The Computer Science graduate program prepares students for research and professional practice in computer science and related technologies. The program includes both fundamentals and advanced work in the areas of artificial intelligence and databases, programming languages and software engineering, systems and networks, theoretical computer science, and visual computing. Graduate classes are divided into basic classes, which have no graduate course prerequisite, and advanced classes, which have a graduate class as a prerequisite. Graduate classes are generally offered in the late afternoon and evening. Financial aid in the form of graduate assistantships may be available for full-time degree-seeking students.

Admissions & Policies

Admissions
In addition to fulfilling Mason’s admission requirements for graduate study, applicants must meet the following requirements:

- Hold a baccalaureate degree that includes Data Structures and Algorithms (CS 310 Data Structures) Automata Theory and Formal Languages (CS 330 Formal Methods and Models), and Computer Architecture including Assembly Language (CS 367 Computer Systems and Programming and CS 465 Computer Systems Architecture). Students also must have completed Calculus I and II and a substantial course in discrete mathematics (such as MATH 125 Discrete Mathematics I (Mason Core)). Students with some deficiencies in preparation may be admitted provisionally pending completion of foundation courses in mathematics or computer science. Undergraduate credit earned for this purpose may not be applied toward the graduate degree.
- Earned a cumulative GPA of 3.00 for the last two years of undergraduate work, preferably with a major in a technical field such as computer science, mathematics, physical sciences, engineering, or information systems.
- Submit transcripts of all post secondary education, complete the self-evaluation section of the online application, (This information is used by the admissions committee to assess an applicant’s academic preparation for the MS program). Students with some deficiencies in preparation may be admitted provisionally pending completion of foundation courses required for the program), a goals statement, resume, two letters of recommendation, and an official GRE score (only required for those who have not earned a Bachelor’s degree from a US institution).
- International students must submit their English Proficiency scores.

Requirements

Degree Requirements
Total credits: 30

Required Courses and Plan of Study
In addition to general university requirements, completion of the MS in CS requires 30 credits of graduate courses. Courses are grouped in the following five broad areas: Artificial Intelligence and Databases, Programming Languages and Software Engineering, Systems and Networks, Theoretical Computer Science, and Visual Computing. The list of preapproved courses with their areas follows.

All the following requirements should be satisfied for the MS in CS degree:
- CS 583 Analysis of Algorithms (from the Theoretical Computer Science area) and two additional core courses from two other areas must be successfully completed with a grade of B- or better.
- At least four courses (12 credits) must be chosen from the advanced courses in the list of preapproved courses from at least three different areas.
- At least six courses, including two advanced courses, must be designated CS.
- At least eight courses must be taken from the list of preapproved courses. Up to two computer science-related courses that are not on the list of preapproved courses may be taken with the approval of the Computer Science Department.

Plan of Study
Before the end of the second semester, students must have a plan of study approved by their academic advisor. This plan should be kept up to date by regular consultation with the academic advisor. A final signed version of the plan must be included when the student submits a graduation application.

Core Courses by Area

Artificial Intelligence and Databases
- CS 550 Database Systems
- CS 580 Introduction to Artificial Intelligence
- CS 584 Theory and Applications of Data Mining

Programming Languages and Software Engineering
- CS 540 Language Processors
- SWE 619 Object-Oriented Software Specification and Construction
- SWE 621 Software Modeling and Architectural Design

Systems and Networks
- CS 555 Computer Communications and Networking
- CS 571 Operating Systems
- ISA 562 Information Security Theory and Practice

Theoretical Computer Science
- CS 583 Analysis of Algorithms

Visual Computing
Computer Science, MS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 551</td>
<td>Computer Graphics</td>
</tr>
</tbody>
</table>

1. Must be successfully completed with a grade of B- or better

**Preapproved Basic and Advanced MS CS Courses by Area**

**Artificial Intelligence and Databases**

**Basic Courses:**
- CS 550: Database Systems
- CS 580: Introduction to Artificial Intelligence
- CS 584: Theory and Applications of Data Mining
- INFS 623: Web Search Engines and Recommender Systems

**Advanced Courses:**
- CS 650: Advanced Database Management
- CS 657: Mining Massive Datasets with MapReduce
- CS 667: Biometrics and Identity Management
- CS 674: Data Mining on Multimedia Data
- CS 681: Knowledge Engineering
- CS 685: Autonomous Robotics
- CS 687: Advanced Artificial Intelligence
- CS 688: Pattern Recognition
- CS 689: Planning Motions of Robots and Molecules
- CS 775: Advanced Pattern Recognition
- CS 782: Machine Learning
- CS 787: Decision Guidance Systems
- CS 811: Research Topics in Machine Learning and Inference
- CS 880: Research Topics in Artificial Intelligence
- CS 884: Advanced Topics in Computer Vision and Robotics
- INFS 740: Database Programming for the World Wide Web
- INFS 760: Advanced Database Management
- INFS 772: Intelligent Agents and the Semantic Web
- INFS 774: Enterprise Architecture

**Programming Languages and Software Engineering**

**Basic Courses:**
- CS 540: Language Processors
- SWE 619: Object-Oriented Software Specification and Construction
- SWE 620: Software Requirements Analysis and Specification
- SWE 621: Software Modeling and Architectural Design
- SWE 622: Distributed Software Engineering

**Advanced Courses:**
- CS 640: Advanced Compilers
- ISA 681: Secure Software Design
- SWE 631: Software Design Patterns
- SWE 632: User Interface Design and Development
- SWE 637: Software Testing
- SWE 642: Software Engineering for the World Wide Web
- SWE 645: Component-Based Software Development
- SWE 721: Reusable Software Architectures
- SWE 727: Quality of Service for Software Architectures
- SWE 737: Advanced Software Testing
- SWE 760: Software Analysis and Design of Real-Time Systems

**Systems and Networks**

**Basic Courses:**
- CS 531: Fundamentals of Systems Programming
- CS 555: Computer Communications and Networking
- CS 571: Operating Systems
- ISA 562: Information Security Theory and Practice
- ISA 564: Security Laboratory

**Advanced Courses:**
- CS 635: Foundations of Parallel Computation
- CS 658: Networked Virtual Environments
- CS 672: Computer System Performance Evaluation
- CS 673: Multimedia Computing and Systems
- CS 675: Distributed Systems
- CS 706: Concurrent Software Systems
- CS 719: Scalable Internet Services
- CS 755: Advanced Computer Networks
- CS 756: Performance Analysis of Computer Networks
- CS 773: Real-Time Systems Design and Development
- CS 779: Topics in Resilient and Secure Computer Systems
- CS 788: Autonomic Computing
- CS 818: Topics in Computer Systems
- ISA 656: Network Security
- ISA 673: Operating Systems Security
- ISA 674: Intrusion Detection
- ISA 697: Topics in Information Security
- ISA 763: Security Protocol Analysis
- ISA 764: Security Experimentation
- ISA 785: Research in Digital Forensics

**Theoretical Computer Science**

**Basic Courses:**
- CS 530: Mathematical Foundations of Computer Science
- CS 583: Analysis of Algorithms

**Advanced Courses:**
- CS 600: Theory of Computation
- CS 611: Computational Methods for Genomics
- CS 630: Advanced Algorithms
- CS 633: Computational Geometry
- CS 683: Parallel Algorithms
- CS 684: Graph Algorithms
## Visual Computing

**Basic Courses:**
- CS 551 Computer Graphics

**Advanced Courses:**
- CS 662 Computer Graphics Game Technologies
- CS 667 Biometrics and Identity Management
- CS 682 Computer Vision
- CS 686 Image Processing and Applications
- CS 752 Interactive Graphics Software
- CS 774 Computational Vision
- CS 777 Human-Computer Intelligent Interaction
- CS 884 Advanced Topics in Computer Vision and Robotics

Total Credits 0

### Project/Thesis (optional)

Three to six credit hours of the advanced classes may be replaced by a project or thesis. The project or thesis must be guided and approved by a committee of three appropriate faculty members and presented at an appropriate forum. The thesis must meet relevant university requirements.

Select one from the following:
- CS 798 Project Seminar (3 credits)
- CS 799 Thesis (6 credits)

### Additional Pre-approved CS Courses

These courses are not classified by area. Note that CS 695 Topics in Computer Science/CS 795 Advanced Topics in CS can be used to satisfy the breadth requirement if the area is listed in the syllabus for the course.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>CS 695</td>
<td>Topics in Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 697</td>
<td>Independent Reading and Research</td>
<td>1-3</td>
</tr>
<tr>
<td>CS 795</td>
<td>Advanced Topics in CS</td>
<td>3</td>
</tr>
<tr>
<td>CS 798</td>
<td>Project Seminar</td>
<td>3</td>
</tr>
<tr>
<td>CS 799</td>
<td>Thesis</td>
<td>1-6</td>
</tr>
<tr>
<td>CS 895</td>
<td>Research Topics in CS</td>
<td>3</td>
</tr>
</tbody>
</table>

### Accelerated Option Requirements

Students must complete all requirements for the BS and MS programs, with 6 credits overlap.

Students register for 6 credits of CS 500-level basic courses in place of the corresponding CS 400-level courses required for the undergraduate degree requirements. Specifically, students must register for CS 583 Analysis of Algorithms and one of the following courses in place of the corresponding 400-level course:

<table>
<thead>
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<td>Language Processors</td>
<td>3</td>
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<td>Operating Systems</td>
<td>3</td>
</tr>
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<td>3</td>
</tr>
<tr>
<td>CS 584</td>
<td>Theory and Applications of Data Mining</td>
<td>3</td>
</tr>
</tbody>
</table>

**Note:**

Students are permitted to take additional graduate basic courses in their undergraduate programs. In such cases, those classes cannot be counted toward requirements for the MS.

### Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

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## Applied Computer Science, BS/Computer Science, Accelerated MS

### Overview

Highly-qualified students in the Applied Computer Science, BS have the option of obtaining an accelerated Computer Science, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

### Admission Requirements

Students in the Applied Computer Science, BS program may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30. Students must have successfully completed:

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>CS 310</td>
<td>Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS 330</td>
<td>Formal Methods and Models</td>
<td>3</td>
</tr>
<tr>
<td>CS 367</td>
<td>Computer Systems and Programming</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits 10
Accelerated Option Requirements

Students must complete all requirements for the BS and MS programs, with 6 credits overlap.

Students register for 6 credits of CS 500-level basic courses in place of the corresponding CS 400-level courses required for the undergraduate degree requirements. Specifically, students must register for two of the following courses in place of the corresponding 400-level courses:

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Note:

Students are permitted to take additional graduate basic courses in their undergraduate programs. In such cases, those classes cannot be counted toward requirements for the MS.

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. At the completion of MS requirements, a master’s degree is conferred.