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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYSE 101</td>
<td>Introduction to Cyber Security Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 205</td>
<td>Systems Engineering Principles</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 211</td>
<td>Operating Systems and Lab</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 220</td>
<td>Systems Modeling</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 230</td>
<td>Computer Networking</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 325</td>
<td>Discrete Events Systems Modeling</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 330</td>
<td>Introduction to Network Security</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 411</td>
<td>Secure Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 421</td>
<td>Industrial Control Systems Security</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 425</td>
<td>Secure RF Communications</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 430</td>
<td>Critical Infrastructure Protection</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 445</td>
<td>System Security and Resilience</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 450</td>
<td>Cyber Vulnerability Lab</td>
<td>1</td>
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<tr>
<td>CYSE 465</td>
<td>Transportation Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 470</td>
<td>Human Factors and Cyber Security Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 475</td>
<td>Cyber Physical Systems</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 491</td>
<td>Engineering Senior Seminar</td>
<td>2</td>
</tr>
<tr>
<td>CYSE 492</td>
<td>Senior Advanced Design Project I</td>
<td>2</td>
</tr>
<tr>
<td>CYSE 493</td>
<td>Senior Advanced Design Project II (Mason Core)</td>
<td>3</td>
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</tbody>
</table>

Technical Electives

Select 9 credits from the following approved technical courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYSE 424</td>
<td>Embedded and Real Time Systems</td>
</tr>
<tr>
<td>CYSE 460</td>
<td>Power Systems and Smart Grid</td>
</tr>
<tr>
<td>CYSE 461</td>
<td>Power Grid Security</td>
</tr>
<tr>
<td>CYSE 462</td>
<td>Mobile Devices and Network Security</td>
</tr>
<tr>
<td>CYSE 467</td>
<td>GPS Security</td>
</tr>
<tr>
<td>CYSE 476</td>
<td>Cryptography and Computer Network Security</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYSE 477</td>
<td>Intrusion Detection</td>
</tr>
<tr>
<td>CYSE 478</td>
<td>Cyber Security Audit and Compliance</td>
</tr>
</tbody>
</table>
Electrical Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ECE 301</td>
<td>Digital Electronics</td>
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</table>

Total Credits 3

Mathematics and Statistics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 113</td>
<td>Analytic Geometry and Calculus I (Mason Core)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 203</td>
<td>Linear Algebra 1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>MATH 214</td>
<td>Elementary Differential Equations 1</td>
<td>3</td>
</tr>
<tr>
<td>STAT 344</td>
<td>Probability and Statistics for Engineers and Scientists I</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 20

Natural Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 160</td>
<td>University Physics I (Mason Core)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 161</td>
<td>University Physics I Laboratory (Mason Core)</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 260</td>
<td>University Physics II (Mason Core) 1</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 261</td>
<td>University Physics II Laboratory (Mason Core)</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Credits 8

Computer Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 112</td>
<td>Introduction to Computer Programming (Mason Core)</td>
<td>4</td>
</tr>
<tr>
<td>CS 222</td>
<td>Computer Programming for Engineers 1</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 7

Accelerated Master's

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 AP6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP6 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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFRS 500</td>
<td>Introduction to Forensic Technology and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CFRS 510</td>
<td>Digital Forensics Analysis (satisfies the IT 357 requirement for the INFS concentration in the BS program)</td>
<td>3</td>
</tr>
<tr>
<td>CFRS 660</td>
<td>Network Forensics (satisfies one NTEL concentration course in the BS program)</td>
<td>3</td>
</tr>
</tbody>
</table>

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/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 AP6 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.