MAJOR IN COMPUTER SCIENCE, NETWORKS AND SECURITY CONCENTRATION

Networks connect computers and other devices so they can share information. The Networks and Security concentration involves designing, building, and maintaining networks and protecting them from cyberattacks.

Network and security technology is vitally important to almost every modern field of human endeavor including biology, physics, agriculture, medicine, defense, and more.

There is explosive demand for professionals who can understand the underlying principles of networks and security, incorporate them into products and practices, and provide defensive capabilities against cyber threats.

The Networks and Security concentration provides students core and elective courses on computer networking, systems security (including the latest trends and technologies in cyber-security), ethical hacking, operating systems, databases, and software. Students will develop fundamental skills in security architecture and analysis, cryptography, system vulnerabilities and attack vectors, malware analysis and defense, intrusion detection and protection, network architecture, engineering and network software development. The CSU Cyber-Security Center (https://cybersecurity.colostate.edu/) expands upon these course offerings with lab equipment, research topics, and certification opportunities.

Learning Objectives

Upon successfully completing this program, students will be able to:

1. Work effectively in teams to develop computational solutions to complex problems.
2. Develop products and technologies that provide network/cyber-security solutions or incorporate these technologies into products that require security or network capabilities.
3. Analyze technologies and situations for cyber vulnerabilities to develop improvements to attack and defense methodologies.
4. Communicate technical ideas effectively in writing and verbally.
5. Confidently pursue graduate studies or professional employment in networks and security and computer science.

Potential Occupations

In addition to the career opportunities open to all computer science graduates, the networks and security concentration opens career paths that include: software developer, software architect, network security analyst, software project manager, computer systems security analyst, computer and information systems manager, and R&D jobs for both cyber-security attack and defense.

Employers in a wide range of fields recognize the need for network and cyber-security architecture and implementations within their domains, which creates research, development and management opportunities across a wide job market.

Requirements
Effective Fall 2025

A minimum grade of C (2.000) is required in CO 150 and in all CS, DSCI, MATH, STAT and departmental Technical Elective courses which are required for graduation.

Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)	3B	3
MATH 156 or 160[1]	Mathematics for Computational Science I (GT-MA1) Calculus for Physical Scientists I (GT-MA1)	1B	4
Select one group from the following:[2]			5-9
Group A:			
CS 150A or 150B	Culture and Coding: Java (GT-AH3) Culture and Coding: Python (GT-AH3)	3B	
CS 162 or 164	CS1--Introduction to Java Programming CS1--Computational Thinking with Java		
Group B:			
CS 152	Python for STEM		
CS 162 or 164	CS1--Introduction to Java Programming CS1--Computational Thinking with Java		
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)		3B	
Group C:			
CS 163	CS1---No Prior Programming Experience		
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-and-humanities)		3B	

Select at least two courses totaling a minimum of 7 credits from the following (one course must be or include the sequenced laboratory):			7
AA 100 & AA 101	Introduction to Astronomy (GT-SC2)	3A	
ANTH 120 & ANTH 121	Human Origins and Variation (GT-SC2)	3A	
BZ 110 & BZ 111	Principles of Animal Biology (GT-SC2)	3A	
BZ 120	Principles of Plant Biology (GT-SC1)	3A	
CHEM 107 & CHEM 108	Fundamentals of Chemistry (GT-SC2)	3A	
CHEM 111 & CHEM 112	General Chemistry I (GT-SC2)	3A	
GEOL 120 & GEOL 121	Geology and Society (GT-SC2)	3A	
GEOL 122 & GEOL 121	Geoscience--Climate and Environmental Change (GT-SC2)	3A	
GEOL 124 & GEOL 121	Earth Resources and Sustainability (GT-SC2)	3A	
GEOL 150	Dynamic Earth (GT-SC2)	3A	
HONR 292A	Honors Seminar: Knowing in the Sciences	3A	
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	
LIFE 103	Biology of Organisms-Animals and Plants (GT-SC1)	3A	
LIFE 201A	Introductory Genetics: Applied/Population/Conservation/Ecological (GT-SC2)	3A	
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	3A	
LIFE 220/LAND 220	Fundamentals of Ecology (GT-SC2)	3A	
NR 150	Oceanography (GT-SC2)	3A	
PH 121	General Physics I (GT-SC1)	3A	
PH 122	General Physics II (GT-SC1)	3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
Electives[3]			1-5
	Total Credits		**30**

Sophomore

CS 165	CS2--Data Structures	4
CS 220	Discrete Structures and the Applications	4
Select one group from the following:		4-5
Group A		
CS 214	Software Development	
CT 301	C++ Fundamentals	
Group B		
CS 253	Software Development with C++	
Select one course from the following:		4
CS 250	Computer Systems Foundations	
CS 270	Computer Organization	
Select one course from the following:		3-4
DSCI 369	Linear Algebra for Data Science	
MATH 369	Linear Algebra I	
Select one course from the following:		1-3
STAT 301	Introduction to Applied Statistical Methods	
STAT 302A	Statistics Supplement: General Applications	

STAT 307	Introduction to Biostatistics		
STAT 315	Intro to Theory and Practice of Statistics		
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
Elective			0-4
	Total Credits		**30**
Junior			
CS 314	Software Engineering	4A,4B	3
CS 320	Algorithms--Theory and Practice		3
CS 356	Systems Security		3
CS 370	Operating Systems		3
Any CS course numbered 300- or above, excluding 380-399 and 480-499			3-4
Technical Electives (see list below)			6-8
Advanced Writing (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)		2	3
Electives			3-6
	Total Credits		**30**
Senior			
CS 456	Modern CyberSecurity	4C	4
CS 457	Computer Networks and the Internet	4C	4
Select one course from the following:			4
CS 430	Database Systems		
CS 458	Blockchain Principles and Applications		
CS course numbered 400- or above, excluding 480-499			4
Electives[4]			14
	Total Credits		**30**
	Program Total Credits:		**120**

Technical Electives (6 credits minimum)

Select a minimum of 6 credits, of which 3 credits must be upper-division.

Code	Title	Credits
BZ 350	Molecular and General Genetics	4
BZ 360	Bioinformatics and Genomics	4
CIS 320	Project Management for Information Systems	3
CIS 413	Advanced Networking and Security	3
CS 300-379		
CS 400-479		
CT 300-379 excluding CT 301		
CT 400-479		
DSCI 235	Data Wrangling	2
DSCI 300-379 excluding DSCI 369		
DSCI 400-479		
ECE 452	Computer Organization and Architecture	3
ENGR 422	Technology Entrepreneurship	3
IDEA 300-379		
IDEA 400-479		
JTC 372	Web Design and Development	3
JTC 472	Advanced Web Design and Development	3
MATH 161	Calculus for Physical Scientists II (GT-MA1)	4
MATH 256	Mathematics for Computational Science II	4
MATH 300-379 excluding MATH 369		
MATH 400-479		
MGT 330	Creativity, Innovation, and Value Creation	3
MGT 340	Fundamentals of Entrepreneurship	3
MGT 420	New Venture Creation	3
PHIL 410	Gödel's Incompleteness Theorems	3
PHIL 411	Logic in Philosophy and Beyond	3
PHIL 415	Logic and Scientific Method	3
PSY 252	Mind, Brain, and Behavior	3
PSY 352	Learning and Memory	3
PSY 452	Cognitive Psychology	3
PSY 454	Biological Psychology	3
PSY 456	Sensation and Perception	3
PSY 458	Cognitive Neuroscience	3
STAT 300-379 excluding STAT 301, STAT 302A, STAT 307, STAT 315		
STAT 400-479		

[1] MATH 156 recommended for computer science majors who do not already have MATH 160 credit.
[2] Recommended sequence for most incoming students is Group A: CS 150B to CS 164.
[3] CS 192 or other seminar course is a recommended elective for incoming, first semester, students.
[4] Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level).

Major Completion Map

Distinctive Requirements for Degree Program:

To prepare for first semester: The curriculum for the Computer Science major assumes students enter college prepared to take calculus. Entering students who are not prepared to take calculus will need to fulfill pre-calculus requirements in the first semester. All students must maintain a C (2.000) or better in CO 150 and in all CS, DSCI, MATH, STAT and departmental Technical Elective courses which are required for graduation.

Freshman

Semester 1		**Critical**	**Recommended**	**AUCC**	**Credits**
CO 150	College Composition (GT-CO2)	X		1A	3
First course from Group A, B, or C (See options in Concentration Requirements Tab)		X		3B	3
Department Approved Science (See list on Concentration Requirements Tab)		X		3A	4
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		X		1C	3
Electives					1-5
MATH 124 and MATH 126 may be necessary for some students to fulfill pre-calculus requirements.		X			
	Total Credits				**14-18**

Semester 2		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 201/PHIL 201	Ethical Computing Systems (GT-AH3)	X		3B	3
MATH 156 or 160	Mathematics for Computational Science I (GT-MA1) Calculus for Physical Scientists I (GT-MA1)	X		1B	4
Remaining course(s) from Group A, B, or C (See options in Concentration Requirements Tab)		X			2-6
Department Approved Science with Lab (See list on Concentration Requirements Tab)		X		3A	3
CO 150 must be completed by the end of Semester 2 with a grade of C or better.		X			
	Total Credits				**12-16**

Sophomore

Semester 3		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 165	CS2--Data Structures	X			4
CS 220	Discrete Structures and the Applications	X			4
Select one course from the following:		X			1-3
STAT 301	Introduction to Applied Statistical Methods				
STAT 302A	Statistics Supplement: General Applications				
STAT 307	Introduction to Biostatistics				
STAT 315	Intro to Theory and Practice of Statistics				
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
Elective			X		0-2
	Total Credits				**14**

Semester 4		**Critical**	**Recommended**	**AUCC**	**Credits**
Select one group from the following:		X			4-5
Group A					
CS 214	Software Development				
CT 301	C++ Fundamentals				
Group B					
CS 253	Software Development with C++				

Select one course from the following:		X			4
CS 250	Computer Systems Foundations				
CS 270	Computer Organization				
Select one course from the following:		X			3-4
DSCI 369	Linear Algebra for Data Science				
MATH 369	Linear Algebra I				
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)			X	3C	3
Elective					0-2
CS 165 and CS 220 and (CS 250 or CS 270) must be completed by the end of Semester 4.		X			
MATH 156 or MATH 160 and MATH 369 or DSCI 369 must be completed by the end of Semester 4.		X			
	Total Credits				**16**

Junior

Semester 5		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 314	Software Engineering	X		4A,4B	3
CS 370	Operating Systems	X			3
Technical Elective (See list on Concentration Requirements Tab)		X			3-4
Advanced Writing (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)			X	2	3
Elective					3
CS 253 must be completed by the end of Semester 5.		X			
	Total Credits				**15-16**

Semester 6		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 320	Algorithms--Theory and Practice		X		3
CS 356	Systems Security	X			3
CS course numbered 300- or above, excluding 380-399 and 480-499			X		3-4
Technical Elective - Upper Division (See list on Concentration Requirements Tab)					3-4
Elective					0-3
CS 314 and CS 320 and CS 370 and CS 356 must be completed by the end of Semester 6.		X			
	Total Credits				**14-15**

Senior

Semester 7		**Critical**	**Recommended**	**AUCC**	**Credits**
CS 456	Modern CyberSecurity	X		4C	4
CS 457	Computer Networks and the Internet	X		4C	4
Electives			X		7
At least two Upper-Division CS classes must be completed by the end of Semester 7.		X			
	Total Credits				**15**

Semester 8		**Critical**	**Recommended**	**AUCC**	**Credits**
Select one course from the following:		X			4
CS 430	Database Systems				
CS 458	Blockchain Principles and Applications				
CS course numbered 400- or above, excluding 480-499		X			4
Electives			X		7
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			
	Total Credits				**15**
	Program Total Credits:				**120**