COMPUTER SCIENCE (PH.D.)

https://ceps.unh.edu/computer-science/program/phd/computer-science

Description

The Ph.D. program is designed to develop a student’s ability to carry out advanced research, as well as ensure the breadth and depth of computer science knowledge required to obtain a faculty position in academia or a research position in industry or at a national laboratory. Students first work to obtain breadth knowledge and a faculty research mentor. Then, working with their mentor, they carry out advanced work that results in original research publications and a doctoral dissertation.

Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 900</td>
<td>Graduate Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Select six CS graduate courses (of at least 3 credits each) beyond the M.S. or twelve CS graduate courses beyond the B.S.</td>
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<tr>
<td></td>
<td>Breadth Requirement</td>
<td>2</td>
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<tr>
<td></td>
<td>Interdisciplinary breadth requirement</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Depth Requirement</td>
<td>4</td>
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<tr>
<td></td>
<td>Dissertation</td>
<td>5</td>
</tr>
</tbody>
</table>

1. The courses must satisfy the following requirements:
   - Two must be implementation intensive (see list below).
   - All students must take CS 845 Formal Specification and Verification of Software Systems.
   - At most two can be CS 998 Independent Study. If two CS 998 courses are taken, they must be taught by different instructors.

2. At least two courses must be taken from the three different breadth areas (see list below). Students must pass these classes with a minimum grade of B-.

3. This requirement must be satisfied by taking a non-CS 800-level or 900-level course. The course must be approved by the student’s research mentor.

4. Under the direction of a depth adviser and a depth committee, the student carries out some preliminary research that is likely to lead to a dissertation topic. The student must produce two written reports (a literature survey and a research report) and make a presentation as part of an oral examination on the material. After the student has successfully completed the depth exam and has satisfied the interdisciplinary breadth requirement, the student is advanced to candidacy.

5. The student must complete original research and present and defend a dissertation describing that research. The research is carried out under the supervision of a faculty member dissertation adviser and a dissertation committee of at least five members, including one from outside the department.

Implementation Intensive Courses

Implementation intensive courses include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CS 812</td>
<td>Compiler Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 830</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 855</td>
<td>Introduction to Parallel and Distributed Programming</td>
<td>3</td>
</tr>
</tbody>
</table>

Breadth Course Groups

The list below identifies the three breadth course groups and introductory (800–level) graduate courses in each group. It is also acceptable to satisfy a group requirement by taking an advanced course (900-level) in the specified area. (Note that there are courses in the curriculum that are not in any of the identified groups.)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>CS 830</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 833</td>
<td>Mobile Robotics</td>
<td>3</td>
</tr>
<tr>
<td>CS 850</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 857</td>
<td>Mathematical Optimization for Applications</td>
<td>3</td>
</tr>
<tr>
<td>CS 931</td>
<td>Planning for Robots</td>
<td>3</td>
</tr>
<tr>
<td>CS 933</td>
<td>Human Robot Interaction</td>
<td>3</td>
</tr>
<tr>
<td>CS 950</td>
<td>Advanced Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 953</td>
<td>Data Science for Knowledge Graphs and Text</td>
<td>3</td>
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<tr>
<td></td>
<td>Systems</td>
<td></td>
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<tr>
<td>CS 820</td>
<td>Systems Programming</td>
<td>3</td>
</tr>
<tr>
<td>CS 823</td>
<td>Performance Evaluation of Computer Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 825</td>
<td>Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CS 827</td>
<td>Computer Security</td>
<td>3</td>
</tr>
<tr>
<td>CS 853</td>
<td>Information Retrieval</td>
<td>3</td>
</tr>
<tr>
<td>CS 920</td>
<td>Distributed Systems and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 925</td>
<td>Advanced Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CS 927</td>
<td>Software Security Analysis</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Software</td>
<td></td>
</tr>
<tr>
<td>CS 812</td>
<td>Compiler Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 835</td>
<td>Introduction to Parallel and Distributed Programming</td>
<td>3</td>
</tr>
<tr>
<td>CS 845</td>
<td>Formal Specification and Verification of Software Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 858</td>
<td>Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 870</td>
<td>Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>CS 871</td>
<td>Web Programming Paradigms</td>
<td>3</td>
</tr>
<tr>
<td>CS 875</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>MCBS 913</td>
<td>Applied Bioinformatics</td>
<td>3</td>
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</tbody>
</table>

Student Learning Outcomes

Graduates of the UNH Ph.D. CS program will have an ability to:

- Understand and apply a wide breadth and depth of computer science knowledge.
- Carry out advanced independent computer science research that results in original publications and a doctoral dissertation.
- Obtain a faculty position in academic, or a research position in industry or at a national laboratory.