Computer Science (PhD)

The doctor of philosophy in computer science is, above all, a high-quality degree that is not conferred simply for the successful completion of a specified number of courses or years of study. It is a degree reserved for students who demonstrate a comprehensive understanding of computer science and an ability to do creative research. Each PhD student produces a significant piece of original research, presented in a written dissertation and defended in an oral examination.

The PhD program is structured to facilitate the process of learning how to do research. Students begin by taking required courses to build a foundation of knowledge that is essential for advanced research. Early in the program the student gains research experience by undertaking a directed research project under the close supervision of a faculty member and the scrutiny of a faculty committee. In the later stages of the program, students take fewer courses and spend most of their time exploring their dissertation area to learn how to identify and solve open problems. The final steps are to propose an independent research project, do the research, and write and defend a dissertation.

Admission

Application materials should be submitted by December 15 for the following fall term. Materials include everything required for admission to the master's program as well as a discussion of the anticipated research area.

Students who enter the UO with a master's degree may petition the Graduate Education Committee for credit toward the course requirements listed below, indicating how their prior graduate work corresponds to these courses. See the graduate coordinator for the petition.

Program Learning Outcomes

Upon successful completion of this program, students will be able to:

- Core Knowledge Breadth: Demonstrate a broad working knowledge of fundamental theories, research findings and methodological approaches in multiple content areas within Computer Science (Foundations, Systems, Data Science).
- Core Knowledge Depth: Demonstrate a deep working knowledge of advanced theories, research findings, and methodological approaches within one of the Computer Science areas of Foundations, Systems, and Data Science.
- Software Engineering: Demonstrate a working knowledge of software engineering and development techniques and related hands-on skills.
- Scientific Inquiry: Achieve a deep fluency in the scientific literature and the ability to ask and pursue compelling questions within a primary field of research, and achieve proficiency in relevant experimental design, methodology, and data analysis/statistical methods.
- Scientific Communication: Demonstrate effective oral and written scientific communication skills.

PhD Course Requirements

Code	Title	Credits
Breadth Requirement: 12 credits total [1]		**12**
CS 621	Algorithms and Complexity	
CS 670	Data Science	
And one of the following:		
CS 630	Distributed Systems	
CS 631	Parallel Processing	
Depth Requirement: Choose one, 12 credits total [1]		**12**
Each Depth requires three courses, at least one at 600-level		
Foundations Depth		
CS 513	Advanced Data Structures	
CS 520	Automata Theory	
CS 543	User Interfaces	
CS 545	Modeling and Simulation	
CS 561	Introduction to Compilers	
CS 624	Structure of Programming Languages	
Data Science Depth		
CS 543	User Interfaces	
CS 553	Data Mining	
CS 571	Introduction to Artificial Intelligence	
CS 572	Machine Learning	
CS 573	Probabilistic Methods for Artificial Intelligence	
CS 6XX TBA		
Systems Depth		
CS 531	Introduction to Parallel Computing	
CS 532	Introduction to Networks	
CS 533	Computer and Network Security	
CS 541	Introduction to Computer Graphics	
CS 561	Introduction to Compilers	
CS 630	Distributed Systems	
CS 631	Parallel Processing	
CS 632	Computer Networks	
CS 633	Advanced Network Security	
Writing Requirement		**2**
CS 640	Writing in Computer Research	
Elective Options: 24 credits total		**24**
Total Credits		**50**

1. A grade of B- or better is required
2. Cannot duplicate Depth course used
3. Cannot duplicate Breadth course used
4. A grade of C or better is required in graded elective credits

PhD Degree Requirements

PhD candidates who enter the program without a master's degree in computer science must take 48 credits in graduate course work including the core and cluster courses required for the MS program. Doctoral students must earn a minimum grade of B– and an overall GPA of 3.50 in the six courses they use to satisfy the breadth and depth requirements.

Minimum Annual Enrollment

PhD students are expected to enroll in at least 6 credits of 600-level course work each year until their advancement to candidacy. Research: [Topic] (CS 601), Dissertation (CS 603), and Reading Conference: [Topic] (CS 605) do not satisfy this requirement. After candidacy, PhD students are encouraged to continue participation in 600-level courses

Directed Research Project

Complete a directed research project, which is supervised by a faculty member and evaluated by a faculty committee. The research project comprises the following:

1. The definition and expected results of the project in the form of a Directed Research Project Contract
2. Delivery of the materials constituting the results of the project and oral presentation of the results
3. A private oral examination by the committee members

Status Change

PhD candidates are admitted conditionally. Successful completion of the directed research project leads to a change in the student's doctoral status from conditional to unconditional.

Dissertation Advisory Committee

After successfully completing the directed research project, PhD students form a Dissertation Advisory Committee chaired by their research advisor. The main role of the committee is to advise the student between completion of the research project and mounting the dissertation defense. The committee takes primary responsibility for evaluating student progress. In addition, it approves the plan for the area examination, which in turn is approved by the graduate education committee. See the graduate coordinator for further instructions.

Area Examination

The student chooses an area of research and works closely with an advisor to learn the area in depth by surveying the current research and learning research methods, significant achievements, and how to pose and solve problems. The student gradually assumes a more independent role and prepares for the area examination, which tests depth of knowledge in the research area. The examination contains the following:

1. A survey of the area in the form of a position paper and an annotated bibliography
2. A public presentation of the position paper
3. A private oral examination by committee members

Advancement to Candidacy

After the area examination, the committee decides whether the student is ready for independent research work; if so, the student is advanced to candidacy.

Dissertation and Defense

Identify a significant unsolved research problem and submit a written dissertation proposal to the dissertation committee. The dissertation committee, comprising three department members and one member from an outside department, is approved by the graduate education committee. In addition to these four, the dissertation committee often includes a fifth examiner. This outside examiner should be a leading researcher in the candidate's field who is not at the University of Oregon. The outside member should be selected a year before the candidate's dissertation defense, and no later than six months before.

The student submits a written dissertation proposal to the committee for approval, and the proposal is then submitted to the graduate education committee. The proposal presents the research problems to be tackled, related research, methodology, anticipated results, and work plan. The committee may request an oral presentation, similar to the area exam, which allows the student to explain and answer question about the proposed research. The student then carries out the research.

The final stage is writing a dissertation and defending it in a public forum by presenting the research and answering questions about the methods and results. The dissertation committee may accept the dissertation, request small changes, or require the student to make substantial changes and schedule another defense

Division of Graduate Studies Requirements

PhD students must meet the requirements set by the Division of Graduate Studies as listed in that section of this catalog

Research Areas

It is important that a PhD student be able to work effectively with at least one dissertation advisor. Hence the student should identify, at an early stage, one or more areas of research to pursue. The student should also find a faculty member with similar interests to supervise the dissertation.