

# Cybersecurity and Operations

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Our cybersecurity and operations major is intended to equip you with the knowledge and skills to defend computer operating systems, networks, and data from cyberattacks. You will be taught by faculty and experts using both theoretical and hands-on approaches to prepare you for high demand jobs.

Cybersecurity is important because it encompasses everything that pertains to protecting our sensitive data, personally identifiable information, protected health information, intellectual property, and governmental and industry information systems from theft and damage attempted by criminals and adversaries. Cybersecurity risk is increasing, driven by global connectivity and usage of cloud services to store sensitive data and personal information. Improperly configured cloud services and devices paired with increasingly sophisticated cybercriminals means the risk that organizations will suffer from a cyberattack or data breach is on the rise.

## Program Goals and Outcomes

Student Learning Goals	Student Learning Outcomes
SLG 1: Students will demonstrate competency in programming principles, including high-level language and the object-oriented paradigm	SLO 1.1 - Students can describe and utilize different datatypes, operators and common language features (conditionals, loops, functions, etc.) in at least one high level language
	SLO 1.2 - Students will design and implement an object hierarchy considering object-oriented encapsulation mechanisms (e.g. class hierarchies, interfaces, member data types and functions of variable visibility)
SLG 2: Students will demonstrate knowledge of principles of computer data structures and algorithms	SLO 2.1 - Students will design and implement basic algorithmic methods for searching, sorting, and solving common industry problems utilizing an appropriate algorithm for the particular context.
	SLO 2.2 - Students will be able to develop and utilize common data structures (Linked Lists, Stacks/Queues, Trees)
SLG 3: Students will demonstrate knowledge of architecture and organization of computer systems	SLO 3.1 - Students will demonstrate knowledge of number systems, numerical operations, and the simplification of Boolean logic.
	SLO 3.2: Students will understand the amount of time it takes to sort for each sorting algorithm
	SLO 3.3 - Students will understand how to develop programs using an assembly language.
	SLO 3.4 - Students will understand how a computer functions at the machine level
SLG 4: Students will demonstrate knowledge of networking protocols and network-level security	SLO 4.1 - Students will explain how TCP, UDP, IP packets are structured and work in their corresponding layers
	SLO 4.2 - Students will describe concepts such as congestion and flow control, checksums, routing, and address resolution
	SLO 4.3 - Students will understand how to identify and defend against network-based attacks
	SLO 4.4 - Students will demonstrate knowledge of Wireless and Mobile Network Security
SLG 5: Students will demonstrate knowledge of system-level administration and security	SLO 5.1 - Students will demonstrate knowledge of Linux administration and security
	SLO 5.2 - Students will demonstrate how to assess threats to networks, servers, embedded systems, and desktops
SLG 6: Students will demonstrate knowledge of instruction-level security and operating system internals	SLO 6.1 - Students will demonstrate knowledge of static and dynamic malware analysis utilizing industry standard tools
	SLO 6.2 - Students will demonstrate knowledge of techniques to determine points of vulnerability in modern software
	SLO 6.3 - Students will demonstrate knowledge of how to operating systems are designed and implemented
SLG 7: Students will demonstrate knowledge of Internet-facing application development and security	SLO 7.1 - Students will develop secure web applications
	SLO 7.2 - Students will describe and evaluate common cryptographic algorithms
SLG 8: Students will demonstrate knowledge of computer science implications in modern society	SLO 8.1 - Students will describe to others the societal impact due to the development of a particular technology.
	SLO 8.2 - Students will critique a user interface for usability within context.

SLG 9: Students will demonstrate knowledge of mathematical structures, techniques, and reasoning as they apply to computer science

SLO 9.1 - Students will describe practical examples of an appropriate set, function, or relation model, and interpret the associated operations and terminology in context

SLO 9.2 - Students will model real-world problems using appropriate graph strategies

## Bachelor of Science with a Major in Cybersecurity and Operations

General Education		38
<b>Required Cybersecurity Operations Core (72 cr.)</b>		
CSCI 160	Computer Science I	4
CSCI 161	Computer Science II	4
CSCI 221	Web and Internet Programming	4
CSCI 240	Assembly Language Programming	4
CSCI 242	Algorithms and Data Structures I	4
CSCI 258	Software Security and Design	4
CSCI 260	UNIX Environment	4
CSCI 276	Industrial Hardware Design and Security	4
CSCI 324	Reverse Engineering	4
CSCI 331	Social Implications	4
CSCI 340	Computer Networks I	4
CSCI 390	Ethical Hacking	4
CSCI 410	Defensive Network Security	4
CSCI 420	Mobile and Wireless Security	4
CSCI 425	Applied Cryptography	4
CSCI 432	Malware Analysis	4
CSCI 450	Operating Systems	4
CSCI 460	Capstone Project (Security Related)	4
<b>Required Support Math Courses (11-12 cr.)</b>		
MATH 146 or MATH 165	Applied Calculus Calculus I	3-4
MATH 208	Discrete Mathematics I	4
MATH 210 or DATA 211	Elementary Statistics Applied Statistics and Data Visualization	4
<b>Total Hours</b>		<b>121-122</b>

## Cybersecurity and Operations Minor

<b>Required Core (16 cr.)</b>		
CSCI 160	Computer Science I	4
CSCI 161	Computer Science II	4
CSCI 242	Algorithms and Data Structures I	4
CSCI 340	Computer Networks I	4
CSCI 390	Ethical Hacking	4
<b>Options</b>		<b>12</b>
Select one of the following options:		
<b>Option 1</b>		
CSCI 240	Assembly Language Programming	
CSCI 324	Reverse Engineering	
CSCI 432	Malware Analysis	
<b>Option 2</b>		
CSCI 221	Web and Internet Programming	
CSCI 260	UNIX Environment	
CSCI 410	Defensive Network Security	
<b>Option 3</b>		

CSCI 258	Software Security and Design	
CSCI 420	Mobile and Wireless Security	
CSCI 425	Applied Cryptography	
<b>Total Hours</b>		<b>32</b>