

# INFORMATION SECURITY AND ASSURANCE, MS

**Banner Code:** EC-MS-ISA

## Academic Advising

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The Department of Computer Science's MS degree in Information Security and Assurance prepares graduates to fill the current and future need for information security and assurance professionals. Graduates work in a wide variety of capacities, protecting the information systems of different types of organizations and supporting the nation's information infrastructure. The Master of Science in Information Security and Assurance provides students with the general and technical knowledge and skills to understand the relationship between information security and advancing information systems technology. The program gives graduates a theoretical understanding of the science and methodologies for ensuring the secrecy and integrity of data, as well as the availability and legitimate use of data and information systems.

Students focus on the technical and management aspects of information security and examine ways to provide secure information processing systems by investigating operating systems security, distributed secure system architectures, database security, software applications security, security policies, secure e-commerce, network and distributed systems security, cryptography, and security protocols. Graduates of the program are actively recruited by federal, state, and local governments, as well as the private sector. Typical employers include Internet-based companies, software companies, banks and insurance companies, and in general any organization that depends heavily on the use of IT. All classes are scheduled in the late afternoon and early evening to accommodate employed students.

## Admissions & Policies

### Admissions

#### Application Requirements

In addition to general admission requirements (<https://www.gmu.edu/admissions-aid/apply-now/how-apply/graduate/>) of the university, applicants must have earned a GPA of 3.00 or better in the last 60 credits of their baccalaureate degree. Other requirements are as follows:

- A one-page statement of educational and career goals
- Current resume
- Internationally-educated students must submit their English Proficiency scores (<https://www2.gmu.edu/admissions-aid/how-apply/graduate/standardized-test-information/>)

### Policies

#### Foundation Requirements

To succeed in graduate courses, students entering the MS program must have coursework or equivalent knowledge in the following five foundation areas: (1) **introductory programming** in any programming language; (2) knowledge of an **object-oriented programming** language such as Java, C++, or C#; (3) **data structures** and algorithms; (4) **machine**

**organization** such as those given in computer system architecture or assembly language courses; (5) and topics in **discrete mathematics**, including sets, propositional and predicate logic, relations, functions, trees, graphs, and inductive proofs.

The level of knowledge required in these areas is equivalent to that taught in undergraduate courses and may be demonstrated in one of several ways:

1. Applicable undergraduate coursework: Such courses must appear on transcripts from the student's undergraduate university, or another accredited university. Applicable courses from George Mason University and Northern Virginia Community College (NVCC) are given here:
  - a. **Foundation:** Introductory programming
    - **GMU CS:** CS 112 Introduction to Computer Programming (Mason Core) (<http://catalog.gmu.edu/mason-core/>)
    - **GMU IT:** IT 106 Introduction to IT Problem Solving Using Computer Programming
    - **NVCC:** CSC 201
  - b. **Foundation:** OO programming
    - **GMU CS:** CS 211 Object-Oriented Programming
    - **GMU IT:** IT 206 Object Oriented Techniques for IT Problem Solving
    - **NVCC:** CSC 202
  - c. **Foundation:** Data structures
    - **GMU CS:** CS 310 Data Structures
    - **GMU IT:** IT 306 Data Structures and Algorithms in Java
    - **NVCC:** None
  - d. **Foundation:** Machine organization
    - **GMU CS:** CS 367 Computer Systems and Programming or CS 465 Computer Systems Architecture
    - **GMU IT:** IT 342 Operating Systems Fundamentals
    - **NVCC:** None
  - e. **Foundation:** Discrete math
    - **GMU Math:** MATH 125 Discrete Mathematics I (Mason Core) (<http://catalog.gmu.edu/mason-core/>)
    - **NVCC:** MATH 288
2. Preparatory coursework taken at GMU: The CS department offers the following bridge foundation courses: (1-2) SWE 510 Object-Oriented Programming in Java or COMP 501 Computer Programming Foundations I, (3) INFS 519 Program Design and Data Structures or COMP 511 Computer Programming Foundations II, (4) INFS 515 Computer Organization Course and Operating Systems or COMP 503 Computer Systems Foundations I, and (5) INFS 501 Discrete and Logical Structures for Information Systems or COMP 502 Mathematical Foundations of Computing I. These courses may be taken by students in provisional status, non-degree status, or while in another graduate program at Mason.
3. Passing appropriate testout exams: Students can self-prepare and attempt testout exams for each of the four foundation requirements (OO programming, data structures, machine organization, and discrete math). The exams are given before classes begin in January and August, and can only be taken once. Registration is not required; students need only be present at the date, time, and location specified and bring some form of photographic identification. Detailed information is available on the department web site (<https://>

cs.gmu.edu/). Students who do not pass an exam must take an equivalent course before enrolling in the core curriculum courses.

Eligible domestic students who lack one or more foundations may be admitted provisionally and required to take the appropriate preparatory course or pass the testout exam. Other students may be advised to learn the foundation material and re-apply.

## Advising

The department holds orientation meetings at the beginning of each semester to advise incoming and continuing students. Members of the faculty are present to answer questions and offer advice concerning programs of study. Detailed information is available on the department web site (<https://cs.gmu.edu/>).

The department also provides advising services to students. Initial and procedural inquiries can be submitted to [csgrad@gmu.edu](mailto:csgrad@gmu.edu). Each student is assigned a faculty advisor with whom to confer on matters related to degree requirements. A plan of study form for the MS degree should be completed and submitted by the student soon after admission to the program. This serves as a planning guide for the student.

## Requirements

### Degree Requirements

Total credits: 30

Completion of the degree program requires a minimum of 30 approved graduate credits (10 courses). Students must choose a concentration.

### Required Core Courses

These courses provide the necessary background and fundamentals of information systems security and assurance.

Code	Title	Credits
ISA 562	Information Security Theory and Practice	3
ISA 656	Network Security	3
One of the following:		3
INFS 612	Principles and Practices of Communication Networks	
CS 555	Computer Communications and Networking <sup>1</sup>	
Total Credits		9

<sup>1</sup> Required for students who select the Network and System Security concentration.

### Concentration in Applied Cyber Security (ACBS)

Students must take any five courses from the list below. At least three of the five courses must be designated ISA, CS, or SWE.

Code	Title	Credits
Select five courses from the following:		15
CS 667	Biometrics and Identity Management	
ISA 650	Security Policy	
ISA 652	Security Audit and Compliance Testing	
ISA 681	Secure Software Design and Programming	
or SWE 681	Secure Software Design and Programming	

ISA 763	Security Protocol Analysis	
ISA 785	Research in Digital Forensics	
DFOR 663	Operations of Intrusion Detection for Forensics	
DFOR 761	Malware Reverse Engineering	
DFOR 780	Advanced Topics in Digital Forensics	
ECE 646	Applied Cryptography	
ECE 746	Advanced Applied Cryptography	
Total Credits		15

### Concentration in Network and System Security (NSS)

Code	Title	Credits
ISA 564	Security Laboratory	3
Select four courses from the following:		12
CS 530	Mathematical Foundations of Computer Science	
CS 531	Computer Systems and Fundamentals of Systems Programming	
CS 571	Operating Systems <sup>1</sup>	
CS 779	Topics in Resilient and Secure Computer Systems	
ISA 673	Operating Systems Security	
ISA 674	Intrusion Detection	
ISA 681	Secure Software Design and Programming	
or SWE 681	Secure Software Design and Programming	
ISA 763	Security Protocol Analysis	
ISA 764	Security Experimentation	
ECE 646	Applied Cryptography	
ECE 746	Advanced Applied Cryptography	
Total Credits		15

<sup>1</sup> Students who elect to take CS 571 Operating Systems but who have not taken CS 367 Computer Systems and Programming or its equivalent are advised to take CS 531 Computer Systems and Fundamentals of Systems Programming first.

### Additional Courses

Code	Title	Credits
All students select two remaining courses from any combination of the following: <sup>1</sup>		6
ISA 500, 600, and 700 level courses ( <a href="http://catalog.gmu.edu/courses/isa/">http://catalog.gmu.edu/courses/isa/</a> )		
CS 500, 600, and 700 level courses ( <a href="http://catalog.gmu.edu/courses/cs/">http://catalog.gmu.edu/courses/cs/</a> )		
Courses from the pre-approved electives list (follows)		
ISA 799	MS Thesis (must take 6 credits)	
Total Credits		6

<sup>1</sup> Students may choose other graduate electives with the consent of their faculty advisor and the graduate coordinator.

**Pre-Approved Electives by Program**

- Information Systems (INFS)
- Software Engineering (SWE)
- Computer Forensics (CFRS)
- Electrical and Computer Engineering (ECE)

**Information Systems (INFS)**

Code	Title	Credits
INFS 623	Web Search Engines and Recommender Systems	3
INFS 740	Database Programming for the World Wide Web	3
INFS 760	Advanced Database Management	3
INFS 772	Intelligent Agents and the Semantic Web	3
INFS 774	Enterprise Architecture	3

**Software Engineering (SWE)**

Code	Title	Credits
SWE 619	Object-Oriented Software Specification and Construction	3
SWE 620	Software Requirements Analysis and Specification	3
SWE 621	Software Design and Architecture	3
SWE 622	Distributed Software Engineering	3
SWE 632	User Interface Design and Development	3
SWE 637	Software Testing	3
SWE 642	Software Engineering for the World Wide Web	3
SWE 645	Component-Based Software Development	3
SWE 681	Secure Software Design and Programming	3
SWE 721	Reusable Software Architectures	3

**Digital Forensics (DFRS)**

Code	Title	Credits
DFOR 761	Malware Reverse Engineering	3
DFOR 780	Advanced Topics in Digital Forensics	3

**Electrical and Computer Engineering (ECE)**

Code	Title	Credits
ECE 646	Applied Cryptography	3
ECE 746	Advanced Applied Cryptography	3