

**COMPUTER SCIENCE**

Department Website: http://cs.uchicago.edu

**PROGRAM OF STUDY**

The computer science program prepares students for careers in computer science by offering a BA and a BS degree, as well as combined BA/MS and BS/MS degrees. Students who earn the BA are prepared either for graduate study in computer science or a career in industry. Students who earn the BS degree build strength in an additional field by following an approved course of study in a related area. The department also offers a minor. Furthermore, a computer science major or minor serves as an excellent foundation for work in other areas, including but not limited to mathematics, the natural sciences, social sciences, public administration, and the arts.

**PROGRAM REQUIREMENTS**

Both the BA and BS in computer science require fulfillment of the mathematical sciences requirement in general education by completing an approved two-quarter calculus sequence. The physical sciences requirement in general education must be satisfied by completing an approved two-quarter sequence in either chemistry or physics. Both BA and BS students take at least fourteen computer science courses chosen from an approved program. BS students also take three courses in an approved related field outside computer science.

**Advanced Placement**

Computer science majors may use AP credit for chemistry or physics to meet their physical sciences requirement in general education or physical science components of the major. However, no credit designated simply as "physical science" (from either AP or the College's physical sciences examinations) may be used to meet general education requirements or requirements in the computer science majors. No course credit is awarded for AP Computer Science.

**Approved Programs**

The computer science department counselor is responsible for approval of specific courses and sequences, and responds as needed to changing course offerings in our program and other programs. Students should consult the department counselor for details on specific courses they are considering taking to meet the requirements.

**Approved Computer Science Program**

There is one approved general program for both the BA and BS degrees, comprised of introductory courses, a sequence in Theory, and a sequence in Programming Languages and Systems, followed by advanced electives. Students may substitute upper-level or graduate courses in similar topics for those on the list that follows with the approval of the department counselor. Students who matriculated prior to Autumn 2016 may choose to follow these requirements; otherwise they should consult the archived catalog from their year of matriculation.
for the degree requirements in computer science. All students who matriculated in Autumn 2016 or later should follow this program.

For up-to-date information on course offerings and instructors in particular quarters, visit http://course-info.cs.uchicago.edu.

Students considering a computer science major are strongly advised to register for an introductory sequence, starting either with CMSC 15100 or CMSC 16100, in their first year. Incoming students should note that while CMSC 12100 can be used as the first course in the major, it is not open to first-year students, and it is not intended as an entry point for students who already know they want to major in computer science. Students who decide to pursue a computer science major or minor after completing CMSC 12100 may continue with either CMSC 15200-15400 or CMSC 12200-12300-15400. Note that CMSC 12200 does not meet the prerequisites for CMSC 15400.

1. Introductory Sequence (three courses required):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CMSC 15100</td>
<td>Introduction to Computer Science I</td>
<td>100</td>
</tr>
<tr>
<td>or CMSC 16100</td>
<td>Honors Introduction to Computer Science I</td>
<td></td>
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<tr>
<td>or CMSC 12100</td>
<td>Computer Science with Applications I</td>
<td></td>
</tr>
<tr>
<td>CMSC 15200</td>
<td>Introduction to Computer Science II</td>
<td>100</td>
</tr>
<tr>
<td>or CMSC 16200</td>
<td>Honors Introduction to Computer Science II</td>
<td></td>
</tr>
<tr>
<td>CMSC 15400</td>
<td>Introduction to Computer Systems</td>
<td>100</td>
</tr>
</tbody>
</table>

Students may only receive credit for one introductory programming sequence: CMSC 10500-10600 Fundamentals of Computer Programming I-II, CMSC 12100-12200 Computer Science with Applications I-II, CMSC 15100-15200 Introduction to Computer Science I-II, or CMSC 16100-16200 Honors Introduction to Computer Science I-II. Exceptions must be approved by the department counselor prior to taking the second sequence.

2. Programming Languages and Systems Sequence (three courses required):

Three of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CMSC 22001</td>
<td>Software Construction</td>
</tr>
<tr>
<td>CMSC 22100</td>
<td>Programming Languages</td>
</tr>
<tr>
<td>CMSC 22200</td>
<td>Computer Architecture</td>
</tr>
<tr>
<td>CMSC 22300</td>
<td>Functional Programming</td>
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<tr>
<td>CMSC 22600</td>
<td>Compilers for Computer Languages</td>
</tr>
<tr>
<td>CMSC 23000</td>
<td>Operating Systems</td>
</tr>
<tr>
<td>CMSC 23010</td>
<td>Parallel Computing</td>
</tr>
<tr>
<td>CMSC 23200</td>
<td>Introduction to Computer Security</td>
</tr>
<tr>
<td>CMSC 23300</td>
<td>Networks and Distributed Systems</td>
</tr>
<tr>
<td>CMSC 23310</td>
<td>Advanced Distributed Systems</td>
</tr>
<tr>
<td>CMSC 23400</td>
<td>Mobile Computing</td>
</tr>
<tr>
<td>CMSC 23500</td>
<td>Introduction to Database Systems</td>
</tr>
<tr>
<td>CMSC 23700</td>
<td>Introduction to Computer Graphics</td>
</tr>
</tbody>
</table>
CMSC 23710 Scientific Visualization
CMSC 23800 Game Construction

3. Theory Sequence (three courses required):

Three of the following:

- CMSC 27100 Discrete Mathematics
- CMSC 27200 Theory of Algorithms
- CMSC 28000 Introduction to Formal Languages
  or CMSC 28100 Introduction to Complexity Theory

We strongly encourage all majors to complete their Theory courses by the end of their third year.

4. Electives (five courses required):

The major requires five additional elective Computer Science courses numbered 20000 or above.

SUMMARY OF REQUIREMENTS**

GENERAL EDUCATION

One of the following sequences: 200

- CHEM 10100 & CHEM 10200 Introductory General Chemistry I
  and Introductory General Chemistry II (or higher or equivalent)*
- PHYS 13100-13200 Mechanics; Electricity and Magnetism (or higher) *
- MATH 13100-13200 Elementary Functions and Calculus I-II (or higher) * 200

Total Units 400

* Credit may be granted by examination.

MAJOR

Introductory Sequence: 300

- CMSC 15100 Introduction to Computer Science I
  or CMSC 16100 Honors Introduction to Computer Science I
  or CMSC 12100 Computer Science with Applications I
- CMSC 15200 Introduction to Computer Science II
  or CMSC 16200 Honors Introduction to Computer Science II
- CMSC 15400 Introduction to Computer Systems

Programming Languages and Systems Sequence (three courses from the list above) 300

Theory Sequence (three courses from the list above) 300

Five electives numbered CMSC 20000 or above 500

Plus the following requirements: 0-300

BA (no other courses required)
BS (three courses in an approved program in a related field)

** Total Units 1400-1700

** Students who matriculated prior to Autumn 2016 may choose to follow these requirements; otherwise they should consult the archived catalog from their year of matriculation for the degree requirements in computer science. All students who matriculated in Autumn 2016 or later should follow this program.

GRADING

Computer science majors must take courses in the major for quality grades. A grade of C- or higher must be received in each course in the major. Any 20000-level computer science course taken as an elective beyond requirements for the major may, with consent of instructor, be taken for P/F grading.

Non-majors may take courses either for quality grades or, subject to College regulations and with consent of instructor, for P/F grading. A Pass grade is given only for work of C- quality or higher. Courses fulfilling general education requirements must be taken for quality grades.

Incompletes are typically given in the Department of Computer Science only to students who have done at least 60 percent of the course’s work of a passing quality and who are unable to complete all course work by the end of the quarter. Other restrictions on Incompletes are the province of individual instructors, many of whom do not permit Incompletes. To receive an Incomplete, students must make arrangements in advance with the instructor; a consent form to be signed by the instructor is available from the College adviser.

HONORS

Students can earn a BA or BS degree with honors by attaining a grade of B or higher in all courses in the major and a grade of B or higher in three approved graduate computer science courses (30000-level and above). These courses may be courses taken for the major or as electives.

Students may also earn a BA or BS degree with honors by attaining the same minimum B grade in all courses in the major and by writing a successful bachelor’s thesis as part of CMSC 29900 Bachelor’s Thesis. This thesis must be based on an approved research project that is directed by a faculty member and approved by the department counselor.

RECOMMENDED INTRODUCTORY SEQUENCES IN COMPUTER SCIENCE

The Department of Computer Science offers different introductory pathways into the program. In consultation with their College adviser and the Computer Science Department advisers, students should choose their introductory courses carefully. Some guidelines follow.

- Students interested in a technical introduction to computer science, without assuming prior experience or unusually strong preparation in mathematics, are encouraged to take CMSC 15100-15200 Introduction to Computer Science I-II.
• Students with programming experience and strong preparation in mathematics should consider CMSC 16100-16200 Honors Introduction to Computer Science I-II.

• Students majoring in quantitative fields other than computer science, including other sciences, mathematics, and economics, should consider CMSC 12100-12200 Computer Science with Applications I-II, possibly followed by CMSC 12300 Computer Science with Applications III.

• Students in the humanities and social sciences may consider CMSC 11000 Multimedia Programming as an Interdisciplinary Art I.

• Students interested in only one or two quarters of study should consider CMSC 12100-12200 Computer Science with Applications I-II. For students intending to pursue advanced study, we recommend CMSC 15100 Introduction to Computer Science I or CMSC 16100 Honors Introduction to Computer Science I as the first course.

• Students who are interested in web design should take CMSC 10100 Introduction to Programming for the World Wide Web I.

• Students may only receive credit for one introductory programming sequence: CMSC 12100-12200 Computer Science with Applications I-II, CMSC 15100-15200 Introduction to Computer Science I-II, or CMSC 16100-16200 Honors Introduction to Computer Science I-II. Exceptions must be approved by the department counselor prior to taking the second sequence.

• Students who have credit for any of the following courses (or equivalent) may not take CMSC 10200 Introduction to Programming for the World Wide Web II for credit: CMSC 10600 Fundamentals of Computer Programming II, CMSC 12100 Computer Science with Applications I, CMSC 15200 Introduction to Computer Science II, or CMSC 16200 Honors Introduction to Computer Science II.

Please be aware that course information is volatile, and the catalog does not necessarily reflect the latest changes. Students should consult http://course-info.cs.uchicago.edu for up-to-date information.

MINOR PROGRAM IN COMPUTER SCIENCE

The minor in computer science requires seven courses. The introductory sequence of three courses is followed by four approved upper-level courses. Courses in the minor must be taken for quality grades, with a grade of C- or higher in each course. Students may not use AP credit for computer science to meet requirements for the minor.

No courses in the minor can be double counted with the student’s major(s) or with other minors; nor can they be counted toward general education requirements. More than half of the requirements for the minor must be met by registering for courses bearing University of Chicago course numbers. The minor advisor must approve the student’s minor consent form and the student must submit that form to their College adviser by the end of Spring Quarter of their third year.
Introductory Courses

Students must choose three courses from the following (one course each from Areas A, B, and C). Please note that not all possible pathways through these courses are valid: for example, CMSC 15200 is not a prerequisite for CMSC 12300. Please consult the prerequisite information below and/or talk to the minor advisor to discuss viable plans.

Area A:
- CMSC 12100 Computer Science with Applications I
- CMSC 15100 Introduction to Computer Science I
- CMSC 16100 Honors Introduction to Computer Science I

Area B:
- CMSC 12200 Computer Science with Applications II
- CMSC 15200 Introduction to Computer Science II
- CMSC 16200 Honors Introduction to Computer Science II

Area C:
- CMSC 12300 Computer Science with Applications III
- CMSC 15400 Introduction to Computer Systems

Upper-Level Courses

The computer science minor must include four courses chosen from among all 20000-level CMSC courses and above. CMSC 12300 may be used as an elective if a student has used CMSC 15400 as the Area C introductory course. A 20000-level course must replace each 10000-level course in the list above that was used to meet general education requirements.

JOINT BA/MS OR BS/MS PROGRAM

Outstanding computer science majors may apply to complete an MS in computer science along with a BA or BS during their four years at the College. Students must be admitted to the joint MS program.

Prior to applying to either joint program, interested students must meet with the department counselor and Pete Segall, the College BA/MS or BS/MS adviser. (For an appointment with Mr. Segall, please contact him at psegall@uchicago.edu.) Students must submit applications for the joint program in the Winter Quarter of their third year.

Participants in the joint BA/MS or BS/MS program must meet the requirements for the BA or BS plus nine courses for the MS and a master's project. Three of the nine courses for the MS may also be used to meet the requirements of the BA or BS, resulting in a total of 20 courses in computer science. For details visit http://cs.uchicago.edu/info/BxMS.
GRADUATE COURSES

Graduate courses and seminars offered by the Department of Computer Science are open to College students with consent of instructor and department counselor. For more information, consult the department counselor.