

**Volgenau School of Engineering - Cybersecurity Engineering, BS**

Catalog Year: 2019 - 2020			Grades	
Mason Core Reqs (21 credits)	Course Information	Credits	Earned	Needed
Written Communication:	ENGH 101 (100)	3		
*Oral Communication	*Satisfied by Major Requirements			
*Quantitative Reasoning	*Satisfied by Major Requirements			
*Information Technology	*Satisfied by Major Requirements			
Arts		3		
Global Understanding		3		
Literature		3		
*Natural Science	*Satisfied by Major Requirements			
*Social & Behavioral Science	*Satisfied by ECON 103	3		
Western Civ/World History		3		
**Written Communication	ENGH 302 - **Natural Science Section Only	3		
*Capstone/Synthesis	*Satisfied by Major Requirements			
<b>Major Requirements (105 - 106 credits)</b> Students in the Cyber Security Engineering, BS program must complete all mathematics, science, and VSE courses with a grade of C or better				
Cyber Security Core Requirements (59 credits)		Credits	Earned	Needed
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		
<b>Technical Electives (9 credits) from:</b>	CYSE 424, 460-462, 465, 467, 477-480, 499	9		
Technical Elective #1:				
Technical Elective #2:				
Technical Elective #3:				
Additional Support Coursework (48-49 credits)		Credits		
COMM 100 or 101	Public Speaking or Fundamentals of Communication	3		
ECE 301	Digital Electronics	3		
SYST 205	Systems Engineering Principles	3		
CDS 130 or CS 112	Computing for Scientists or Introduction to Computer Programming	3-4		
SYST 230 or CS 222	Object-oriented Modeling and Design or Computer Programming for Engineers	4		
MATH 113 & 114	Analytic Geometry and Calculus I and II	8		
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 I	3		
PHYS 160/161 and 260/261	University Physics I & II	8		
ENGR 107	Introduction to Engineering (Mason Core)	2		
<b>Advisor Notes:</b>				

## CYBER SECURITY ENGINEERING, B.S. 2019 - 2020

Cyber Security Engineering is concerned with the development of cyber resilient systems which include the protection of the 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 to include, but not limited to, 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. The program is administered by the Dean's Office, Volgenau School of Engineering.

Cyber security engineers are part of integrated design and development teams for physical systems that require embedded cyber security design, working with engineers from other disciplines (e.g. civil, mechanical, electrical, systems engineers as well as computer scientists and software engineers). Cyber security engineers are engineers who know technology, but who also have in-depth exposure to the application/domain area. Not only do they provide technological solutions to cyber security problems of engineering systems posed by others, but by having an understanding of the application/domain, they can formulate potential security threats, propose appropriate solutions, and then provide leadership in the design of a system to resist and survive these threats.

Because of their interdisciplinary training, cyber security engineers are expected to play an increasing role in attacking some of the most pressing current cyber security issues in the country. For example, while everyone welcomes new methods to identify and then mitigate cyber threats, hardly a day goes by without being reminded that mitigating these risks by incorporating prevention into our systems would be more appropriate. Cyber security engineers must become part of the solution by developing appropriate, effective, and affordable systems with security engineered in from the concept phase, through design, and into implementation and deployment.

### **Degree Requirements**

The cyber security engineering curriculum requires 126 total credit hours, which can be completed within eight semesters. At least 45 semester hours of the degree requirements must be level 300 or above.

# CYBER SECURITY ENGINEERING, B.S.

## 2019-20120 Sample Schedule for Undergraduate Cyber Security Engineering majors

### First Semester

MATH 113 Analytic Geom. & Calculus I	4
CS 112 Introduction to Computer Prog <b>OR</b> CDS 130 – Computing for Scientists (3 cr)****	4
ECON 103 Contemp. Microeconomic Prin.	3
ENGR 107 Intro to Engineering	2
Mason Core*	3
<b>Total</b>	<b>16(15)</b>

### Second Semester

MATH 114 Analytic Geom. & Calculus II	4
CS 222 Computer Programming for Engineers <b>OR</b> SYST 230 Computing for Engineers****	3
CYSE 101 Introduction to Cyber Security Engineering	3
PHYS 160 University Physics I	3
PHYS 161 University Physics I Lab	1
Mason Core*	3
<b>Total</b>	<b>17</b>

### Third Semester

SYST 205 Systems Engineering Principles	3
MATH 213 Analytic Geom. & Calculus III	3
MATH 203 Linear Algebra	3
PHYS 260 University Physics II	3
PHYS 261 University Physics II Lab	1
Mason Core*	3
<b>Total</b>	<b>16</b>

### Fourth Semester

CYSE 211 Operating Systems & Lab	3
CYSE 220 System Modeling	3
CYSE 230 Computer Networking	3
MATH 214 Elementary Differential Equations	3
STAT 344 Probability & Stat for Engineers & Scientists	3
<b>Total</b>	<b>15</b>

### Fifth Semester

ECE 301 Digital Electronics	3
CYSE 325 Discrete Events Systems Modeling	3
CYSE 330 Introduction to Network Security	3
CYSE 425 Secure RF Communications	3
Mason Core*	3
<b>Total</b>	<b>15</b>

### Sixth Semester

CYSE 411 Secure Software Engineering	3
CYSE 421 Industrial Control Systems (ICS) Security	3
CYSE 430 Critical Infrastructure Protection (seminar)	3
CYSE 470 User Experience Engineering (seminar)	3
ENGH 302 Advanced Composition (Multi- Disciplinary or Natural Science section) ***	3
<b>Total</b>	<b>15</b>

### Seventh Semester

CYSE 445 Systems Security and Resilience	3
CYSE 450 Cyber Vulnerability Lab	1
CYSE 476 Cryptography and Network Security	3
CYSE 492 Senior Advanced Design Project I	2
CYSE Technical Elective	3
Mason Core*	3
<b>Total</b>	<b>15</b>

### Eighth Semester

CYSE 475 Cyber Physical Systems	3
CYSE 491 Engineering Senior Seminar	2
CYSE 493 Senior Advanced Design Project II	3
CYSE Technical Elective	3
CYSE Technical Elective	3
Mason Core*	3
<b>Total</b>	<b>17</b>

\* <http://catalog.gmu.edu/mason-core> Mason Core Categories: One course from each: Oral Communication, ENGH 100 or ENGH101, Arts, Global Understanding, Literature, Western Civilization/World History. VSE students do not need to seek out Science, Math, and IT categories as they are built into the major curriculum.

\*\*\* ENGH 100 or ENGH 101 and Mason Core-Literature must be completed before taking ENGH 302.

\*\*\*\* Students take either (CDS 130 and SYST 230) or (CS 112 and CS 222)-Technical Electives should be selected from the CYSE program's list of approved courses

**We invite requests for additional information. Please contact:**

George Mason University  
Volgenau School of Engineering  
Cyber Security Engineering Program  
Nguyen Engineering Building, Room 2215, Mail Stop 4A6  
Fairfax, VA 22030-4444  
Phone: (703) 993-1502 Fax: (703) 993-1521  
Email: Dr. Peggy Brouse [pbrouse@gmu.edu](mailto:pbrouse@gmu.edu) Website: <http://vse.gmu.edu>