# DIGITAL FORENSICS, MS

**Banner Code: EC-MS-DFOR**

3800 Nguyen Engineering Building
MS 2B5

Phone: (703) 993-3810
Email: dfor@gmu.edu
Website: https://dfor.gmu.edu/

Digital forensics is a discipline addressing the collection, processing, and analysis of digital data for the purpose of verifying/validating the existence of an event of investigative, intelligence, cyber, or business interest. The data can be from physical media, a mobile device, real-time network traffic, the Internet of Things (IoT), unknown code, memory, the cloud, and many other sources. Digital forensics is interdisciplinary by nature and our program includes computer engineering, computer science, information technology, law, and ethics. Digital forensics is a key component in criminal, corporate, civil, cyber defense, incident response, intelligence, and counter-terrorism matters.

In the last several years, with a proliferation of digital storage, transmission, and processing of sensitive information, there has been an increase in the aberrant use of digital devices. This aberrant behavior includes but is not limited to digital extortion, intrusions, economic espionage, child exploitation, cybercrime, fraud, terrorism, and identity theft. In response to this, digital forensics has become an important profession serving both public and private sectors. The MS in Digital Forensics will prepare graduates for a wide variety of careers to include law enforcement, various other branches of government, incident response, and all facets of cyber security by combining academic education with real world practical techniques and by offering advanced training in analyzing digital evidence, intrusion forensics, reverse engineering, network analysis, legal, and ethical matters.

## Admissions & Policies

# Admissions

Students who hold a bachelor's degree from an accredited college or university in engineering, math, science, computer science, business (with a quantitative background), economics, or other analytical disciplines, or students who have equivalent work experience indicating analytical aptitude, may apply. Depending on their background, some domestic applicants may be accepted provisionally and required to complete 3 to 12 credits of preliminary coursework before they are allowed to enroll in any of the core or specialty courses in the program. A minimum undergraduate GPA of 3.00 is required for acceptance.

## Requirements

**(formerly VS-MS-CFRS)**

**Degree Requirements**

Total credits: 30

Students must complete a minimum of 30 graduate credits beyond the bachelor's degree with a GPA of 3.00 or higher, with no more than 6 credit hours of C grades. The plan of study includes a 21-credit required core component which includes a mandatory capstone course, and the choice of either a concentration or a 9-credit elective component as shown below:

### Core Courses

| Code | Title | Credits |
|---|---|---|
| DFOR 510 | Digital Forensics Analysis | 3 |
| DFOR 660 | Network Forensics | 3 |
| DFOR 661 | Digital Media Forensics | 3 |
| DFOR 663 | Operations of Intrusion Detection for Forensics | 3 |
| or DFOR 664 | Incident Response Forensics | |
| DFOR 670 | Fraud Analytics [1] | 3 |
| or DFOR 671 | Digital Forensics Ethics Law | |
| DFOR 672 | Mobile Device Forensics | 3 |
| DFOR 790 | Advanced Digital Forensics | 3 |
| **Total Credits** | | **21** |

[1] Both DFOR 670 and DFOR 671 may be taken, but only one may be used in the core component.

### Concentration in Penetration Testing/Reverse Engineering (PTRE)

Focused on the practical aspects of penetration testing and reverse engineering. Students are expected to master tools, techniques, and methodologies of penetration testing and reverse engineering. Students must take three of the four concentration courses offered (9 credits).

| Code | Title | Credits |
|---|---|---|
| DFOR 740 | Advanced Offensive Defensive Strategies | 3 |
| DFOR 761 | Malware Reverse Engineering | 3 |
| DFOR 767 | Penetration Testing in Digital Forensics | 3 |
| DFOR 772 | Forensic Artifact Extraction | 3 |

### Electives

| Code | Title | Credits |
|---|---|---|
| Students who do not choose the above concentration should select 9 credits from the following: | | 9 |
| DFOR 590 | Special Topics in Digital Forensics | |
| DFOR 637 | Cloud Forensics | |
| DFOR 663 | Operations of Intrusion Detection for Forensics | |
| DFOR 664 | Incident Response Forensics | |
| DFOR 670 | Fraud Analytics | |
| DFOR 671 | Digital Forensics Ethics Law | |
| DFOR 672 | Mobile Device Forensics | |
| DFOR 673 | Registry Forensics - Windows | |
| DFOR 674 | Mac Forensics | |
| DFOR 675 | Linux Forensics | |
| DFOR 698 | Independent Reading and Research | |

| | |
|---|---|
| DFOR 710 | Memory Forensics |
| DFOR 720 | Digital Audio Video Forensics |
| DFOR 730 | Forensic Deep Packet Inspection |
| DFOR 740 | Advanced Offensive Defensive Strategies |
| DFOR 761 | Malware Reverse Engineering |
| DFOR 767 | Penetration Testing in Digital Forensics |
| DFOR 768 | Digital Warfare |
| DFOR 769 | Anti-Forensics |
| DFOR 771 | Digital Forensic Profiling |
| DFOR 772 | Forensic Artifact Extraction |
| DFOR 773 | Mobile Application Forensics and Analysis |
| DFOR 775 | Kernel Forensics and Analysis |
| DFOR 780 | Advanced Topics in Digital Forensics |
| ECE 511 | Computer Architecture |
| ECE 512 | Computer Architecture Security |
| ECE 547 | Applied Cryptography |
| ECE 611 | Advanced Computer Architecture |
| ECE 612 | Real-Time Embedded Systems |
| ECE 642 | Design and Analysis of Computer Networks |
| ECE 647 | Post-Quantum Cryptography |
| ECE 649 | Side-Channel Security |
| ISA 650 | Security Policy |
| ISA 652 | Security Audit and Compliance Testing |
| ISA 656 | Network Security |
| ISA 674 | Intrusion Detection |
| ISA 785 | Research in Digital Forensics |
| TCOM 662 | Advanced Secure Networking |
| FRSC 510 | Basic Crime Analysis |

Other courses may be appropriate as electives in the degree program, but they must be approved prior to registration.

## Accelerated Master's

# Applied Science, BAS (Cyber Security Concentration)/Digital Forensics, Accelerated MS

### Overview

Highly-qualified students in the Applied Science, BAS, Cyber Security Concentration (https://catalog.gmu.edu/colleges-schools/interdisciplinary-programs-courses/applied-science-bas/#cybs) have the option of obtaining an accelerated Digital Forensics, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

### Admission Requirements

Students in the Applied Science, BAS, Cyber Security Concentration (https://catalog.gmu.edu/colleges-schools/interdisciplinary-programs-courses/applied-science-bas/#cybs) program may apply for this option if they have earned 60 undergraduate credits with an overall GPA of at least 3.00. Criteria for admission are identical to criteria for admission to the Digital Forensics, MS program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

### Accelerated Option Requirements

Students must complete all credits that satisfy requirements for the BAS and MS programs, with up to 12 credits overlapping from the following courses:

| Code | Title | Credits |
|---|---|---|
| DFOR 510 | Digital Forensics Analysis | 3 |
| DFOR 660 | Network Forensics | 3 |
| DFOR 661 | Digital Media Forensics | 3 |
| DFOR 663 | Operations of Intrusion Detection for Forensics | 3 |
| DFOR 664 | Incident Response Forensics | 3 |

### Degree Conferral

Students must apply the semester before they expect to complete the BAS requirements to have the BAS 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. At the completion of MS requirements, a master's degree is conferred.

# Cyber Security Engineering, BS/Digital Forensics, Accelerated MS

### Overview

Highly-qualified students in the Cyber Security Engineering, BS (https://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/cyber-security-engineering/cyber-security-engineering-bs/) have the option of obtaining an accelerated Digital Forensics, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

### Admission Requirements

Students in the Cyber Security Engineering, BS (https://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/cyber-security-engineering/cyber-security-engineering-bs/) program may apply for this option if they have earned 60 undergraduate credits with an overall GPA of at least 3.25. Criteria for admission are identical to criteria for admission to the Digital Forensics, MS program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific prerequisites.

### Accelerated Option Requirements

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

Students register for two Digital Forensics core courses (6 credits) in place of two of the three required technical electives, as part of the undergraduate degree requirements. Specifically, students must take:

DFOR 510 Digital Forensics Analysis

DFOR 660 Network Forensics

Note: Students complete all Digital Forensics, MS core courses and apply the two courses from the above list toward the Digital Forensics, MS requirements.

## 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 CEC Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

# Information Technology, BS/Digital Forensics, Accelerated MS

## Overview

Highly-qualified students in the Information Technology, BS (https://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/information-sciences-technology/information-technology-bs/) have the option of obtaining an accelerated Digital Forensics, MS.

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7). For policies governing all graduate degrees, see AP.6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

## Admission Requirements

Students in the Information Technology, BS (https://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/information-sciences-technology/information-technology-bs/) program may apply for this option if they have earned 60 undergraduate credits and take graduate level courses after completion of 75 credits with an overall GPA of at least 3.25. Criteria for admission are identical to criteria for admission to the Digital Forensics, MS program.

## Accelerated Option Requirements

Students must complete all credits that satisfy requirements for the BS and MS programs, with a minimum of 3 credits (maximum 9 credits) overlapping from the following courses:

| Code | Title | Credits |
|---|---|---|
| DFOR 510 | Digital Forensics Analysis | 3 |
| DFOR 660 | Network Forensics | 3 |
| DFOR 663 | Operations of Intrusion Detection for Forensics | 3 |

## 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. At the completion of MS requirements, a master's degree is conferred.