

# CYBER SECURITY ENGINEERING, BS

## Banner Code: VS-BS-CYSE

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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.

### 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. For more information, see AP.5.2.4 Termination from the Major.

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. 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

##### Core Courses <sup>1</sup>

CYSE 101	Introduction to Cyber Security Engineering	3
CYSE 205	Systems Engineering Principles	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 465	Transportation Systems Design	3
CYSE 470	Human Factors and Cyber Security Engineering	3
CYSE 475	Cyber Physical Systems	3
CYSE 491	Engineering Senior Seminar <sup>2</sup>	2
CYSE 492	Senior Advanced Design Project I	2
CYSE 493	Senior Advanced Design Project II (Mason Core) <sup>3</sup>	3

##### Technical Electives <sup>1</sup>

Select 9 credits from the following approved technical courses: <sup>4</sup>		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 467	GPS Security	
CYSE 476	Cryptography and Computer Network 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		62

- <sup>1</sup> A grade of C or better is required for all CYSE courses.
- <sup>2</sup> Fulfills the university writing intensive requirement for the major.
- <sup>3</sup> Fulfills the Mason Core synthesis requirement for the major.
- <sup>4</sup> Electives allow students to gain special expertise in selected areas of cyber security engineering.

## Electrical Engineering

ECE 301	Digital Electronics	3
Total Credits		3

## Mathematics and Statistics

MATH 113	Analytic Geometry and Calculus I (Mason Core)	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 203	Linear Algebra <sup>1</sup>	3
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations <sup>1</sup>	3
STAT 344	Probability and Statistics for Engineers and Scientists I <sup>1</sup>	3
Total Credits		20

- <sup>1</sup> Must be completed with a grade of C or better.

## Natural Sciences

PHYS 160	University Physics I (Mason Core)	3
PHYS 161	University Physics I Laboratory (Mason Core)	1
PHYS 260	University Physics II (Mason Core) <sup>1</sup>	3
PHYS 261	University Physics II Laboratory (Mason Core)	1
Total Credits		8

- <sup>1</sup> Must be completed with a grade of C or better.

## Computer Science

CS 112	Introduction to Computer Programming (Mason Core)	4
CS 222	Computer Programming for Engineers <sup>1</sup>	3
Total Credits		7

- <sup>1</sup> Must be completed with a grade of C or better.

## Engineering

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

## Oral Communication and Economics

COMM 100	Public Speaking (Mason Core)	3
or COMM 101	Interpersonal and Group Interaction (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.

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 Options

## Cyber Security Engineering, BS/Digital Forensics and Cyber Analysis, 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.