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: 26 credits must be graduate-level coursework. Details can be found in the Graduate School’s Minimum Graduate Coursework (50%) policy (https://policy.wisc.edu/library/UW-1244/).

Overall GPA: 3.00 GPA required.

Graduate GPA: This program follows the Graduate School’s policy. https://policy.wisc.edu/library/UW-1203/.

Other Grade Requirements: All grades must be at least AB in all required qualifying 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 “qualifying 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.

Breadth Requirement

All doctoral students are required to complete a doctoral minor or Graduate/Professional certificate.

REQUIRED COURSES

Additional Qualifying Breadth Courses 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. All offerings of COMP SCI 839 may count; confirm with program which area a specific topic counts toward.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP SCI/E C E 552</td>
<td>Introduction to Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 752</td>
<td>Advanced Computer Architecture I</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 755</td>
<td>VLSI Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 757</td>
<td>Advanced Computer Architecture II</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 758</td>
<td>Advanced Topics in Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 640</td>
<td>Introduction to Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 707</td>
<td>Mobile and Wireless Networking</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 740</td>
<td>Advanced Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 642</td>
<td>Introduction to Information Security</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 782</td>
<td>Advanced Computer Security and Privacy</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 537</td>
<td>Introduction to Operating Systems</td>
<td>4</td>
</tr>
<tr>
<td>COMP SCI 736</td>
<td>Advanced Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 739</td>
<td>Distributed Systems</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 744</td>
<td>Big Data Systems</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 506</td>
<td>Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 536</td>
<td>Introduction to Programming Languages and Compilers</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
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</tr>
<tr>
<td>COMP SCI 538</td>
<td>Introduction to the Theory and Design of Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 701</td>
<td>Construction of Compilers</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 703</td>
<td>Program Verification and Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 704</td>
<td>Principles of Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 706</td>
<td>Analysis of Software Artifacts</td>
<td>3</td>
</tr>
</tbody>
</table>

**Band 2**

**Artificial Intelligence:**
- COMP SCI 534: Computational Photography
- COMP SCI 540: Introduction to Artificial Intelligence
- COMP SCI 545: Natural Language and Computing
- COMP SCI/E C E 760: Machine Learning
- COMP SCI/E C E 761: Mathematical Foundations of Machine Learning
- COMP SCI 762: Advanced Deep Learning
- COMP SCI 766: Computer Vision
- COMP SCI 769: Advanced Natural Language Processing

**Bioinformatics:**
- COMP SCI/B M I 576: Introduction to Bioinformatics
- COMP SCI/B M I 776: Advanced Bioinformatics

**Computer Graphics:**
- COMP SCI 559: Computer Graphics
- COMP SCI 765: Data Visualization

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

**Human-Computer Interaction:**
- COMP SCI 570: Introduction to Human-Computer Interaction
- COMP SCI/I SY E/ ED PSYCH/ PSYCH 770: Human-Computer Interaction

**Band 3**

**Numerical Analysis:**
- COMP SCI/ MATH 513: Numerical Linear Algebra
- COMP SCI/ MATH 514: Numerical Analysis
- COMP SCI/ MATH 714: Methods of Computational Mathematics I
- COMP SCI/ MATH 715: Methods of Computational Mathematics II

**Optimization:**
- COMP SCI/E C E/I SY E 524: Introduction to Optimization
- COMP SCI/I SY E/ MATH/STAT 525: Linear Optimization
- COMP SCI/I SY E 635: Tools and Environments for Optimization

**Stochastic Programming:**
- COMP SCI/I SY E 719: Stochastic Programming

**Dynamic Programming and Associated Topics:**
- COMP SCI/I SY E 723

**Nonlinear Optimization I:**
- COMP SCI/I SY E/MATH/STAT 726

**Integer Optimization:**
- COMP SCI/I SY E/MATH 728

**Nonlinear Optimization II:**
- COMP SCI/I SY E/MATH 730

**Theory of Computing:**
- COMP SCI 520: Introduction to Theory of Computing
- COMP SCI 577: Introduction to Algorithms
- COMP SCI 710: Computational Complexity
- COMP SCI 787: Advanced Algorithms
- COMP SCI 880: Topics in Theoretical Computer Science

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.