3
Elective course 3

Hours 15

Total Hours 120-132

1 General Education (GE) courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses. For more information, view the General Education Program.
2 Students who have completed four years of a single language in high school have satisfied the College of Liberal Arts and Sciences GE: World Languages requirement. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course.
3 Students may use their elective courses to complete a double major, minors, or certificates.
4 Possible course is CS:3640 Introduction to Networks and Their Applications or CS:4640 Computer Security for systems requirement, or CS:3820 Programming Language Concepts.
5 Possible course is CS:3620 Operating Systems for systems requirement or CS:3820 Programming Language Concepts.
6 Choose from MATH:2700 Introduction to Linear Algebra, or STAT:2020 Probability and Statistics for the Engineering and Physical Sciences or STAT:3120 Probability and Statistics.

Career Advancement

Computer science graduates work primarily in two market sectors. One includes the software and computer industry, from small start-ups to giants such as Amazon, Google, Intel, Yahoo, and Microsoft. These offer job opportunities in software design, including UI/UX, mobile, and web development. Another sector is made up of organizations whose primary business is not computing, such as banks, insurance, and other financial groups; health care organizations; consulting, media and legal firms; entertainment companies; and the military.

As many as one-third of computer science graduates go into research or elect to pursue graduate studies in computer science, including the University of Iowa B.S./M.C.S. program, or other areas where computer science provides a strong foundation.

A recent job placement survey indicates that more than 97 percent of computer science graduates were placed or no longer seeking employment within six months of graduation. The Pomerantz Career Center offers multiple resources to help students find internships and jobs.