

# Cybersecurity Major Curriculum

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## Curriculum

### Major Description

Cybersecurity focuses on defending digital systems from malicious actors in an increasingly connected world. Grounded in computer science and combining analytical, investigational, and ethical reasoning, the study of cybersecurity encompasses encryption, network defense, secure software development, and digital forensics. Students develop both technical expertise and critical thinking skills to anticipate, detect, and respond to evolving threats. Career paths include security analyst, secure software engineer, penetration tester, and digital forensic investigator.

### Program Learning Outcomes

#### Algorithmic Problem Solving

Solve problems within computer science and in other domains using computational tools.

#### Ethical Collaboration & Technical Communication

Work on integrated teams to deliver software grounded in ethical conduct and an understanding of computing's societal impacts. Be able to explain technical concepts to a variety of stakeholders.

#### Systems Thinking

Understand how the multiple layers of the hardware and software stack work in concert to support modern applications.

#### Analytical and Mathematical Reasoning

Apply mathematical and logical reasoning, including discrete mathematics and statistics, to analyze computational problems.

#### Security Analysis

Identify, analyze, and assess vulnerabilities and threats in computing systems.

## Defense of Computing Systems

Apply modern tools and techniques to secure systems and mitigate cyberattacks.

### Required Courses

Course Code	Name	Pre-Requisites	Credits	Modified Course?	New Course?
CSC 141	Foundations of Computer Science I	None	4		
CSC 142	Foundations of Computer Science II	CSC 141	4		
CSC 210	Data Structures & Algorithms	CSC 142, MAT 250 co-req	3	X	
CSC 280	Computer Ethics	CSC 141, 30 College Credits	3		X
CSC 300	Computer Networking	CSC 142	3		X
CSC 310	Computer Architecture	CSC 142	3		
CSC 382	Computer Science Internship	CSC 210	3		
MAT 110	Elementary Statistics	None	3		
MAT 131	Calculus and Analytical Geometry I	None	4		
MAT 250	Foundation of Mathematics	MAT 131	3	X	
CSC 150	Introduction to Cybersecurity	CSC 141	3		X
CSC 250	Secure Software Development	CSC 142, CSC 150	3		X
CSC 350	Cryptography	CSC 142, MAT 110, MAT 250	3		X
CSC 351	Network Security & Penetration Testing	CSC 250, CSC 300	3		X
CSC 352	Digital Forensics	CSC 250, CSC 300, CSC 310	3		X
CSC 494	Cybersecurity Capstone	CSC 250, 90 College Credits	4		X
			<b>52</b>		

**Yellow** = Same as Computer Science Major

### Required Courses' Descriptions

#### **CSC 141 Foundations of Computer Science I**

This is an introduction to problem-solving methods and algorithm development as well as the fundamental building blocks of programs including control structures, loops, functions, and simple data structures. The objective is to teach how to design, code, debug and document programs using techniques of good programming style. Binary and fundamental data types are also discussed.

*4 Credits, Pre-Requisite: None*

## **CSC 142      Foundations of Computer Science II**

This course builds on Foundations of Computer Science I, continuing the development of discipline in program design, style and expression while expanding it to object-oriented programming. It focuses on debugging and testing; and introduces basic aspects of recursion and simple class hierarchies. Specific object-oriented topics include polymorphism, encapsulation, abstraction, modularity, and inheritance.

*4 Credits, Pre-Requisite: CSC 141*

## **CSC 210      Data Structures & Algorithms**

A study of data structures and algorithms, their practical applications, and key techniques for designing, analyzing, and reasoning about them with an emphasis on comparative efficiency utilizing Big O notation. Students implement data structures and algorithms from scratch in addition to studying their theoretical properties. Topics include lists, stacks, queues, hash tables, recursion, searching and sorting, binary trees, and graphs.

*3 Credits, Pre-Requisite: CSC 142 and co-requisite of MAT 250*

## **CSC 280      Computer Ethics**

Students analyze ethical issues in the software industry using both theoretical ethics frameworks as well as a modern lens. The relationship between technology and economics, culture, and human rights is a particular focus. Specific topics include but are not limited to intellectual property, open source software, privacy, work culture, social media, automation, algorithmic decision making, AI ethics, and bias. Multiple sides are illuminated through extensive discussion classes and student-led debates.

*3 Credits, Pre-Requisite: CSC 141 and 30 College Credits*

## **CSC 300      Computer Networking**

An exploration of computer networks from two perspectives: a high-level network architecture view, and a low-level introduction to packet exchange using sockets. Network concepts, models, protocols, and real-world applications (e.g. HTTP, DNS) are covered. Practical skills are acquired through programming TCP and UDP based applications and by utilizing network analysis tools.

*3 Credits, Pre-Requisite: CSC 142*

## **CSC 310      Computer Architecture**

Covers the foundations of computer hardware and the software/hardware interface. Digital logic circuit diagrams and assembly programming are utilized as tools to develop an

understanding of the functioning of a microprocessor. Different microprocessor architectures and historical trends in CPU design are discussed.

*3 Credits, Pre-Requisite: CSC 142*

### **CSC 382 Computer Science Internship**

Students will apply computer science in a professional context (e.g. business, institution, government agency, or significant open source project) under the supervision of a staff member and a faculty sponsor. Reports and tangible project results are required. Students must obtain faculty approval of their internship prior to the start of the semester.

*3 Credits, Quality/Non-quality only, Prerequisite: CSC 210*

### **MAT 110 Elementary Statistics**

This course gives students a general overview of modern statistics. Topics include: organization of data; probability and probability distributions; measures of central tendency and variability; normal distributions; sampling; hypothesis testing; correlation and regression.

*3 Credits, Pre-Requisite: None*

### **MAT 131 Calculus and Analytical Geometry I**

This course involves fundamental concepts of functions of one variable. Topics include: limits, continuity, differentiation, derivative applications, curve sketching, related rates, and maxima-minima problems. Introduction to indefinite and definite integration including the fundamental theorems, and numerical approximation techniques are also covered.

*4 Credits, Pre-Requisite: None*

### **MAT 250 Foundation of Mathematics**

This is an introduction to abstract and discrete mathematics. Topics include symbolic logic, methods of proof (direct, contradiction, and induction), set theory, relations and functions, graph theory (graphs, trees, Euler and Hamiltonian cycles, search algorithms), countable and uncountable sets.

*3 Credits, Pre-Requisite: MAT 131*

### **CSC 150 Introduction to Cybersecurity**

An introduction to cybersecurity principles, practices, and the threat landscape facing modern digital systems. Core topics include operating system security (privileges, access controls, file systems, authentication), network fundamentals, cryptographic concepts,

common attack vectors, and defensive strategies. Through hands-on exercises, students gain practical experience with security tools while examining the ethical dimensions of cybersecurity work. This course provides the foundation for specialized study in secure software development, cryptography, digital forensics, and penetration testing.

*3 Credits, Prerequisite: CSC 141*

### **CSC 250      Secure Software Development**

This course examines software engineering practices that prevent the introduction of security vulnerabilities. The course introduces common software weaknesses. This includes but is not limited to injection flaws, buffer overflows, and authentication failures. Students learn to implement programmatic countermeasures. Topics include input validation, secure coding patterns, threat modeling, code review techniques, and security testing methodologies. Through hands-on projects, students develop the ability to identify, exploit, and remediate common vulnerabilities in software systems.

*3 Credits, Prerequisite: CSC 142, CSC 150*

### **CSC 350      Cryptography**

This course examines the mathematical and computational foundations of modern cryptographic systems. Topics include symmetric and asymmetric encryption algorithms, cryptographic hash functions, digital signatures, and their vulnerabilities. Applications of cryptography in security, privacy-preserving systems, authentication, and blockchain technology are explored.

*3 Credits, Prerequisite: CSC 142, MAT 110, MAT 250*

### **CSC 351      Network Security & Penetration Testing**

This course examines network attack vectors and defensive strategies. Students explore how attackers compromise network environments through reconnaissance, exploitation, and post-exploitation techniques. Topics include vulnerability assessment, penetration testing methodologies, network hardening, intrusion detection, and incident response. Through hands-on labs in controlled environments, students conduct ethical security assessments while learning defensive measures to protect network infrastructure.

*3 Credits, Prerequisite: CSC 250, CSC 300*

### **CSC 352      Digital Forensics**

Methods for collecting and analyzing digital evidence from computer systems and networks. Topics include disk and file system analysis, memory forensics, network traffic examination, and evidence preservation procedures. Students apply forensic tools and techniques to investigate security incidents while understanding legal and ethical

requirements for digital evidence handling.

*3 Credits, Prerequisite: CSC 250, CSC 300, CSC 310*

### **CSC 494      Cybersecurity Capstone**

Students work in small teams on the production of a significant tangible software project that can serve both as a culminating experience and a portfolio piece. In addition to writing the software, students complete an extensive report including their background research, an analysis of any ethical or legal issues related to their project, the architecture and design of their project, and connections between their project and other disciplines. Prototyping and secure software engineering best practices are required.

*4 Credits, Prerequisite: CSC 250 and 90 Credits*

### Example Student Progression

	<b>Fall</b>	<b>Spring</b>
<b>Year 1</b>	CSC 141 Foundational of Computer Science I MAT 131 Calculus and Analytical Geometry I	CSC 142 Foundations of Computer Science II MAT 250 Foundation of Mathematics
<b>Year 2</b>	CSC 210 Data Structures & Algorithms CSC 150 Introduction to Cybersecurity	CSC 300 Computer Networking MAT 110 Elementary Statistics
<b>Year 3</b>	CSC 350 Cryptography CSC 280 Computer Ethics	CSC 250 Secure Software Development CSC 310 Computer Architecture
<b>Year 4</b>	CSC 351 Network Security & Penetration Testing CSC 382 Computer Science Internship	CSC 352 Digital Forensics CSC 494 Cybersecurity Capstone