Computer Science, PhD

Requirements

The Doctor of Philosophy program in computer science requires a minimum of 72 s.h. of graduate credit, four examinations (qualifying, comprehensive, dissertation proposal, and final), and a written dissertation. Students must maintain a cumulative grade-point average of at least 3.00. Consult the Computer Science Graduate Handbook for detailed information about PhD requirements and graduate study policies.

Basic PhD requirements are as follows.

Core Requirements

<table>
<thead>
<tr>
<th>Course #</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>
<tr>
<td>And one of these:</td>
<td></td>
<td></td>
</tr>
<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.).

Systems and Software

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<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 the director of graduate studies)</td>
<td>3</td>
</tr>
<tr>
<td>CS:5610</td>
<td>High Performance Computer Architecture</td>
<td>3</td>
</tr>
</tbody>
</table>

Networks and Distributed Systems

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:4980</td>
<td>Topics in Computer Science II (section approved by the director of graduate studies)</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>

Programming Languages and Compilers

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:4980</td>
<td>Topics in Computer Science II (section approved by the director of graduate studies)</td>
<td>3</td>
</tr>
<tr>
<td>CS:5810</td>
<td>Formal Methods in Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CS:5850</td>
<td>Programming Language Foundations</td>
<td>3</td>
</tr>
</tbody>
</table>

CS:5860   Lambda Calculus and Applications  3

With departmental approval, new courses or specific section offerings of CS:4980 Topics in Computer Science II also may satisfy a given area requirement.

Practice

Students must complete at least one 3 s.h. course with significant practical or implementation-oriented content. Each semester the department designates courses that satisfy this requirement. The following are typical selections.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:4400</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS:4420</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS:4440</td>
<td>Web Mining</td>
<td>3</td>
</tr>
<tr>
<td>CS:4470</td>
<td>Health Data Analytics</td>
<td>3</td>
</tr>
<tr>
<td>CS:4500</td>
<td>Research Methods in Human-Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>CS:4630</td>
<td>Mobile Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS:4700</td>
<td>High Performance and Parallel Computing</td>
<td>3</td>
</tr>
<tr>
<td>CS:4720</td>
<td>Optimization Techniques</td>
<td>3</td>
</tr>
<tr>
<td>CS:4980</td>
<td>Topics in Computer Science II (section approved by the director of graduate studies)</td>
<td>3</td>
</tr>
<tr>
<td>CS:5800</td>
<td>Fundamentals of Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CS:5990</td>
<td>Individualized Research or Programming Project</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 constitute 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>Course #</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)</td>
<td>4</td>
</tr>
<tr>
<td>CS:5980</td>
<td>Topics in Computer Science III (Responsible Conduct of Research)</td>
<td>1 s.h.</td>
</tr>
</tbody>
</table>

Responsible Conduct of Research Requirement

Students must complete this course within their first two years; it is offered in spring semesters.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS:5980</td>
<td>Topics in Computer Science III (Responsible Conduct of Research)</td>
<td>1 s.h.</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 coursework and before the 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 PhD program.

**Dissertation Proposal**

At least six months prior to the final exam, a student must form a dissertation committee and circulate a formal thesis proposal to the committee. The proposal should describe the research performed to date and related work, and outline the expected thesis results. A student must argue the originality and significance of the expected results to the committee in a manner consistent with the advisor’s counsel, which may or may not include an oral presentation.

Possible outcomes of a thesis proposal are that the committee finds the proposal satisfactory; the committee suggests modifications, and within a few weeks after the proposal defense, the student and committee reach a consensus by email or in face-to-face meetings on a modified set of expected thesis results; or the committee asks the student to redo their proposal, likely with a fresh proposal document and oral presentation, giving the student enough time to address the committee’s concerns.

**Dissertation**

Each student must write a dissertation, a significant, original contribution to the field of computer science. The dissertation must be prepared in accordance with the format specified on the Graduate College Thesis and Dissertation website.

**Final Oral Examination**

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