

Computer Science (BS): Cybersecurity Concentration

Program Overview

The Department of Computer Science in the College of Engineering at NC State University offers a Bachelor of Science in Computer Science degree. The program is accredited by the Computing Accreditation Commission of ABET, <https://www.abet.org>.

Students complete the standard set of engineering first-year courses, which include courses in the humanities, chemistry, mathematics, physics, and computing. Students may apply to join the Department of Computer Science as degree-seeking students via the CODA process (<https://www.engr.ncsu.edu/academics/undergrad/coda/>).

The Computer Science curriculum teaches students the skills needed to specify, design, implement, test, and deploy computer and software systems. Core courses provide a foundation for all students in programming languages, data structures, software engineering, systems, the theory of computation, the basics of building secure software and systems, teaming and communication, and the social and ethical dimensions of the practice of computer science.

All Computer Science majors must complete a team project in Senior Design. Projects under the auspices of the department's Senior Design Center (<https://sdc.csc.ncsu.edu>) may have industrial sponsors, so student teams gain experience working jointly with industry representatives to achieve project goals. Senior Design teams are expected to solve a technical computing problem while effectively communicating their work and process to various audiences.

Cybersecurity Concentration

Securing cyberspace is one of the 14 Grand Challenges for Engineering in the 21st Century (<http://www.engineeringchallenges.org/challenges.aspx>). We rely on software systems for everything from utilities, banking, and entertainment to business, travel, and health care. However, these systems are vulnerable to attack, which could have a significant impact on our society. Cybersecurity professionals are in high demand to protect the security and privacy of software systems for government and industry.

The Cybersecurity Concentration provides students with the opportunity to analyze security risks, define a threat landscape, and defend against threats from adversaries in software, networks, and systems. Students complete 21 hours of cybersecurity-focused coursework beyond the computer science core. Concentration students complete a concentration capstone project where they will explore cybersecurity solutions as part of an industrially sponsored project.

Students in the Cybersecurity Concentration are eligible to apply for the CyberCorps(R) Scholarship for Service program (<https://sci.ncsu.edu/sfs/>) with the Department of Computer Science.

Departmental Information

The Department of Computer Science is located in Engineering Building II on NC State's Centennial Campus.

Department of Computer Science

Contact Computer Science Academic Advising

Plan Requirements

Code	Title	Hours
Major Field of Study Requirements		
Math		
MA 141	Calculus I ^{1,2}	4
MA 241	Calculus II ^{1,2}	4
MA 242	Calculus III	4
MA 305	Introductory Linear Algebra and Matrices	3
ST 370	Probability and Statistics for Engineers	3
Sciences		
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory ^{1,2}	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ^{1,2}	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
Basic Science Elective (p. 2)		3
CSC Major		
CSC 116	Introduction to Computing - Java ²	3
CSC 216 & CSC 217	Software Development Fundamentals and Software Development Fundamentals Lab ²	4
CSC 226	Discrete Mathematics ²	3
CSC 230	C and Software Tools	3
CSC 246	Concepts and Facilities of Operating Systems for Computer Scientists	3
CSC 316	Data Structures and Algorithms	3
CSC 326	Software Engineering	4
CSC 333	Automata, Grammars, and Computability	3
CSC 379	Ethics in Computing	1
CSC 492	Senior Design Project	3
Other Major		
CSC Restricted Electives (p. 2)		3
Other Restricted Electives - Group B (p. 3)		3
ENG 331	Communication for Engineering and Technology	3
Concentration Courses/Groups/Electives		
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3
CSC 405	Computer Security ²	3
CSC 471	Modern Topics in Cybersecurity ²	3
CSC 472	Cybersecurity Practicum ²	3
CSC 474	Network Security ²	3
CSC Cybersecurity Restricted Elective ²		3
CSC 414	Foundations of Cryptography	
CSC 415	Software Security	
CSC 433	Privacy in the Digital Age	
Cybersecurity Topics		3
CSC 297	Cybersecurity Topics ²	
College Requirements		

Orientation Course(s):	4
E 101 Introduction to Engineering & Problem Solving ^{1,3}	
E 102 Engineering in the 21st Century ³	
E 115 Introduction to Computing Environments ¹	
Other:	3
EC 205 Fundamentals of Economics or EC 201 Principles of Microeconomics or ARE 201 Introduction to Agricultural & Resource Economics	
General Education Program Requirements	
ENG 101 ^{1,3}	4
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	6
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3
GEP Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2
GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)	
GEP Foundations of American Democracy (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-fad/) (verify requirement)	
World Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/) (verify requirement)	
Total Hours	121

¹ College of Engineering CODA classes.² A grade of C or higher is required.³ A grade of C- or higher is required.

Basic Science Electives

Code	Title	Hours
BIO ***		
CH 201	Chemistry - A Quantitative Science	3
MEA ***		
PB ***		
PY 123	Stellar and Galactic Astronomy	3
PY 124	Solar System Astronomy	3
PY 328	Stellar and Galactic Astrophysics	3
PY 341	Relativity, Gravitation and Cosmology	3
PY 401	Quantum Physics I	3
PY 402	Quantum Physics II	3
PY 407	Introduction to Modern Physics	3
PY 411	Mechanics I	3
PY 412	Mechanics II	3
PY 413	Thermal Physics	3
PY 414	Electromagnetism I	3

PY 415	Electromagnetism II	3
ZOO ***		

CSC Restricted Electives

Code	Title	Hours
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3
CSC 302 or CSC 580	Introduction to Numerical Methods Numerical Analysis I	3
CSC 342	Applied Web-based Client-Server Computing	3
CSC 401 or CSC 573	Data and Computer Communications Networks Internet Protocols	3
CSC 402	Networking Projects	3
CSC 405	Computer Security	3
CSC 406 or CSC 506	Architecture Of Parallel Computers Architecture Of Parallel Computers	3
CSC 408	Software Product Management	3
CSC 411 or CSC 520	Introduction to Artificial Intelligence Artificial Intelligence I	3
CSC 412 or CSC 512	Compiler Construction Compiler Construction	3
CSC 414 or CSC 514	Foundations of Cryptography Foundations of Cryptography	3
CSC 415 or CSC 515	Software Security Software Security	3
CSC 416	Introduction to Combinatorics	3
CSC 417	Theory of Programming Languages	3
CSC 418	Software Analysis and Design	3
CSC 419 or CSC 519	DevOps: Modern Software Engineering Practices DevOps: Modern Software Engineering Practices	3
CSC 422 or CSC 522	Automated Learning and Data Analysis Automated Learning and Data Analysis	3
CSC 431	File Organization and Processing	3
CSC 433 or CSC 533	Privacy in the Digital Age Privacy in the Digital Age	3
CSC 440 or CSC 540	Database Management Systems Database Management Concepts and Systems	3
CSC 442	Introduction to Data Science	3
CSC 447 or CSC 547	Introduction to Cloud Computing Cloud Computing Technology	3
CSC 450	Web Services	3
CSC 451	Robot Motion Planning	3
CSC 453	Introduction to Internet of Things (IoT) Systems	3
CSC 454 or CSC 554	Human-Computer Interaction Human-Computer Interaction	3
CSC 455 or CSC 555	Social Computing and Decentralized Artificial Intelligence Social Computing and Decentralized Artificial Intelligence	3
CSC 456 or CSC 506	Computer Architecture and Multiprocessors Architecture Of Parallel Computers	3
CSC 461 or CSC 561	Computer Graphics Principles of Computer Graphics	3

CSC 462	Advanced Computer Graphics Projects	3	ACC 330	An Introduction To Income Taxation	3
or CSC 562	Introduction to Game Engine Design		ACC 340	Accounting Information Systems	3
CSC 467	Introduction to Quantum Algorithms	3	ARS 306	Music Composition with Computers	3
CSC 469	Quantum Programming	3	BUS 320	Financial Management	3
CSC 471	Modern Topics in Cybersecurity	3	BUS 340	Information Systems Management	3
CSC 472	Cybersecurity Practicum	3	BUS 360	Marketing Methods	3
CSC 474	Network Security	3	BUS 4**		
or CSC 574	Computer and Network Security		CHE 435	Process Systems Analysis and Control	3
CSC 481	Game Engine Foundations	3	CHE 465	Colloidal and Nanoscale Engineering	3
or CSC 581	Game Engine Foundations		CSC 427	Introduction to Numerical Analysis I	3
CSC 482	Advanced Computer Game Projects	3	CSC 428	Introduction to Numerical Analysis II	3
CSC 484	Building Game AI	3	DSC 405	Data Wrangling and Web Scraping	1
or CSC 584	Building Game AI		DSC 406	Exploratory Data Analysis for Big Data	1
CSC 486	Computational Visual Narrative	3	DSC 410	Data Internship Preparation for Social Impact	1
CSC 490	Independent Study in Computer Science	1-6	DSC 412	Exploring Machine Learning	1
CSC 491	Special Topics in Computer Science	1-6	EC 3**		
CSC 499	Independent Research in Computer Science	1-6	EC 4**		
CSC 501	Operating Systems Principles	3	EC 5**		
CSC 503	Computational Applied Logic	3	ECE 3** (except for ECE 309)		
CSC 505	Design and Analysis Of Algorithms	3	ECE 4**		
CSC 510	Software Engineering	3	ECE 5**		
CSC 517	Object-Oriented Design and Development	3	EED 401	Teaching Undergraduate Engineers	3
CSC 530	Computational Methods for Molecular Biology	3	or EED 501	Teaching Undergraduate Engineers	
CSC 537	Systems Attacks and Defenses	3	EED 411	Societal Foundations for Engineering Education	3
CSC 541	Advanced Data Structures	3	or EED 511	Societal Foundations for Engineering Education	
CSC 542	Neural Networks and Deep Learning	3	EED 414	Ethics for Engineering Education	3
CSC 546	Management Decision and Control Systems	3	or EED 514	Ethics for Engineering Education	
CSC 548	Parallel Systems	3	EED 495	Special Topics in Engineering Education	1-3
CSC 563	Visual Interfaces for Mobile Devices	3	EED 502	Engineering Education : Content, Assessment, and Pedagogy	3
CSC 565	Graph Theory	3	EED 509	Field Experiences in Engineering Education	3
CSC 568	Enterprise Storage Architecture	3	EED 595	Special Topics in Engineering Education	1-3
CSC 570	Computer Networks	3	EMS 480	Teaching Mathematics with Technology	3
CSC 572	Optimizations and Algorithms	3	GC 320	3D Spatial Relations	3
CSC 575	Introduction to Wireless Networking	3	GC 350	Applied CAD/D and Geometric Controls	3
CSC 576	Networking Services: QoS, Signaling, Processes	3	GC 420	Visual Thinking	3
CSC 577	Switched Network Management	3	GN 5**		
CSC 578	LTE and 5G Communications	3	ISE 311	Engineering Economic Analysis	3
CSC 582	Computer Models of Interactive Narrative	3	ISE 361	Deterministic Models in Industrial Engineering	3
CSC 583	Introduction to Parallel Computing	3	ISE 4**		
CSC 591	Special Topics In Computer Science	1-6	ISE 5**		
CSC 595	Cybersecurity Practicum	3	LOG 335	Symbolic Logic	3
ECE 482	Engineering Entrepreneurship Senior Design I	3	LOG 435	Advanced Logic & Metamathematics	3
ECE 483	Engineering Entrepreneurship Senior Design II	3	LOG 535	Advanced Logic and Metamathematics	3
MA 414	Foundations of Cryptography	3	MA 302	Numerical Applications to Differential Equations	1
MA 416	Introduction to Combinatorics	3	MA 341	Applied Differential Equations I	3
ST 442	Introduction to Data Science	3	MA 351	Introduction to Discrete Mathematical Models	3

Other Restricted Electives - Group B

Code	Title	Hours
CSC Restricted Elective Courses		1-6
ACC 310	Intermediate Financial Accounting I	3
ACC 311	Intermediate Financial Accounting II	3

MA 401	Applied Differential Equations II	3
MA 402	Mathematics of Scientific Computing	3
MA 403	Introduction to Modern Algebra	3
MA 405	Introduction to Linear Algebra	3

MA 407	Introduction to Modern Algebra for Mathematics Majors	3
MA 408	Foundations of Euclidean Geometry	3
MA 410	Theory of Numbers	3
MA 412	Long-Term Actuarial Models	3
MA 413	Short-Term Actuarial Models	3
MA 425	Mathematical Analysis I	3
MA 426	Mathematical Analysis II	3
MA 427	Introduction to Numerical Analysis I	3
MA 428	Introduction to Numerical Analysis II	3
MA 430	Mathematical Models in the Physical Sciences	3
MA 432	Mathematical Models in Life Sciences	3
MA 437	Applications of Algebra	3
MA 5**		
MAE 3**		
MAE 4**		
MAE 5**		
MIE 3**		
MIE 4**		
MSE 3**		
MSE 4**		
MSE 5**		
MUS 306	Music Composition with Computers	3
NE 3**		
NE 4**		
NE 5**		
OR 5**		
PHI 425	Introduction to Cognitive Science	3
PSY 307	Industrial and Organizational Psychology	3
PSY 340	Human Factors Psychology	3
PSY 400	Perception	3
PSY 420	Cognitive Processes	3
PSY 425	Introduction to Cognitive Science	3
PY 4**		
PY 5**		
ST 372	Introduction to Statistical Inference and Regression	3
ST 4**		
ST 5**		

Semester Sequence⁴

Freshman Year

Fall Semester		Hours
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory ^{1,2}	4
E 101	Introduction to Engineering & Problem Solving ^{1,3}	1
E 115	Introduction to Computing Environments ¹	1
ENG 101	Academic Writing and Research ^{1,3}	4
MA 141	Calculus I ^{1,2}	4
Hours		14

Spring Semester

CSC 116	Introduction to Computing - Java ²	3
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MA 241	Calculus II ^{1,2}	4
PY 205	Physics for Engineers and Scientists I ^{1,2}	3
PY 206	Physics for Engineers and Scientists I Laboratory ^{1,2}	1
EC 205	Fundamentals of Economics	3
or EC 201	or Principles of Microeconomics	
or ARE 201	or Introduction to Agricultural & Resource Economics	
E 102	Engineering in the 21st Century ^{1,3}	2
Hours		16

Sophomore Year

Fall Semester		
CSC 216 & CSC 217	Software Development Fundamentals and Software Development Fundamentals Lab ²	4
CSC 226	Discrete Mathematics ²	3
CSC 297	Cybersecurity Topics	1
MA 242	Calculus III	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
Hours		16

Spring Semester

CSC 230	C and Software Tools	3
CSC 297	Cybersecurity Topics	1
CSC 316	Data Structures and Algorithms	3
CSC 333	Automata, Grammars, and Computability	3
MA 305	Introductory Linear Algebra and Matrices	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		16

Junior Year

Fall Semester		
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3
CSC 246	Concepts and Facilities of Operating Systems for Computer Scientists	3
CSC 297	Cybersecurity Topics	1
CSC 474	Network Security ²	3
ST 370	Probability and Statistics for Engineers	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		16

Spring Semester

CSC 326	Software Engineering	4
CSC 405	Computer Security ²	3
CSC 379	Ethics in Computing	1
ENG 331	Communication for Engineering and Technology	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
Other Restricted Electives - Group B (p. 3)		3
Hours		15

Senior Year**Fall Semester**

CSC 471	Modern Topics in Cybersecurity	3
CSC 472	Cybersecurity Practicum	3
CSC 414	Foundations of Cryptography ²	3
or CSC 415	or Software Security	
or CSC 433	or Privacy in the Digital Age	
Basic Science Elective (p. 2)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3

Hours	15
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Spring Semester

CSC 492	Senior Design Project	3
CSC Restricted Elective (p. 2)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1

Hours	13
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Total Hours	121
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¹ College of Engineering CODA classes.

² A grade of C or higher is required.

³ A grade of C- or higher is required.

⁴ One of the following two conditions regarding the major GPA is required: (1) the major GPA, which consists of all CSC courses attempted at NCSU, must be 2.0 or higher or (2) a student whose major grade point average is below 2.0 may graduate if no CSC course used to satisfy the major requirements has a grade below a C-.

Career Opportunities

Designing computer systems, and the software that runs on them is the job of computer scientists. Computer scientists find demand for their innovation, design, analysis, testing, and engineering skills across all domains. As a direct consequence of the increasingly critical role of computers in society, the discipline of computer science has enjoyed rapid growth for many years, with the trend likely to continue.

Employment projections indicate a critical nationwide shortfall in the supply of people skilled in computing and information technology, and a resulting steady rise in demand and salaries, for decades to come. Computer Science graduates from NC State are in high demand, including by employers that are extremely selective in their national recruiting. The Cybersecurity concentration prepares students to defend our critical cyber infrastructure.

Anchoring one corner of the world-famous Research Triangle Park, and located in modern state-of-the-art teaching and research facilities on NC State's Centennial Campus, the department and its students and faculty benefit from strong and active industry partnerships. NC State Computer Science is one of the top suppliers in the nation of new graduate hires to a number of high-tech companies, including several Fortune 500 companies, some with a substantial presence in the Research Triangle. Starting salaries for our undergraduates now average over \$75,000 and

show a steady increase. Opportunities are also plentiful for graduate study for those who wish to pursue the field in more depth.

Career Titles

- Architectural Drafters
- Business Intelligence Analysts
- Clinical Data Managers
- Computer and Information Scientists
- Computer and Information Systems Managers
- Computer Hardware Engineers
- Computer Network Architects
- Computer Programmer
- Computer Science Professor
- Computer Systems Analyst
- Computer Systems Engineer
- Computer User Support Specialist
- Data Warehousing Specialists
- Database Administrator
- Information Security Analysts
- Information Technology Project Managers
- IT Administrator (Information Technology)
- Mathematician
- Project Management Specialists
- Robotics Engineers
- Scientific Linguist
- Software Developer
- Software Engineer
- Technical & Scientific Publications Editor
- Technical Publications Writer
- Video Game Designer
- Web Art Director
- Webmaster

Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)

This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an

account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

Professional Organizations & Societies

- Associate for Computing Machinery (<https://www.acm.org/>) (ACM)
- Association of Information Technology Professionals (<http://www.aitp.org/>) (AITP)
- Institute of Electrical and Electronics Engineers (IEEE) Computer Society
- National Association of Professional Engineers (<https://www.nspe.org/>) (NSPE)