Computer Science, Ph.D.

The Doctor of Philosophy program in computer science emphasizes preparation for research and teaching in academic settings or for research in private, industrial, or government laboratories.

Current and prospective graduate students should consult the Computer Science Graduate Handbook, available from the department's office and its website. The handbook provides detailed information about specific degree requirements, such as required courses, examinations, and dissertation requirements.

Requirements

The Doctor of Philosophy program in computer science requires a minimum of 72 s.h. of graduate credit, three examinations (qualifying, comprehensive, and final), and a written dissertation. Consult the Computer Science Graduate Handbook for detailed information about Ph.D. requirements and graduate study policies.

Basic Ph.D. requirements are as follows.

Core Requirement

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:5350</td>
<td>Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
</tbody>
</table>

And one of these:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:4330</td>
<td>Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>CS:5340</td>
<td>Limits of Computation</td>
<td>3</td>
</tr>
</tbody>
</table>

Breadth

Students must complete at least three of the following courses, with at least one course selected from each area (9 s.h.).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Systems and Software</strong></td>
<td></td>
</tr>
<tr>
<td>CS:4640</td>
<td>Computer Security</td>
<td>3</td>
</tr>
<tr>
<td>CS:4980</td>
<td>Topics in Computer Science II (section approved by advisor)</td>
<td>3</td>
</tr>
<tr>
<td>CS:5610</td>
<td>High Performance Computer Architecture</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Networks and Distributed Systems</strong></td>
<td></td>
</tr>
<tr>
<td>CS:4980</td>
<td>Topics in Computer Science II (section approved by advisor)</td>
<td>3</td>
</tr>
<tr>
<td>CS:5620</td>
<td>Distributed Systems and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS:5630</td>
<td>Cloud Computing Technology</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Programming Languages and Compilers</strong></td>
<td></td>
</tr>
<tr>
<td>CS:4980</td>
<td>Topics in Computer Science II (section approved by advisor)</td>
<td>3</td>
</tr>
<tr>
<td>CS:5810</td>
<td>Formal Methods in Software Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Cognate Area

In consultation with their advisor, students are required to select three courses, totaling 9 s.h. or more, that constitutes coherent coverage of an external cognate area; the courses need not be offered by the same department. Choices include, but are not limited to, mathematics, statistics, genetics, biology, and engineering disciplines.

Colloquium

Students must earn at least 4 s.h. in the following.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:6000</td>
<td>Research Seminar: Colloquium Series (must enroll at least four times for 1 s.h. each)</td>
<td>4</td>
</tr>
</tbody>
</table>

Electives

Students fill their remaining semester hours with a selection of computer science graduate courses numbered 4300 or above and graduate courses outside of the Department of Computer Science, approved by their advisor.

Qualifying Exam

Students are required to pass a qualifying examination by the end of their second year of graduate study. Once students select a topic in consultation with their advisor, they are assigned a three-member faculty examination panel by the department. Then they prepare a written prospectus for review by the committee, followed by an oral presentation.
Comprehensive Exam

The comprehensive examination is an evaluation of a student's mastery of a research area near completion of formal course work, and before preparation of the dissertation. The exam may be written, oral, or both, at the department's discretion, and is administered by a faculty committee. The comprehensive exam typically should be completed by the end of a student's third year and no later than the end of the fourth year in the Ph.D. program.

Dissertation

Each student must write a dissertation, a significant, original contribution to the field of computer science. Once students obtain some preliminary results and can identify and describe the boundaries of their dissertation, they prepare a written proposal for their committee's review. The dissertation must be prepared in accordance with the format specified in the Graduate College Thesis Manual.

Final Oral Examination

Once the dissertation is complete and has been reviewed by the student's committee, a final oral examination is administered on campus. This examination must take place no sooner than the semester following successful completion of the comprehensive examination and no later than five years after completion of the comprehensive exam.

Admission

Admission decisions are based on prior academic performance, letters of reference, the applicant's statement about background and purpose, and scores on the Graduate Record Examination (GRE) General Test. Students need not have a master's degree to begin the Ph.D. program or to be granted the doctoral degree. A student admitted without a master's degree may choose to be granted an M.S. or the M.C.S. while working toward the doctorate.

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

Career Advancement

Many graduates obtain positions in industry research laboratories, such as Amazon, Disney, Google, Samsung, and Yahoo, or in government research laboratories. Others pursue research and teaching careers in higher education, with some starting their careers in postdoctoral positions at universities before seeking employment in tenure-track positions, and some are employed as faculty with more teaching-oriented positions. A few recent Ph.D. graduates have founded or joined start-up companies.