

# CYBER SECURITY ENGINEERING, BS

**Banner Code:** VS-BS-CYSE

2215 Nguyen Engineering Building  
Fairfax Campus

Phone: 703-993-1502  
Email: [pbrouse@gmu.edu](mailto:pbrouse@gmu.edu)

Cyber Security Engineering is concerned with the development of cyber-resilient systems which include the protection of physical as well as computer and network systems. It requires a proactive approach in engineering design of physical systems with cyber security incorporated from the beginning of system development. Cyber security engineering is an important quantitative methodology to be used in all industries including transportation, energy, healthcare, infrastructure, finance, government (federal, state, and local), and defense. The program is focused on the cyber security engineering of integrated cyber-physical systems. This degree provides a foundation in cyber security engineering, and is most appropriate for students with a strong mathematics and science background.

## Admissions & Policies

### Policies

For policies governing all undergraduate degrees, see AP.5 Undergraduate Policies.

### Advising and Plan of Study

All cyber security engineering students are assigned a faculty advisor. With the advisor's help and approval, each student is required to complete a plan of study, which constitutes a learning plan for the degree program. The plan of study must be signed by the student's advisor and the Program Chair and be updated and signed by the advisor at least once a year.

### Change of Major

See Change of Major for more information.

### Grade Requirements

Students in the Cyber Security Engineering, BS program must complete all mathematics, science, and VSE courses with a grade of C or better.

### Termination from the Major

No math, science, or Volgenau School of Engineering course that is required for the major may be attempted more than three times. Those students who do not successfully complete such a course within three attempts will be terminated from the major. Undeclared students in the Volgenau School who do not successfully complete a course required for a Volgenau School major within three attempts will also be terminated.

In addition, students in the Volgenau School with evidence of continued failure to make adequate progress toward declaring or completing a Volgenau School major will also be terminated. Adequate progress is determined by the major program. For more information, see AP.5.2.4 Termination from the Major (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-2-4>).

Once a student has attempted one of these courses twice unsuccessfully, the third attempt must be no later than the next semester of enrollment, excluding summers. Failure to take the course at that time will result in termination from the major. A third attempt of a Volgenau School of Engineering course requires support by the student's major department as well as permission by the department offering the course. This permission is not guaranteed. If the student is unable to take the course when required, the student may request an extension to a future semester; extensions require approval of the student's advisor, their department, and the Associate Dean for Undergraduate Programs. The deadline for extension requests is the add deadline for the semester in which the course is required.

Students who have been terminated from a Volgenau School of Engineering major may not register for a Volgenau School course without permission of the department offering the course. This applies to all undergraduate courses offered by the Volgenau School except IT 104 Introduction to Computing (Mason Core) and STAT 250 Introductory Statistics I (Mason Core).

A student may not declare any major in the Volgenau School of Engineering if the student has previously met the termination criteria for that major at any time, regardless of what the student's major was at the time the courses were taken.

## Requirements

### Degree Requirements

Total credits: 126

#### Cyber Security Engineering Core

Code	Title	Credits
<b>Core Courses</b>		
CYSE 101	Introduction to Cyber Security Engineering	3
CYSE 211	Operating Systems and Lab	3
CYSE 220	Systems Modeling	3
CYSE 230	Computer Networking	3
CYSE 325	Discrete Events Systems Modeling	3
CYSE 330	Introduction to Network Security	3
CYSE 411	Secure Software Engineering	3
CYSE 421	Industrial Control Systems Security	3
CYSE 425	Secure RF Communications	3
CYSE 430	Critical Infrastructure Protection	3
CYSE 445	System Security and Resilience	3
CYSE 450	Cyber Vulnerability Lab	1
CYSE 470	Human Factors and Cyber Security Engineering	3
CYSE 475	Cyber Physical Systems	3
CYSE 476	Cryptography Fundamentals	3
CYSE 491	Engineering Senior Seminar	2
CYSE 492	Senior Advanced Design Project I	2
CYSE 493	Senior Advanced Design Project II (Mason Core)	3

**Technical Electives**

Select 9 credits from the following approved technical courses: 9

CYSE 424	Embedded and Real Time Systems
CYSE 460	Power Systems and Smart Grid
CYSE 461	Power Grid Security
CYSE 462	Mobile Devices and Network Security
CYSE 465	Transportation Systems Design
CYSE 467	GPS Security
CYSE 477	Intrusion Detection
CYSE 478	Cyber Security Audit and Compliance
CYSE 479	Methods of User Authentication
CYSE 480	Malicious Software and Hardware
CYSE 499	Special Topics in Cyber Security Engineering

Total Credits 59

**Electrical and Computer Engineering**

Code	Title	Credits
ECE 301	Digital Electronics	3
Total Credits		3

**Systems Engineering**

Code	Title	Credits
SYST 205	Systems Engineering Principles	3
Total Credits		3

**Mathematics and Statistics**

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core)	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 203	Linear Algebra	3
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations	3
STAT 344	Probability and Statistics for Engineers and Scientists I	3
Total Credits		20

**Natural Sciences**

Code	Title	Credits
PHYS 160	University Physics I (Mason Core)	3
PHYS 161	University Physics I Laboratory (Mason Core)	1
PHYS 260	University Physics II (Mason Core)	3
PHYS 261	University Physics II Laboratory (Mason Core)	1
Total Credits		8

**Computing**

Code	Title	Credits
Select from options below: 7		
CDS 130	Computing for Scientists (Mason Core)	

or CS 112	Introduction to Computer Programming (Mason Core)	
and		
SYST 230	Object-oriented Modeling and Design	
CS 222	Computer Programming for Engineers	
Total Credits		7

**Engineering**

Code	Title	Credits
ENGR 107	Introduction to Engineering (Mason Core)	2
Total Credits		2

**Oral Communication and Economics**

Code	Title	Credits
COMM 100	Public Speaking (Mason Core)	3
or COMM 101	Fundamentals of Communication (Mason Core)	
ECON 103	Contemporary Microeconomic Principles (Mason Core)	3
Total Credits		6

**Remaining Mason Core**

Students must complete all Mason Core requirements not fulfilled by major requirements.

Code	Title	Credits
Written Communication		6
Literature		3
Arts		3
Western Civilization/World History		3
Global Understanding		3
Total Credits		18

**Note:**

All students must submit at least 24 credits of social science and humanities coursework, which is normally satisfied by the 24 credits of Mason Core social science and humanities courses listed above and with the oral communication and economics requirement.

**Accelerated Master's****Cyber Security Engineering, BS/Computer Engineering, Accelerated MS****Overview**

The university offers highly-qualified students in the Cyber Security Engineering, BS the option of obtaining an accelerated Computer Engineering, 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 program may apply for this option if they have earned 90 undergraduate credits with an overall

GPA of at least 3.25. Criteria for admission are identical to criteria for admission to the Computer Engineering, MS program.

### Accelerated Option Requirements

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

Students take 6 credits of 500-level ECE or CS courses as part of their technical electives or substitutes for required courses in the Cyber Security Engineering, BS program.

Specifically, students are encouraged to take two of the following courses:

Code	Title	Credits
CS 571	Operating Systems	3
ECE 505	Hardware Security	3
ECE 508	Internet of Things	3
ECE 511	Computer Architecture	3
ECE 542	Computer Network Architectures and Protocols	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 (<https://registrar.gmu.edu/forms>) 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.

## Cyber Security Engineering, BS/Digital Forensics and Cyber Analysis(title change pending SCHEV approval), Accelerated MS Overview

Highly-qualified students in the Cyber Security Engineering, BS have the option of obtaining an accelerated Digital Forensics and Cyber Analysis, 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 Cyber Security Engineering, BS program may apply for this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.25. Criteria for admission are identical to criteria for admission to the Digital Forensics and Cyber Analysis, MS program.

### 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 and Cyber Analysis 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:

Code	Title	Credits
CFRS 500	Introduction to Forensic Technology and Analysis	3
and one of the following:		3
CFRS 510	Digital Forensics Analysis (satisfies the IT 357 requirement for the INFS concentration in the BS program)	
CFRS 660	Network Forensics (satisfies one NTEL concentration course in the BS program)	
Total Credits		6

Note: Students complete all Digital Forensics and Cyber Analysis, MS core courses and apply the two courses from the above list toward the Digital Forensics and Cyber Analysis, 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 VSE Graduate Admissions Office. At the completion of MS requirements, a master's degree is conferred.

## Cyber Security Engineering, BS/ Operations Research, Accelerated MS Overview

Highly-qualified students in the Cyber Security Engineering, BS have the option of obtaining an accelerated Operations Research, 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

Mason undergraduate students majoring in Cyber Security Engineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Operations Research, MS program.

### Accelerated Options Requirement

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 credit hours) of approved master's level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such electives to replace the corresponding undergraduate courses.

### 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.

## **Cyber Security Engineering, BS/Systems Engineering, Accelerated MS**

### **Overview**

Highly-qualified students in the Cyber Security Engineering, BS have the option of obtaining an accelerated Systems Engineering, 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**

Mason undergraduate students majoring in Cyber Security Engineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Systems Engineering, MS program.

### **Accelerated Options Requirement**

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 credit hours) of approved master's level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such electives to replace the corresponding undergraduate courses.

### **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.