COMPUTER SCIENCES, PH.D.

The Department of Computer Sciences offers the master of science (http://guide.wisc.edu/graduate/computer-sciences/computer-sciences-ms/) and doctor of philosophy degrees in computer sciences. Research specialty areas include artificial intelligence, computational biology, computer architecture, computer graphics, computer networks, computer security, database systems, human–computer interaction, numerical analysis, optimization, performance analysis, programming languages and compilers, systems research, and theoretical computer sciences. The department’s Graduate Advising Committee (GAC) advises all computer sciences graduate students except students who are in dissertator status. See department website (https://www.cs.wisc.edu/) for faculty interests, research activities, courses, facilities, and degree requirements.

ADMISSIONS

Please consult the table below for key information about this degree program’s admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program’s website.

Graduate admissions is a two-step process between academic programs and the Graduate School. Applicants must meet the minimum requirements (https://grad.wisc.edu/apply/requirements/) of the Graduate School as well as the program(s).

Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/apply/).

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>The program does not admit in the spring.</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>The program does not admit in the summer.</td>
</tr>
<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>Required.</td>
</tr>
<tr>
<td>English Proficiency Test</td>
<td>Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (<a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a>).</td>
</tr>
<tr>
<td>Other Test(s) (e.g., GMAT, MCAT)</td>
<td>n/a</td>
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<tr>
<td>Letters of Recommendation</td>
<td>3</td>
</tr>
<tr>
<td>Required</td>
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</tbody>
</table>

Students with a strong background in computer sciences or a related field are encouraged to apply for admission. At a minimum, the applicant should have had some programming experience, including courses in data structures and machine organization, and should have had a year of college-level mathematics at the calculus level or above. Applicants are evaluated based on their previous academic record, GRE scores, letters of recommendation, and a personal statement. All applications must be submitted online. Admission is very competitive. Aid is offered to about half of the students to whom admission is offered. Aid is usually in the form of fellowships, teaching assistantships, or research assistantships. For more information on admissions, visit the department website (https://www.cs.wisc.edu/academics/graduate-programs/guidebook/admission/).

Contact admissions@cs.wisc.edu with questions about admissions in the traditional M.S. or the Ph.D. programs.

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding/) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

PROGRAM RESOURCES

Funding is offered to about half of the students to whom admission is offered. Funding is usually in the form of fellowships, teaching assistantships, or research assistantships. Because computer science skills are in demand, students who are admitted without funding are often able to find graduate assistantships on campus. The department website (https://www.cs.wisc.edu/academics/graduate-programs/guidebook/financial-aid/) provides information on funding options and offers suggestions for those who are admitted without department funding.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students are able to complete a program with minimal disruptions to careers and other commitments.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.
CURRICULAR REQUIREMENTS

Requirements Detail

Minimum Credit Requirement
51 credits

Minimum Residence Credit Requirement
32 credits

Minimum Graduate Coursework Requirement
Half of degree coursework (26 credits out of 51 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide.

Overall Graduate GPA Requirement
3.00 GPA required.

Other Grade Requirements
All grades must be at least AB in all required breadth courses.

Assessments and Examinations
Doctoral students must complete a qualifying process, a preliminary examination, and a dissertation requirement. The qualifying process includes both completion of "breadth courses" (see Required Courses, below) as well as satisfactory completion of a depth examination in a selected focus area. The preliminary examination is an oral examination demonstrating depth of knowledge in the area of specialization in which research for the dissertation will be conducted. The dissertation requirement consists of conducting a substantial piece of original research in computer science, reporting it in a dissertation that meets the highest standards of scholarship, and explaining and defending the contents of the dissertation in a final oral examination and defense.

Language Requirements
No language requirements.

Doctoral Minor/Breadth Requirements
All doctoral students are required to complete a minor.

REQUIRED COURSES

Additional Breadth Requirement
Ph.D. students must take at least one course from each of the bands 1, 2, and 3 listed below; the courses must be distinct from the research area of the student's qualifying exam activity. This requirement can be satisfied with 3 700-level courses, or 2 700-level and 2 500-level courses. Grades in all courses used for breadth must be at least AB. Details on which courses may be used for breadth are in the Graduate Program Handbook.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band 1</td>
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</tbody>
</table>

**Computer Architecture:**
- COMP SCI/ECE 552 Introduction to Computer Architecture 3
- COMP SCI/ECE 752 Advanced Computer Architecture I 3
- COMP SCI/ECE 755 VLSI Systems Design 3
- COMP SCI/ECE 757 Advanced Computer Architecture II 3
- COMP SCI 758 Advanced Topics in Computer Architecture 3

**Computer Networks:**
- COMP SCI 640 Introduction to Computer Networks 3
- COMP SCI/ECE 707 Mobile and Wireless Networking 3
- COMP SCI 740 Advanced Computer Networks 3

**Computer Security:**
- COMP SCI 642 Introduction to Information Security 3

**Operating Systems:**
- COMP SCI 537 Introduction to Operating Systems 4
- COMP SCI 736 Advanced Operating Systems 3
- COMP SCI 739 Distributed Systems 3
- COMP SCI 744 Big Data Systems 3

**Programming Languages and Compilers:**
- COMP SCI/ECE 506 Software Engineering 3
- COMP SCI 536 Introduction to Programming Languages and Compilers 3
- COMP SCI 538 Introduction to the Theory and Design of Programming Languages 3
- COMP SCI 701 Construction of Compilers 3
- COMP SCI 703 Program Verification and Synthesis 3
- COMP SCI 704 Principles of Programming Languages 3
- COMP SCI 706 Analysis of Software Artifacts 3

**Band 2**

**Artificial Intelligence:**
- COMP SCI 534 Computational Photography 3
- COMP SCI 540 Introduction to Artificial Intelligence 3
- COMP SCI 545 Natural Language and Computing 3
- COMP SCI 760 Machine Learning 3
- COMP SCI/ECE 761 Mathematical Foundations of Machine Learning 3
- COMP SCI 766 Computer Vision 3
- COMP SCI 769 Advanced Natural Language Processing 3

**Bioinformatics:**
- COMP SCI/BM 576 Introduction to Bioinformatics 3
- COMP SCI/BM 776 Advanced Bioinformatics 3

**Computer Graphics:**
- COMP SCI 559 Computer Graphics 3
- COMP SCI 679 Computer Game Technology 3
- COMP SCI 765 Data Visualization 3
- COMP SCI 777 Computer Animation 3

**Database Systems:**
- COMP SCI 564 Database Management Systems: Design and Implementation 4
- COMP SCI 764 Topics in Database Management Systems 3
- COMP SCI 784 Foundations of Data Management 3

**Human-Computer Interaction:**
- COMP SCI 570 Introduction to Human-Computer Interaction 4
- COMP SCI/ED PSYCH/PSYCH 770 Human-Computer Interaction 3

Band 3
In addition, some offerings of COMP SCI 838 (http://www.cs.wisc.edu/courses/838/) count towards the breadth requirement. Before each term, it is announced which sections do and what area/band they are in.

One course taken as a graduate student elsewhere may be counted for breadth. A request for this must be made in writing to the GAC Chair. The request should indicate the corresponding UW–Madison course, include a transcript showing a grade of AB or better, and suggest a faculty member who can evaluate the course. GAC will ask this faculty member to evaluate the outside course’s syllabus and other course materials and vouch for the choice of UW–Madison course.

**Policies**

**Graduate School Policies**

The Graduate School’s Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy/) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

**Major-Specific Policies**

**Prior Coursework**

**Graduate Work from Other Institutions**

Subject to faculty approval, one graduate course taken elsewhere may be used for breadth. Other than that, no credits of graduate coursework from other institutions are allowed to satisfy requirements.

**UW-Madison Undergraduate**

No credits from a UW–Madison undergraduate degree are allowed to satisfy requirements.

**UW-Madison University Special**

With program approval, students are allowed to count no more than 15 credits of coursework numbered 300 or above taken as a UW–Madison University Special student. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

**Probation**

At the end of any regular (nonsummer) semester, a student is considered to be making satisfactory academic progress (SAP) if the following conditions are all satisfied:

- Before achieving dissertator status: the student has completed at least 6 (if full load) or 3 (if part load) credits of approved courses during the semester.
- After achieving dissertator status: the student has satisfactorily completed at least three credits of courses approved by the student's major professor.
- The student has removed all Incomplete grades from any previous regular semester or summer session.
- The student has passed any required exams and procedures within designated time limits.

Any graduate student who fails to make SAP during two consecutive regular semesters (fall and spring, or spring and fall) will be dismissed from the department at the end of the subsequent summer session. Any graduate student who fails to make SAP due to missed deadlines will be dismissed from the department at the end of the subsequent summer session.

**Advisor / Committee**

A member of the graduate advising committee must formally approve all graduate schedules each semester until a student is in dissertator status.

**Credits per Term Allowed**

15 credits

**Time Constraints**

Students must pass the qualifying process by the end of the sixth semester.

The preliminary exam must be taken within two regular (nonsummer) semesters after the deadline for the qualifying exam.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may by required to take another preliminary examination and to be admitted to candidacy a second time.
Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence.

**GRIEVANCES AND APPEALS**
These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (https://doso.students.wisc.edu/bias-or-hate-reporting/)
- Graduate Assistantship Policies and Procedures (https://hr.wisc.edu/policies/gapp/#grievance-procedure)
- Hostile and Intimidating Behavior Policies and Procedures (https://hr.wisc.edu/hib/)
- Office of the Provost for Faculty and Staff Affairs (https://facstaff.provost.wisc.edu/)
- Dean of Students Office (https://doso.students.wisc.edu/) (for all students to seek grievance assistance and support)
- Employee Assistance (http://www.eao.wisc.edu/) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (https://employeedisabilities.wisc.edu/) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (https://grad.wisc.edu/) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (https://compliance.wisc.edu/) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (https://conduct.students.wisc.edu/) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (http://www.ombuds.wisc.edu/) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (https://compliance.wisc.edu/titleix/) (for concerns about discrimination)

Students should contact the department chair or program director with questions about grievances. They may also contact the L&S Academic Divisional Associate Deans, the L&S Associate Dean for Teaching and Learning Administration, or the L&S Director of Human Resources.

**LEARNING OUTCOMES**

1. Articulates research problems, potentials, and limits with respect to theory, knowledge, or practice within the field of study.
2. Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of study.
3. Creates research, scholarship, or performance that makes a substantive contribution.
4. Demonstrates breadth within their learning experiences.
5. Advances contributions of the field of study to society.
6. Communicates complex ideas in a clear and understandable manner.
7. Fosters ethical and professional conduct.

**PEOPLE**
See Faculty (https://www.cs.wisc.edu/people/faculty/) on the department website.

**OTHER**
n/a

**PROFESSIONAL DEVELOPMENT**

**GRADUATE SCHOOL RESOURCES**
Take advantage of the Graduate School's professional development resources (https://grad.wisc.edu/pd/) to build skills, thrive academically, and launch your career.

**PROGRAM RESOURCES**
The Department of Computer Sciences hosts many professional development opportunities including: job fairs, workshops, seminars, talks, employer information sessions, mentoring and student socials. The Department of Computer Sciences student organizations, Student-ACM (SACM) and Women's ACM (WACM), are active partners in providing professional development opportunities for computer sciences graduate students.