COMPUTER SCIENCE, MS

Banner Code: EC-MS-CS

Academic Advising
Phone: 703-993-1530
Email: csgrad@gmu.edu
Website: http://cs.gmu.edu/prospective-students/ms-programs/ms-in-cs/

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 hold a four-year (120-credit minimum) baccalaureate degree in an appropriate discipline from an accredited institution and have earned a GPA of 3.00 or better in the last 60 credits of undergraduate study.

Applicants must also submit the following:
- Transcripts of all post secondary education
- A one-page statement of educational and career goals
- A current resume
- Two letters of recommendation, preferably from instructors
- Internationally-educated applicants must submit an English Proficiency Exam Score (https://www2.gmu.edu/admissions-aid/how-apply/graduate/standardized-test-information/), if applicable
- The baccalaureate degree must include the following subjects:
  - Calculus I and II (equivalent to MATH 113 Analytic Geometry and Calculus I (Mason Core) (http://catalog.gmu.edu/mason-core/) and MATH 114 Analytic Geometry and Calculus II)
  - Introductory and Object-Oriented Programming (equivalent to CS 112 Introduction to Computer Programming (Mason Core) (http://catalog.gmu.edu/mason-core/) and CS 211 Object-Oriented Programming)
  - Discrete Mathematics (equivalent to MATH 125 Discrete Mathematics I (Mason Core) (http://catalog.gmu.edu/mason-core/)
  - Computer Architecture including Assembly Language (equivalent to CS 367 Computer Systems and Programming)
  - Data Structures and Algorithms (equivalent to CS 310 Data Structures)

- Automata Theory and Formal Languages (equivalent to CS 330 Formal Methods and Models)

Alternatively, students may take equivalent courses after their undergraduate program and before applying to the MSCS program, and submit appropriate transcripts. George Mason's School of Computing offers the following foundation courses, which students can use to bridge into the MS CS program:
- Introductory and Object-Oriented Programming: COMP 501 Computer Programming Foundations I
- Computer Architecture: COMP 503 Computer Systems Foundations I
- Data Structures and Algorithms: COMP 511 Computer Programming Foundations II
- Automata Theory and Formal Languages: COMP 512 Mathematical Foundations of Computing II

The COMP bridge courses can be taken in non-degree status, provisional status, while enrolled in the Foundations of Computing (bridge) program, or while enrolled in a different MS program. Students who earn a B or better in all the foundation courses they did not have in their undergraduate degree can then apply for full admission into the MSCS program. Eligible domestic students who lack one or more foundation courses may be admitted provisionally and may be required to take the appropriate foundation courses before converting to full degree status.

Requirements

Degree Requirements
Total credits: 30

Required Courses and Plan of Study
In addition to general university requirements, students must complete 30 approved graduate credits (10 courses), divided into five core (required) basic courses, four advanced constrained elective courses, and one constrained elective.

Students must take the two core courses of CS 530 Mathematical Foundations of Computer Science and CS 531 Computer Systems and Fundamentals of Systems Programming as early as possible, preferably as their first two courses in the program.

Students with a strong academic background in computer science may have CS 530 and CS 531 substituted for other elective courses at the discretion of the program director. Students enrolled in PhD CS or the Bachelor’s-Accelerated Master’s program cannot take CS 530 or CS 531 for credit. Students may also demonstrate that they have the requisite knowledge corresponding to CS 530 or CS 531 by passing an exam. The exams are given before classes begin in January and August, and can only be taken once. Students who fail either one of the exams must take the course in their first semester. Students who successfully test out of CS 530 or CS 531 will be required to fulfill the credit requirement with other coursework chosen under advisement.

Courses are grouped into five areas: Artificial Intelligence and Databases, Programming Languages and Software Engineering, Systems and...
Networks, Theoretical Computer Science, and Visual Computing. These areas apply at both the basic and the advanced level.

All the following requirements should be satisfied for the MS in CS degree:

- **Core**: Students must take CS 583 Analysis of Algorithms (from the Theoretical Computer Science area) and two additional core courses from two other areas. Core courses must be successfully completed with a grade of B- or higher. Students receiving lower than a B- must retake the course, or choose a different core course and use the B-grade as an elective.

- **Advanced**: At least four courses (12 credits) must be chosen from the advanced courses in the list given below. These four courses must come from at least two different areas.

- **CS designation**: At least six courses, two of which must be advanced, must be designated CS.

- **Alternative electives**: Up to two courses that are not on the list of pre-approved courses may be taken with prior approval of the program director.

### Plan of Study
Before the end of the first semester, students must have a plan of study approved by their academic advisor.

### Core Courses by Area

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 550</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 584</td>
<td>Theory and Applications of Data Mining</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 540</td>
<td>Language Processors</td>
<td>3</td>
</tr>
<tr>
<td>SWE 619</td>
<td>Object-Oriented Software Specification and Construction</td>
<td>3</td>
</tr>
<tr>
<td>SWE 621</td>
<td>Software Design and Architecture</td>
<td>3</td>
</tr>
</tbody>
</table>

### Systems and Networks

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 555</td>
<td>Computer Communications and Networking</td>
<td>3</td>
</tr>
<tr>
<td>CS 571</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>ISA 562</td>
<td>Information Security Theory and Practice</td>
<td>3</td>
</tr>
</tbody>
</table>

### Theoretical Computer Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 583</td>
<td>Analysis of Algorithms</td>
<td>3</td>
</tr>
</tbody>
</table>

### Visual Computing

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 551</td>
<td>Computer Graphics</td>
<td>3</td>
</tr>
</tbody>
</table>

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

### Basic and Advanced MS CS Electives by Area

### Artificial Intelligence and Databases

#### Basic Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 550</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 584</td>
<td>Theory and Applications of Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>INFS 623</td>
<td>Web Search Engines and Recommender Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Advanced Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 650</td>
<td>Advanced Database Management</td>
<td>3</td>
</tr>
<tr>
<td>CS 657</td>
<td>Mining Massive Datasets with MapReduce</td>
<td>3</td>
</tr>
<tr>
<td>CS 667</td>
<td>Biometrics and Identity Management</td>
<td>3</td>
</tr>
<tr>
<td>CS 678</td>
<td>Advanced Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>CS 681</td>
<td>Instructable Cognitive Agents</td>
<td>3</td>
</tr>
<tr>
<td>CS 685</td>
<td>Autonomous Robotics</td>
<td>3</td>
</tr>
<tr>
<td>CS 687</td>
<td>Advanced Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CS 688</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 689</td>
<td>Planning Motions of Robots and Molecules</td>
<td>3</td>
</tr>
<tr>
<td>CS 690</td>
<td>Special Topics in Artificial Intelligence and Databases</td>
<td>3</td>
</tr>
<tr>
<td>CS 747</td>
<td>Deep Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 782</td>
<td>Advanced Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CS 787</td>
<td>Decision Guidance Systems</td>
<td>3</td>
</tr>
<tr>
<td>INFS 740</td>
<td>Database Programming for the World Wide Web</td>
<td>3</td>
</tr>
<tr>
<td>INFS 760</td>
<td>Advanced Database Management</td>
<td>3</td>
</tr>
<tr>
<td>INFS 772</td>
<td>Intelligent Agents and the Semantic Web</td>
<td>3</td>
</tr>
<tr>
<td>INFS 774</td>
<td>Enterprise Architecture</td>
<td>3</td>
</tr>
</tbody>
</table>

### Programming Languages and Software Engineering

#### Basic Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 540</td>
<td>Language Processors</td>
<td>3</td>
</tr>
<tr>
<td>SWE 619</td>
<td>Object-Oriented Software Specification and Construction</td>
<td>3</td>
</tr>
<tr>
<td>SWE 620</td>
<td>Software Requirements Analysis and Specification</td>
<td>3</td>
</tr>
<tr>
<td>SWE 621</td>
<td>Software Design and Architecture</td>
<td>3</td>
</tr>
<tr>
<td>SWE 622</td>
<td>Distributed Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SWE 625</td>
<td>Software Project Management</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Advanced Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 640</td>
<td>Advanced Compilers</td>
<td>3</td>
</tr>
<tr>
<td>CS 691</td>
<td>Special Topics in Programming Languages and Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SWE 631</td>
<td>Software Design Patterns</td>
<td>3</td>
</tr>
<tr>
<td>SWE 632</td>
<td>User Interface Design and Development</td>
<td>3</td>
</tr>
<tr>
<td>SWE 637</td>
<td>Software Testing</td>
<td>3</td>
</tr>
<tr>
<td>SWE 642</td>
<td>Software Engineering for the World Wide Web</td>
<td>3</td>
</tr>
<tr>
<td>SWE 645</td>
<td>Component-Based Software Development</td>
<td>3</td>
</tr>
<tr>
<td>SWE 681</td>
<td>Secure Software Design and Programming</td>
<td>3</td>
</tr>
<tr>
<td>SWE 681</td>
<td>Secure Software Design and Programming</td>
<td>3</td>
</tr>
<tr>
<td>SWE 699</td>
<td>Special Topics in Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SWE 721</td>
<td>Reusable Software Architectures</td>
<td>3</td>
</tr>
<tr>
<td>SWE 737</td>
<td>Advanced Software Testing</td>
<td>3</td>
</tr>
<tr>
<td>SWE 760</td>
<td>Software Analysis and Design of Real-Time Systems</td>
<td>3</td>
</tr>
<tr>
<td>SWE 795</td>
<td>Advanced Topics in Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SWE 796</td>
<td>Directed Readings in Software Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

### Systems and Networks

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 555</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 571</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>ISA 562</td>
<td>Information Security Theory and Practice</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Must be successfully completed with a grade of B- or better
### Basic Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 531</td>
<td>Computer Systems and Fundamentals of Systems Programming</td>
</tr>
<tr>
<td>CS 555</td>
<td>Computer Communications and Networking</td>
</tr>
<tr>
<td>CS 571</td>
<td>Operating Systems</td>
</tr>
<tr>
<td>CS 587</td>
<td>Introduction to Cryptography</td>
</tr>
<tr>
<td>ISA 562</td>
<td>Information Security Theory and Practice</td>
</tr>
<tr>
<td>ISA 564</td>
<td>Security Laboratory</td>
</tr>
</tbody>
</table>

### Advanced Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 635</td>
<td>Foundations of Parallel Computation</td>
</tr>
<tr>
<td>CS 655</td>
<td>Wireless and Mobile Computing</td>
</tr>
<tr>
<td>CS 658</td>
<td>Networked Virtual Environments</td>
</tr>
<tr>
<td>CS 672</td>
<td>Computer System Performance Evaluation</td>
</tr>
<tr>
<td>CS 673</td>
<td>Multimedia Computing and Systems</td>
</tr>
<tr>
<td>CS 675</td>
<td>Distributed Systems</td>
</tr>
<tr>
<td>CS 692</td>
<td>Special Topics in Systems and Networks</td>
</tr>
<tr>
<td>CS 706</td>
<td>Concurrent Software Systems</td>
</tr>
<tr>
<td>CS 719</td>
<td>Scalable Internet Services</td>
</tr>
<tr>
<td>CS 756</td>
<td>Performance Analysis of Computer Networks</td>
</tr>
<tr>
<td>CS 773</td>
<td>Real-Time Systems Design and Development</td>
</tr>
<tr>
<td>CS 779</td>
<td>Topics in Resilient and Secure Computer Systems</td>
</tr>
<tr>
<td>CS 788</td>
<td>Autonomic Computing</td>
</tr>
<tr>
<td>ISA 656</td>
<td>Network Security</td>
</tr>
<tr>
<td>ISA 673</td>
<td>Operating Systems Security</td>
</tr>
<tr>
<td>ISA 674</td>
<td>Intrusion Detection</td>
</tr>
<tr>
<td>ISA 697</td>
<td>Topics in Information Security</td>
</tr>
<tr>
<td>ISA 763</td>
<td>Security Protocol Analysis</td>
</tr>
<tr>
<td>ISA 764</td>
<td>Security Experimentation</td>
</tr>
<tr>
<td>ISA 785</td>
<td>Research in Digital Forensics</td>
</tr>
<tr>
<td>SWE 660</td>
<td>Software Engineering for Real-Time Embedded Systems</td>
</tr>
</tbody>
</table>

### Theoretical Computer Science

**Basic Courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 530</td>
<td>Mathematical Foundations of Computer Science</td>
</tr>
<tr>
<td>CS 583</td>
<td>Analysis of Algorithms</td>
</tr>
</tbody>
</table>

**Advanced Courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 600</td>
<td>Theory of Computation</td>
</tr>
<tr>
<td>CS 630</td>
<td>Advanced Algorithms</td>
</tr>
<tr>
<td>CS 633</td>
<td>Computational Geometry</td>
</tr>
<tr>
<td>CS 683</td>
<td>Parallel Algorithms</td>
</tr>
<tr>
<td>CS 684</td>
<td>Graph Algorithms</td>
</tr>
<tr>
<td>CS 693</td>
<td>Special Topics in Theoretical Computer Science</td>
</tr>
</tbody>
</table>

### Visual Computing

**Basic Courses:**

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

**Advanced Courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 662</td>
<td>Computer Graphics Game Technologies</td>
</tr>
</tbody>
</table>

### Elective courses not classified by area

#### Basic Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 595</td>
<td>Basic Topics in Computer Science</td>
</tr>
</tbody>
</table>

#### Advanced Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 695</td>
<td>Special Topics in Computer Science</td>
</tr>
<tr>
<td>CS 697</td>
<td>Independent Reading and Research</td>
</tr>
<tr>
<td>CS 795</td>
<td>Advanced Topics in CS</td>
</tr>
<tr>
<td>CS 798</td>
<td>Research Project</td>
</tr>
<tr>
<td>CS 799</td>
<td>MS Thesis</td>
</tr>
<tr>
<td>CS 895</td>
<td>Research Topics in CS</td>
</tr>
</tbody>
</table>

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1 Unclassified courses can be classified into an area with approval from the Program Director or Associate Chair.

### Project or Thesis

With approval from a faculty advisor and the Program Director or Associate Chair, six credit hours of the advanced classes may be replaced by a thesis. A thesis must be advised by a member of the Graduate Faculty who is a full-time or affiliate member of the CS Department. A thesis committee must be formed, consisting of the thesis advisor and two members of the Graduate Faculty, at least one of whom must be in the CS Department. An MS thesis must have a research component and must result in a written document, and may include software. An MS thesis usually spans two semesters and the student takes three credits of CS 799 in each semester.

Three credits of the advanced classes may be replaced by a project. A project must be advised by a member of the Graduate Faculty who is a full-time or affiliate member of the CS Department. An MS project must result in a written document, and may include software.

Requests for either a project or a thesis must be initiated by the thesis advisor, and approved by the CS Department Chair or delegate.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 798</td>
<td>Research Project (3 credits)</td>
<td></td>
</tr>
<tr>
<td>CS 799</td>
<td>MS Thesis</td>
<td>6</td>
</tr>
</tbody>
</table>

### Concentration in Cyber Security (CYSC)

Students must take 5 courses from the following categories:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISA 566</td>
<td>Network Security</td>
<td>3</td>
</tr>
<tr>
<td>ISA 562</td>
<td>Information Security Theory and Practice</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose 2-3 elective courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 587</td>
<td>Introduction to Cryptography</td>
<td>6-9</td>
</tr>
</tbody>
</table>
ISA 564    Security Laboratory
ISA 673    Operating Systems Security
ISA 674    Intrusion Detection
SWE 637    Software Testing
SWE 681    Secure Software Design and Programming
           or ISA 681    Secure Software Design and Programming
ISA 763    Security Protocol Analysis
ISA 764    Security Experimentation

Choose 0-1 related course: 0-3
  CS 540    Language Processors
  CS 555    Computer Communications and Networking
  CS 571    Operating Systems
  CS 600    Theory of Computation
  CS 655    Wireless and Mobile Computing

Thesis (optional):
If a student in a concentration choose a thesis option, the 6 credits of CS 799 MS Thesis can replace two electives or related courses in the concentration.

Concentration in Machine Learning (ML)
Students must take 5 courses from the following categories:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 584</td>
<td>Theory and Applications of Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>CS 688</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>Choose 2-3 elective courses:</td>
<td>6-9</td>
<td></td>
</tr>
<tr>
<td>CS 657</td>
<td>Mining Massive Datasets with MapReduce</td>
<td></td>
</tr>
<tr>
<td>CS 678</td>
<td>Advanced Natural Language Processing</td>
<td></td>
</tr>
<tr>
<td>CS 681</td>
<td>Instructable Cognitive Agents</td>
<td></td>
</tr>
<tr>
<td>CS 747</td>
<td>Deep Learning</td>
<td></td>
</tr>
<tr>
<td>CS 782</td>
<td>Advanced Machine Learning</td>
<td></td>
</tr>
<tr>
<td>Choose 0-1 related course:</td>
<td>0-3</td>
<td></td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>CS 687</td>
<td>Advanced Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>CS 685</td>
<td>Autonomous Robotics</td>
<td></td>
</tr>
<tr>
<td>CS 682</td>
<td>Computer Vision</td>
<td></td>
</tr>
</tbody>
</table>

Thesis (optional):
If a student in a concentration choose a thesis option, the 6 credits of CS 799 MS Thesis can replace two elective or related courses in the concentration.

Accelerated Master's

Applied Computer Science, BS/Computer Science, Accelerated MS

Overview
Highly-qualified students in the Applied Computer Science, BS (http://catalog.gmu.edu/colleges-schools/engineering/computer-science/applied-computer-science-bs/) can complete both a BS-ACS and a Computer Science, MS (http://catalog.gmu.edu/colleges-schools/engineering/computer-science/computer-science-ms/) in five years through the BS-MS accelerated (BAM) program.

General BAM policies are in the catalog under AP.6.7 Bachelor's/Accelerated Master's Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). Policies governing all graduate degrees are in the catalog under AP.6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

Admission Requirements
Students in the Applied Computer Science, BS (http://catalog.gmu.edu/colleges-schools/engineering/computer-science/applied-computer-science-bs/) program are encouraged to apply to the BAM program after earning 60 undergraduate credits with an overall GPA of at least 3.30. Students must have successfully completed CS 310 Data Structures and CS 330 Formal Methods and Models.

Accelerated Option Requirements
Students accepted to the BAM program may earn up to 12 credits of graduate coursework that count towards both the BS and MS degrees. They may begin taking graduate courses after completing 75 undergraduate credits and successfully completing CS 367 Computer Systems and Programming.

The following graduate courses can replace the corresponding undergraduate courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 540</td>
<td>Language Processors (to replace CS 440)</td>
<td>3</td>
</tr>
<tr>
<td>CS 550</td>
<td>Database Systems (to replace CS 450)</td>
<td>3</td>
</tr>
<tr>
<td>CS 551</td>
<td>Computer Graphics (to replace CS 451)</td>
<td>3</td>
</tr>
<tr>
<td>CS 555</td>
<td>Computer Communications and Networking (to replace CS 455)</td>
<td>3</td>
</tr>
<tr>
<td>CS 571</td>
<td>Operating Systems (to replace CS 471)</td>
<td>3</td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence (to replace CS 480)</td>
<td>3</td>
</tr>
<tr>
<td>CS 584</td>
<td>Theory and Applications of Data Mining (to replace CS 484)</td>
<td>3</td>
</tr>
<tr>
<td>CS 583</td>
<td>Analysis of Algorithms (to replace CS 483)</td>
<td>3</td>
</tr>
<tr>
<td>CS 587</td>
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<td>3</td>
</tr>
<tr>
<td>SWE 619</td>
<td>Object-Oriented Software Specification and Construction (to replace SWE 419)</td>
<td>3</td>
</tr>
<tr>
<td>SWE 637</td>
<td>Software Testing (to replace SWE 437)</td>
<td>3</td>
</tr>
<tr>
<td>SWE 642</td>
<td>Software Engineering for the World Wide Web (to replace SWE 432)</td>
<td>3</td>
</tr>
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Notes:
- Students may not use both the graduate course and the undergraduate alternative for their BS degree.
- Students must satisfy all recommended and required prerequisites for the graduate courses they take.
- Students also have the option to take up to 6 additional credits of graduate coursework on reserve, which can be used for the MS degree only.
**Degree Conferral**

Students must apply for degree conferral the semester before they expect to complete their BS requirements. At the beginning of their final undergraduate semester, students must submit a completed Bachelor’s-Accelerated Master’s Transition form to the CS department office. The master’s degree will be conferred after the student completes the MS requirements.

**Computer Science, BS/Computer Science, Accelerated MS**

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