Computer and Information Science PhD

COLLEGE OF SCIENCE AND TECHNOLOGY

Learn more about the Doctor of Philosophy in Computer and Information Science.

About the Program

The Computer and Information Science PhD program prepares a student to undertake independent research leading to science and engineering advances in computer and information sciences. The program is structured around the PhD dissertation, with coursework and seminars designed to attain the requisite quality of the dissertation. An important criterion for the dissertation is that it be publishable in a recognized journal and presentable at international conferences.

Time Limit for Degree Completion: 7 years

Campus Location: Main

Full-Time/Part-Time Status: Students complete the degree program through classes offered after 4:30 p.m. The degree program can be completed on a full- or part-time basis.

Areas of Specialization: The PhD program focuses on four research tracks:

1. Artificial Intelligence and Applications, which is concerned with systems that exhibit intelligent behavior.
2. Computer and Network Systems, which covers systems programming, operating systems, and system architectures, including networks and distributed systems.
3. Information Systems, which focuses on systems that provide information to improve the performance of organizations.
4. Software Systems, which is dedicated to the creation of software and its associated methodologies.

Job Prospects: Graduates typically find employment in universities, industry or government agencies.

Non-Matriculated Student Policy: Non-matriculated students are permitted to take a maximum of two graduate-level CIS courses.

Financing Opportunities: Teaching Assistants teach two undergraduate laboratory sections each term under the direction of a faculty lecturer. Assistantships provide a stipend and full-time tuition.

Admission Requirements and Deadlines

Application Deadline:

Fall: January 15
Spring: November 1; August 1 international

Applications are reviewed as they are received. Late applications may be considered for admission.

APPLY ONLINE to this graduate program.

Letters of Reference:

Number Required: 3

From Whom: Letters of recommendation should be obtained from Computer Science faculty and professionals.

Coursework Required for Admission Consideration: The applicant is required to have a solid background in Computer and Information Science and related disciplines. In addition, acceptance by a PhD Graduate Faculty member in at least one open track is required. To find a faculty advisor, prospective students should contact Graduate Faculty whose research interests are similar to their own. The list of faculty can be found at https://cis.temple.edu/people/faculty.

Master's Degree in Discipline/Related Discipline: A master's degree is not required.

Bachelor's Degree in Discipline/Related Discipline: A baccalaureate degree in Computer Science, Information Science, Mathematics, Science or Engineering is required. The applicant's undergraduate program must include a considerable amount of coursework in Computer and Information Science.

Statement of Goals: In approximately 500 to 1,000 words, describe your specific interest in Temple's program, research goals, future career goals, and academic and research achievements.

Standardized Test Scores:
GRE: Required. Scores should minimally be in the 75th percentile on the quantitative section and 25th percentile on the verbal section for a combined total score of at least 297.

Applicants who earned their baccalaureate degree from an institution where the language of instruction was other than English, with the exception of those who subsequently earned a master’s degree at a U.S. institution, must report scores for a standardized test of English that meet these minimums:

- TOEFL iBT: 85
- IELTS Academic: 6.5
- PTE Academic: 58
- Duolingo: 110

A score of 45 or greater on the Test of Spoken English (TSE) or a score of 28 or greater on the TOEFL iBT Speaking section is required for international applicants who wish to be considered for a Teaching Assistantship.

Resume: Current resume required.

Advanced Standing: Students who enter the PhD program with graduate credits in Computer Science or a closely related field may be considered for advanced standing. The CIS Graduate Committee recommends the awarding of advanced standing on a case-by-case basis. The credits must be equivalent to coursework offered at Temple, with a grade of "B" or better having been earned in the course(s). The maximum number of advanced standing credits awarded is 24.

Program Requirements

General Program Requirements:
Number of Credits Required Beyond the Baccalaureate: 36

Required Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Track-Specific Courses</strong></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td><strong>Research Preparation Courses</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select 6 credits from the following:</td>
<td></td>
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<tr>
<td></td>
<td>CIS 9182 Independent Study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CIS 9282 Independent Study</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Graduate-level course aligned with the student's research area</td>
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</tr>
<tr>
<td></td>
<td><strong>Research Courses</strong></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>CIS 9994 Preliminary Examination Preparation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CIS 9998 Pre-Dissertation Research / Elevation to Candidacy</td>
<td></td>
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<td></td>
<td>CIS 9999 Dissertation Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credit Hours</strong></td>
<td>36</td>
</tr>
</tbody>
</table>

1. Required and elective courses are identified in the course lists below for each of the four tracks: Artificial Intelligence and Applications, Computer and Network Systems, Information Systems, and Software Systems.

2. Course selection requires approval from the faculty advisor and Graduate Committee.

Artificial Intelligence and Applications Track

Core Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIS 5511</td>
<td>Programming Techniques</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5526</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5603</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional Track-Specific Courses

Select five courses from the following: 15

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>CIS 5513</td>
<td>Automata and Formal Languages</td>
</tr>
<tr>
<td>CIS 5515</td>
<td>Design and Analysis of Algorithms</td>
</tr>
<tr>
<td>CIS 5523</td>
<td>Knowledge Discovery and Data Mining</td>
</tr>
<tr>
<td>CIS 5525</td>
<td>Neural Computation</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
</tr>
<tr>
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</tr>
<tr>
<td>CIS 5527</td>
<td>Data Warehousing, Filtering and Mining</td>
</tr>
<tr>
<td>CIS 5538</td>
<td>Text Mining and Language Processing</td>
</tr>
<tr>
<td>CIS 5543</td>
<td>Computer Vision</td>
</tr>
<tr>
<td>CIS 5617</td>
<td>Computer Networking and Communication</td>
</tr>
<tr>
<td>CIS 5950</td>
<td>Seminar in Advanced Topics in Computer Science</td>
</tr>
<tr>
<td>CIS 9601</td>
<td>Computer Graphics and Image Processing</td>
</tr>
<tr>
<td>CIS 9618</td>
<td>Web Applications Development</td>
</tr>
<tr>
<td>CIS 9651</td>
<td>Artificial Intelligence, Heuristic Models, and Education</td>
</tr>
<tr>
<td>CIS 9665</td>
<td>Advanced Topics in Data Base Systems</td>
</tr>
</tbody>
</table>

**Total Credit Hours** 24

### Computer and Network Systems Track

#### Core Courses
Select at least two courses from the following: 6

- CIS 5511 Programming Techniques
- CIS 5512 Operating Systems
- CIS 5513 Automata and Formal Languages
- CIS 5617 Computer Networking and Communication
- CIS 5642 Computer Architecture

#### Additional Track-Specific Courses
Select at most six courses from the following: 18

- CIS 5515 Design and Analysis of Algorithms
- CIS 5523 Knowledge Discovery and Data Mining
- CIS 5526 Machine Learning
- CIS 5603 Artificial Intelligence
- CIS 5636 Ad Hoc Networks
- CIS 5637 Network & Information Security
- CIS 5639 Wireless Network and Communication
- CIS 5644 Distributed Systems
- CIS 9618 Web Applications Development
- CIS 9665 Advanced Topics in Data Base Systems
- CIS 9666 Advanced Networks and Client-Server Computing
- CIS 9669 Distributed and Parallel Computer Systems

**Total Credit Hours** 24

### Information Systems Track

#### Code Title Credit Hours

Select a minimum of one and up to three theory courses from the following:

- CIS 5511 Programming Techniques
- CIS 5515 Design and Analysis of Algorithms
- STAT 8003 Statistical Methods and Concepts

Select a minimum of one and up to three systems courses from the following:

- CIS 5512 Operating Systems
- CIS 5516 Principles of Data Management
- CIS 5617 Computer Networking and Communication
- CIS 5644 Distributed Systems
- CIS 9666 Advanced Networks and Client-Server Computing

Select a minimum of two and up to four track-specific courses from the following:

- CIS 5525 Neural Computation
### Software Systems Track

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
</thead>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>CIS 5511</td>
<td>Programming Techniques</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5512</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5513</td>
<td>Automata and Formal Languages</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5515</td>
<td>Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5516</td>
<td>Principles of Data Management</td>
<td>3</td>
</tr>
<tr>
<td>CIS 5617</td>
<td>Computer Networking and Communication</td>
<td>3</td>
</tr>
<tr>
<td>CIS 9618</td>
<td>Web Applications Development</td>
<td>3</td>
</tr>
<tr>
<td><strong>Elective</strong></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credit Hours**: 24

1. Selection of the elective requires approval of the Software Systems Track Chair.

### Additional Requirements:

**PhD Qualifying Examination:**

The Qualifying Examination tests the student on the fundamentals of Computer and Information Science and the basic body of knowledge in a track. It consists of a written exam on theory and algorithms, systems, and track-specific material. The Qualifying Exam is offered twice a year, usually in late January and late June.

**Culminating Events:**

**Preliminary Examinations:**

The goal of the preliminary examinations is to test the research skills and knowledge of the student and the appropriateness and feasibility of the proposed research. The exams are completed in two stages:

- Prelim I consists of written and oral components testing advanced track knowledge and in-depth knowledge of the research area. It includes a literature review of the area. This preliminary exam is used to determine whether the student needs to take additional courses in order to support research in the chosen area. Prelim I is open only to the Doctoral Advisory Committee and members of the department. It is to be taken within one year of passing the PhD Qualifying Examination.
- Prelim II consists of written and oral components to assess the appropriateness of the research, including approach and methodology. It is designed to ensure that the selected research problem is of reasonable scope and significance and that the proposed dissertation is feasible. The written portion of Prelim II should be of sufficient quality to be publishable as a department technical report. This exam is open to the public.

The Doctoral Advisory Committee evaluates the preliminary examinations. Each member votes to pass or fail the student. In order to pass, a majority of the committee members must agree that the exam has been satisfactorily completed. The successful completion of the preliminary examinations produces a written understanding among the student, faculty advisor and Doctoral Advisory Committee, specifying the work to be done to obtain final approval of the dissertation.

Students who are preparing to do their preliminary examinations should confirm a time and date with the Chair of their Doctoral Advisory Committee and register with the Administrative Coordinator one month prior to the date. The student and Chair receive confirmation of the time, date and room of the examination.

**Dissertation Proposal:**

The dissertation proposal demonstrates the student's knowledge of and ability to conduct the proposed research. The proposal should consist of:
1. the context and background surrounding a particular research problem; 
2. an exhaustive survey and review of literature related to the problem; and 
3. a detailed methodological plan for investigating the problem.

The proposal should be finished and approved no more than one year after completing coursework. Upon approval, a timeline for completing the investigation and writing process are established.

Dissertation:
The doctoral dissertation is an original empirical study that makes a significant contribution to the field of Computer and Information Science. It should expand the existing knowledge and demonstrate the student's knowledge of research methods and a mastery of their primary area of interest. Dissertations should be rigorously investigated; uphold the ethics and standards of the Computer and Information Science field; demonstrate an understanding of the relationship between the primary area of interest and the broader field of Computer and Information Science; and be prepared for publication in a professional journal.

The Doctoral Advisory Committee is formed to oversee the student's doctoral research and is comprised of at least three Graduate Faculty members. Two members, including the Chair, must be from the Department of Computer and Information Sciences. Committee compositions must be approved by the CIS Graduate Committee. The Chair is responsible for overseeing and guiding the student's progress, coordinating the responses of the committee members, and informing the student of their academic progress.

The Dissertation Examining Committee evaluates the student's dissertation and oral defense. This committee is comprised of the Doctoral Advisory Committee and at least one additional Graduate Faculty member from outside the Department of Computer and Information Sciences. The Outside Examiner should be identified no later than the beginning of the term in which the student will defend the dissertation. The committee evaluates the student's ability to express verbally their research question, methodological approach, primary findings and implications. The committee votes to pass or fail the dissertation and the defense at the conclusion of the public presentation.

If a student needs to change a member of a committee, the new member must be approved by the CIS Graduate Committee and registered with the Administrative Coordinator and the Graduate School.

Students who are preparing to defend their dissertation should confirm a time and date with their Doctoral Advisory Committee and register with the Administrative Coordinator at least 30 days before the defense is to be scheduled. The student and Chair receive confirmation of the time, date and room for the examination.

The Administrative Coordinator sends the Graduate School a completed "Announcement of Dissertation Defense" form, found in TUPortal under the Tools tab within “University Forms,” at least 10 days before the defense. The department posts flyers announcing the defense.

Contacts

Program Web Address:
https://www.temple.edu/academics/degree-programs/computer-and-information-science-phd-st-cis-phd

Department Information:
Dept. of Computer and Information Sciences
313 Science and Education Research Center
1925 N. 12th Street
Philadelphia, PA 19122-1801
cisadmit@temple.edu
215-204-8450

Submission Address for Application Materials:
https://cst.temple.edu/academics/graduate-programs/apply-now

Department Contacts:

Admissions:
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cisadmit@temple.edu
215-204-8450

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