Bachelor of Science
Cybersecurity with a Major in Cyber Operations (BS)

Shobha Vatsa, Program Coordinator and Faculty Advisor (svatsa@odu.edu)

Cybersecurity with a major in Cyber Operations is an interdisciplinary major encompassing the entire scope of cyberspace and related operations that are both technical and non-technical (i.e., ethical, legal, human-centered, etc.) in nature. Cyber Operations is a complementary discipline to Cybersecurity. Cyber Operations places a particular emphasis on technologies and techniques applicable to all operational and system levels. Coursework in Cyber Operations balances theory, practice and hands-on labs inspired by real-life scenarios. Skills and competencies emphasized are in system attack, infiltration, exploitation, defense, mitigation, and recovery.

Graduates of the Bachelor of Science degree in Cybersecurity with the Cyber Operations major will have the skills and proficiencies that are critical to intelligence, military and law enforcement organizations authorized to perform these specialized operations. Therefore, they will play a role in the enhancement of the national security posture of the nation.

Requirements

Lower-Division General Education

Written Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written)

Oral Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral)

Mathematics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math)

Language and Culture (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language)

Information Literacy and Research (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information)

Human Behavior (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior)

Human Creativity (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity)

Interpreting the Past (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret)

Literature (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature)

Philosophy and Ethics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy)

The Nature of Science (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature)

Impact of Technology (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact)

Written Communication: Grade of C or better required in both written communication courses and in ENGL 110C before declaring major.

Mathematics: MATH 211 and MATH 212 required

Philosophy and Ethics: met in the major by PHIL 355E

Impact of Technology: met in the major by CYSE 200T

Human Behavior: CRJS 215S or DASC 205S/SOC 205S required

Upper-Division General Education

Met through 300/400-level prerequisite courses required for the major.

Requirements for Graduation

Requirements for graduation include the following:

- Minimum of 120 credit hours.
- Minimum of 30 credit hours overall and 12 credit hours of upper-level courses in the major program from Old Dominion University.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward the major.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward a minor.
- Completion of ENGL 110C, ENGL 211C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better. The W course must be taken at Old Dominion University.
- Completion of Senior Assessment.

Cyber Operations Major

General Education

Complete lower-division requirements

Complete upper-division requirements (met through prerequisite courses required for the major)

Prerequisites

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 150</td>
<td>Introduction to Programming with C++</td>
<td>4</td>
</tr>
<tr>
<td>or CS 151</td>
<td>Programming with Java</td>
<td></td>
</tr>
<tr>
<td>or CS 153</td>
<td>Introduction to Programming with Python</td>
<td></td>
</tr>
<tr>
<td>CS 170</td>
<td>Introduction to Computer Architecture I</td>
<td>3</td>
</tr>
<tr>
<td>CS 250</td>
<td>Programming with C++</td>
<td>4</td>
</tr>
<tr>
<td>or CS 251</td>
<td>Programming with Java</td>
<td></td>
</tr>
<tr>
<td>CS 252</td>
<td>Introduction to Unix for Programmers</td>
<td>1</td>
</tr>
<tr>
<td>CS 260</td>
<td>C++ for Programmers</td>
<td>1</td>
</tr>
<tr>
<td>or CS 261</td>
<td>Java for Programmers</td>
<td></td>
</tr>
<tr>
<td>CS 270</td>
<td>Introduction to Computer Architecture II</td>
<td>3</td>
</tr>
<tr>
<td>CS 381</td>
<td>Introduction to Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECE 241</td>
<td>Fundamentals of Computer Engineering</td>
<td>4</td>
</tr>
<tr>
<td>ECE 304</td>
<td>Probability, Statistics, and Reliability</td>
<td>3</td>
</tr>
</tbody>
</table>

Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYSE 200T</td>
<td>Cybersecurity, Technology, and Society</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 301</td>
<td>Cybersecurity Techniques and Operations</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 425W</td>
<td>Cybersecurity Strategy and Policy</td>
<td>3</td>
</tr>
<tr>
<td>CYSE/CRJS 406</td>
<td>Cyber Law</td>
<td>3</td>
</tr>
</tbody>
</table>

Major Coursework

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 361</td>
<td>Data Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS 390</td>
<td>Introduction to Theoretical Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CS 466</td>
<td>Principles and Practice of Cyber Defense</td>
<td>3</td>
</tr>
<tr>
<td>CS 467</td>
<td>Introduction to Reverse Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CS 471</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 368</td>
<td>Cybersecurity Internship</td>
<td>3</td>
</tr>
<tr>
<td>or IDS 493</td>
<td>IDS Electronic Portfolio Project</td>
<td></td>
</tr>
<tr>
<td>ECE 346</td>
<td>Microcontrollers</td>
<td>3</td>
</tr>
<tr>
<td>ECE 355</td>
<td>Introduction to Networks and Data Communications</td>
<td>3</td>
</tr>
<tr>
<td>ECE 416</td>
<td>Cyber Defense Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ECE 419</td>
<td>Cyber Physical System Security</td>
<td>3</td>
</tr>
<tr>
<td>ECE 455</td>
<td>Network Engineering and Design</td>
<td>3</td>
</tr>
<tr>
<td>MSIM 470</td>
<td>Foundations of Cyber Security</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 355E</td>
<td>Cybersecurity Ethics</td>
<td>3</td>
</tr>
</tbody>
</table>

Approved Program Elective

Select one of the following:

1  Cybersecurity with a Major in Cyber Operations (BS)
Cybersecurity with a Major in Cyber Operations (BS)

CS 476  Systems Programming
CYSE 407  Digital Forensics
ECE 483  Embedded Systems
IT 417  Management of Information Security

Total Credit Hours 120-126

* Students who take CS 250 Programming with C++ need to select CS 261 Java for Programmers as the required lab course. Students who take CS 251 Programming with Java need to select CS 260 C++ for Programmers as the required lab course.

No more than two classes, or six credits, may be counted for both the major and a minor. Some minors may allow fewer credits to share.

Elective credit may be needed to meet the 120 hour requirement for graduation.

Degree Program Guide

The Degree Program Guide is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Course  Title  Credit Hours
Freshman
Fall
ENGL 110C  English Composition (Grade of C or better required)  3
MATH 211  Calculus I  4

Oral Communication  3
Information Literacy and Research  3
Human Behavior (CRJS 215S or DASC 205S/SOC 205S required)  3

Spring
ENGL 211C  Writing, Rhetoric, and Research (Grade of C or better required)  3
or ENGL 231C

Writing, Rhetoric, and Research: Special Topics  3

CS 150 or CS 151 or CS 153  Introduction to Programming with C++ or Introduction to Programming with Java or Introduction to Programming with Python  4

CYSE 200T  Cybersecurity, Technology, and Society (meets Impact of Technology)  3

MATH 212  Calculus II  4

Sophomore
Fall
Nature of Science I  4
CS 170  Introduction to Computer Architecture I  3
CS 250 or CS 251  Programming with C++ or Programming with Java  4
CS 252  Introduction to Unix for Programmers  1

Spring
ECE 241  Fundamentals of Computer Engineering  4

Credit Hours 16

Junior
Fall
PHIL 355E  Cybersecurity Ethics (meets Philosophy and Ethics)  3
CS 466  Principles and Practice of Cyber Defense  3
CS 381  Introduction to Discrete Structures  3

ECE 304  Introduction to Networks and Data Communications  3

Interpreting the Past  3

Spring
CYSE 425W  Cybersecurity Strategy and Policy (C or better required)  3
CYSE 301  Cybersecurity Techniques and Operations  3
CS 390  Introduction to Theoretical Computer Science  3
CS 467  Introduction to Reverse Software Engineering  3
ECE 346  Microcontrollers  3

Credit Hours 15

Senior
Fall
Literature  3
CS 471  Operating Systems  3
ECE 416  Cyber Defense Fundamentals  3
MSIM 470  Foundations of Cyber Security  3
Approved Program Elective  3

Credit Hours 15

Spring
Human Creativity  3
CYSE 368 or IDS 493  Cybersecurity Internship or IDS Electronic Portfolio Project  3
ECE 419  Cyber Physical System Security  3
ECE 455  Network Engineering and Design  3

Credit Hours 12

Total Credit Hours 120
Students who take CS 250 Programming with C++ need to select CS 261 Java for Programmers as the required lab course. Students who take CS 251 Programming with Java need to select CS 260 C++ for Programmers as the required lab course.

Language and Culture I & II may be met in high school and are not included in this four-year plan. Please see requirement details.