Ph.D. in Computer Science

The doctoral program in computer science provides students with a deep grounding in the fundamental principles and practice of computer science through core and elective coursework. The program also prepares students to conduct novel research that advances the state of the art in the field of computer science. Students conduct research projects under the direction of a faculty mentor, culminating in the defense of a doctoral dissertation. Graduates of the program are expected to excel in research, teaching, and the practice of computer science.

Admission Requirements

Applicants must have earned a Baccalaureate degree from an accredited university. Students apply through the Graduate School by submitting an application and the following supporting materials:

- Official transcripts of all previous academic work.
- Official scores on the Graduate Record Exam (GRE).
- Applicants from countries where English is not the first language are required to demonstrate English proficiency. Please consult the graduate school website for required scores.
- Personal Statement of Purpose.
- A minimum of two letters of recommendation.
- A CV/resume with evidence of other relevant experience.

Depending on qualifications for study, students may need to complete leveling coursework at the undergraduate level. These courses are not applied towards the degree. Applicants must be able to demonstrate knowledge of programming in a high-level language such as Java or C++, including knowledge of data structures and algorithms. This can be demonstrated by completing CS 2302 Data Structures with a B or better, or by completing equivalent coursework or certifications as approved by the program committee. Additional leveling courses may be required as prerequisites for specific graduate courses, or on a case-by-case basis depending on the qualifications of the student.

Degree Requirements

The PhD program requires a minimum of 36 credit hours of coursework beyond the bachelor's degree, and 36 credit hours of research, seminar, and dissertation courses. Students who enter the program with a relevant Master's degree qualify for reduced coursework, with a minimum of 15 hours of coursework. All courses must be taken at the 5000-level or above, unless specifically approved by the graduate advisor; when possible PhD students should take 6000-level courses. The coursework and research credit requirements are summarized in the following table.

Table 1 summarizes the degree requirements. The descriptions follow.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table 1: Degree Requirements Summary</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Courses</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Breadth Courses</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Technical Electives</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Interdisciplinary Electives</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Doctoral Research</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Dissertation</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Doctoral Seminar</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>

Core Courses (9 credit hours):

The following three (3) core courses are required for all students and must be completed with a B or better.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6392</td>
<td>Graduate Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>CS 6315</td>
<td>Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>CS 6350</td>
<td>Advanced Algorithms</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

Breadth Courses (12 credit hours):

To fulfill the breadth requirement, students must complete at least one course from four of the following five areas of computer science. All courses must be completed with a B or better.
Ph.D. in Computer Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6313</td>
<td>Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CS 6340</td>
<td>Advanced Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 6341</td>
<td>Adv Computer Architecture</td>
<td>3</td>
</tr>
</tbody>
</table>

**Area 2: Security**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6352</td>
<td>Computer Security</td>
<td>3</td>
</tr>
<tr>
<td>CS 6375</td>
<td>Software Reverse Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CS 6376</td>
<td>Comp. Dec Making &amp; Risk Anal</td>
<td>3</td>
</tr>
<tr>
<td>CS 6377</td>
<td>Cyber-Sec for Critical Op Tech</td>
<td>3</td>
</tr>
</tbody>
</table>

**Area 3: Software Development**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6382</td>
<td>Model-Based Software Devpmnt</td>
<td>3</td>
</tr>
<tr>
<td>CS 6385</td>
<td>Software Requirements Engr</td>
<td>3</td>
</tr>
<tr>
<td>CS 6386</td>
<td>Software Architecture &amp; Design</td>
<td>3</td>
</tr>
<tr>
<td>CS 6387</td>
<td>Software Integration and V&amp;V</td>
<td>3</td>
</tr>
</tbody>
</table>

**Area 4: Intelligent and Interactive Systems**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6314</td>
<td>Artificial Intelligence I</td>
<td>3</td>
</tr>
<tr>
<td>CS 6317</td>
<td>Human-Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>CS 6303</td>
<td>Logical Foundations of CS</td>
<td>3</td>
</tr>
</tbody>
</table>

**Area 5: Data Management and Analytics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6342</td>
<td>Database Management</td>
<td>3</td>
</tr>
<tr>
<td>CS 6361</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 6362</td>
<td>Data Mining</td>
<td>3</td>
</tr>
</tbody>
</table>

**Technical Electives (12) credit hours:**

Students must select at least 12 credit hours of technical elective courses in computer science. These courses should be selected in consultation with the research advisor and graduate program advisor to develop technical depth in the student's specific area of research interest.

**Interdisciplinary Elective (3) credit hours:**

Students must take at least one graduate-level course outside of the computer science department to develop exposure to interdisciplinary topics that complement the student's area of study.

**Doctoral Research (27) credit hours:**

Students must take at least 27 hours of doctoral research credits.

**Dissertation (6) credit hours:**

Students must take a minimum of six (6) hours of dissertation credits. These credits may only be taken after passing the comprehensive examination (dissertation proposal).

The dissertation must demonstrate competence in scholarly exposition and the ability to do independent research. It should present original investigations at an advanced level on a significant problem in computer science and should provide the basis for a publishable contribution to the research literature in the field. The rules for the dissertation and dissertation defense will follow the guidelines set forth by the Graduate School at UTEP.

**Doctoral Seminar (3) credit hours:**

Students are expected to actively participate in departmental seminars and other scholarly activities. During the program, they must complete at least 3 hours of seminar credits.

**Students Entering with a Relevant MS Degree**

Students entering with a relevant Master's degree must satisfy the core requirements of the PhD program through coursework or transfer credits and must complete a minimum of 15 credit hours of technical coursework in the PhD program. The specific coursework will be determined in consultation with the graduate advisor.

**Examinations**

Doctoral students must complete a qualifying examination, a comprehensive examination, and a final dissertation defense. The detailed requirements for each examination can be found on the departmental website.
The qualifying examination is designed to ensure that students are prepared to conduct research at the PhD level. This includes assessing graduate-level mastery of fundamental concepts in computer science, as well as written and oral communication skills.

The comprehensive examination is a written and oral defense of a dissertation proposal. This is designed to ensure that the student has identified a relevant research problem, outlined a feasible and sound approach to address the problem/research questions, and acquired sufficient depth of knowledge in the topic area to perform new and significant research. Upon successful completion of the examination, the chair of the student's dissertation committee will inform the graduate school that the student is ready to begin work on his or her final dissertation, and the student will be admitted to candidacy.

The culmination of the PhD is writing and defending a dissertation. Students must submit a written dissertation following the guidelines published by the graduate school and defend the dissertation in a public defense before an approved dissertation committee.

**Cybersecurity Certificate**

The department also offers a certificate in cyber security that can be obtained in combination with the PhD degree if the student selects the necessary courses as electives. See the description of the certificate program for the detailed requirements.

**Degree Plan**

Required Credits: 72

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td></td>
<td><strong>PhD in Computer Science Program</strong></td>
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</tr>
<tr>
<td></td>
<td>(All courses require a grade of C or better)</td>
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</tr>
<tr>
<td></td>
<td><strong>Core Courses:</strong></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Core Courses (9) credit hours (B or above is required for the following three (3) courses):</td>
<td></td>
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<tr>
<td>CS 6315</td>
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<td></td>
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<tr>
<td>CS 6362</td>
<td>Data Mining</td>
<td></td>
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<tr>
<td></td>
<td><strong>Technical Electives (12) credit hours:</strong></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Select twelve additional credit hours of technical electives in CS. Courses should be selected in consultation with the research advisor and graduate program advisor.</td>
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<tr>
<td>CS 6194</td>
<td>Doctoral Research</td>
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<tr>
<td>CS 6294</td>
<td>Doctoral Research</td>
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</tbody>
</table>
### Interdisciplinary Electives (3 credit hours):

Students must take at least one graduate-level course outside of the computer science department to develop exposure to interdisciplinary topics.

### Doctoral Research (27 credit hours):

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CS 6194</td>
<td>Doctoral Research</td>
</tr>
<tr>
<td>CS 6294</td>
<td>Doctoral Research</td>
</tr>
<tr>
<td>CS 6394</td>
<td>Doctoral Research</td>
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<tr>
<td>CS 6694</td>
<td>Doctoral Research</td>
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</tbody>
</table>

### Dissertation (6 credit hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CS 6398</td>
<td>Dissertation</td>
</tr>
<tr>
<td>&amp; CS 6399</td>
<td>Dissertation and Dissertation</td>
</tr>
</tbody>
</table>

### Doctoral Seminar (3 credit hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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</table>

Total Hours: 72