Computer Science (BS): Artificial Intelligence 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 understand, design, implement, test, and deploy computer systems and software systems. Core courses provide a foundation for all students in programming languages, data structures, software engineering, computer architectures, 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 Cente (https://sdc.csc.ncsu.edu)r 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.

Artificial Intelligence Concentration

The AI concentration supports the overall goals of the National Artificial Intelligence Initiative, which seeks to advance American development of AI applications, management, and other areas. It supports the Engineering Grand Challenges (http://www.engineeringchallenges.org/challenges.aspx) of Advance Personalized Learning, Enhance Virtual Reality, Reverse-Engineer the Brain, and Engineer the Tools of Scientific Discovery.

The Artificial Intelligence (AI) Concentration provides the student with the opportunity to develop intelligent and autonomous systems in multiple domains, apply machine learning and data mining to address real-world problems, and incorporate intelligent behavior into computing platforms. Students complete 21 credit hours of focused work on AI topics.

Departmental Information

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

Department of Computer Science website (https://www.csc.ncsu.edu/)

Contact Computer Science Academic Advising (https://www.csc.ncsu.edu/academics/undergrad/advising/)

Plan Requirements

Code	Title	Hours	Counts towards
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. 3)		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. 4)		3
Other Restricted Electives - Group B (p. 5)		3
ENG 331	Communication for Engineering and Technology	3
Concentration Courses/Groups/ Electives		
CSC 411	Introduction to Artificial Intelligence [2]	3
CSC 422	Automated Learning and Data Analysis [2]	3
CSC AI Restricted Electives (p. 3) [2]		6
AI Restricted Electives (p. 2)		9
College Requirements		
Orientation Course(s):		4
E 101	Introduction to Engineering & Problem Solving [1,3]	
E 102	Engineering in the 21st Century [2]	
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)		
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.

AI Restricted Electives

Code	Title	Hours	Counts towards
BUS 351	Introduction to Business Analytics	3	
BUS 428	Financial Analytics	3	
BUS 429	Financial Modeling	3	
BUS 470	Operations Modeling and Analysis	3	
BUS 476	Decision Modeling and Analysis	3	
CSC 427	Introduction to Numerical Analysis I	3	
CSC 428	Introduction to Numerical Analysis II	3	
DSC 495	Special Topics in Data Science	1-3	
EC 351	Econometrics I	3	

EC 451	Econometrics II	3
ISE 361	Deterministic Models in Industrial Engineering	3
ISE 362	Stochastic Models in Industrial Engineering	3
ISE 417	Database Applications in Industrial & Systems Engineering	3
ISE 437	Data Analytics for Industrial Engineering	3
ISE 441	Introduction to Simulation	3
ISE 447	Applications of Data Science in Healthcare	3
MA 341	Applied Differential Equations I	3
MA 351	Introduction to Discrete Mathematical Models	3
MA 401	Applied Differential Equations II	3
MA 402	Mathematics of Scientific Computing	3
MA 421	Introduction to Probability	3
MA 430	Mathematical Models in the Physical Sciences	3
MA 432	Mathematical Models in Life Sciences	3
ST 307	Introduction to Statistical Programming-SAS	1
ST 372	Introduction to Statistical Inference and Regression	3
ST 430	Introduction to Regression Analysis	3
ST 431	Introduction to Experimental Design	3
ST 432	Introduction to Survey Sampling	3
ST 437	Applied Multivariate and Longitudinal Data Analysis	3
ST 440	Applied Bayesian Analysis	3
ST 445	Introduction to Statistical Computing and Data Management	3

Basic Science Elective

Code	Title	Hours	Counts towards
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 AI Restricted Electives[2]

Code	Title	Hours	Counts towards
CSC 440	Database Management Systems	3	
CSC 442	Introduction to Data Science	3	

CSC 455	Social Computing and Decentralized Artificial Intelligence	3
CSC 484	Building Game AI	3

CSC Restricted Electives

Code	Title	Hours	Counts towards
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3	
CSC 302	Introduction to Numerical Methods	3	
CSC 342	Applied Web-based Client-Server Computing	3	
CSC 401	Data and Computer Communications Networks	3	
CSC 402	Networking Projects	3	
CSC 405	Computer Security	3	
CSC 406	Architecture Of Parallel Computers	3	
CSC 411	Introduction to Artificial Intelligence	3	
CSC 412	Compiler Construction	3	
CSC 414	Foundations of Cryptography	3	
CSC 415	Software Security	3	
CSC 416	Introduction to Combinatorics	3	
CSC 417	Theory of Programming Languages	3	
CSC 419	DevOps: Modern Software Engineering Practices	3	
CSC 422	Automated Learning and Data Analysis	3	
CSC 431	File Organization and Processing	3	
CSC 433	Privacy in the Digital Age	3	
CSC 440	Database Management Systems	3	
CSC 442	Introduction to Data Science	3	
CSC 447	Introduction to Cloud Computing	3	
CSC 450	Web Services	3	
CSC 453	Introduction to Internet of Things (IoT) Systems	3	
CSC 454	Human-Computer Interaction	3	
CSC 455	Social Computing and Decentralized Artificial Intelligence	3	
CSC 456	Computer Architecture and Multiprocessors	3	
CSC 461	Computer Graphics	3	
CSC 462	Advanced Computer Graphics Projects	3	
CSC 467	Multimedia Technology	3	
CSC 471	Modern Topics in Cybersecurity	3	
CSC 472	Cybersecurity Projects	3	
CSC 474	Network Security	3	
CSC 481	Game Engine Foundations	3	
CSC 482	Advanced Computer Game Projects	3	
CSC 484	Building Game AI	3	
CSC 486	Computational Visual Narrative	3	
CSC 495	Special Topics in Computer Science	1-6	
CSC 498	Independent Study in Computer Science	3	
CSC 499	Independent Research in Computer Science	1-6	
CSC 5**			
ECE 482	Engineering Entrepreneurship and New Product Development I	3	

ECE 483	Engineering Entrepreneurship and New Product Development II	3
MA 414	Foundations of Cryptography	3
MA 416	Introduction to Combinatorics	3
ST 442	Introduction to Data Science	3

Other Restricted Elective - Group B

Code	Title	Hours	Counts towards
CSC Restricted Elective Courses		1-6	
ACC 310	Intermediate Financial Accounting I	3	
ACC 311	Intermediate Financial Accounting II	3	
ACC 330	An Introduction To Income Taxation	3	
ACC 340	Accounting Information Systems	3	
ARS 306	Music Composition with Computers	3	
BUS 320	Financial Management	3	
BUS 340	Information Systems Management	3	
BUS 360	Marketing Methods	3	
BUS 4**			
CHE 435	Process Systems Analysis and Control	3	
CHE 465	Colloidal and Nanoscale Engineering	3	
CSC 427	Introduction to Numerical Analysis I	3	
CSC 428	Introduction to Numerical Analysis II	3	
EC 3**			
EC 4**			
EC 5**			
ECE 3** (except for ECE 309)			
ECE 4**			
ECE 5**			
EMS 480	Teaching Mathematics with Technology	3	
GC 320	3D Spatial Relations	3	
GC 350	Applied CAD/D and Geometric Controls	3	
GC 420	Visual Thinking	3	
GN 5**			
ISE 311	Engineering Economic Analysis	3	
ISE 361	Deterministic Models in Industrial Engineering	3	
ISE 4**			
ISE 5**			
LOG 335	Symbolic Logic	3	
LOG 435	Advanced Logic & Metamathematics	3	
LOG 535	Advanced Logic and Metamathematics	3	
MA 302	Numerical Applications to Differential Equations	1	
MA 341	Applied Differential Equations I	3	
MA 351	Introduction to Discrete Mathematical Models	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 Sequence[4]

First 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
MA 241	Calculus II [1, 2]	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory [1, 2]	4
E 102	Engineering in the 21st Century [1, 2]	2
EC 205 or EC 201 or ARE 201	Fundamentals of Economics or Principles of Microeconomics or Introduction to Agricultural & Resource Economics	3
	Hours	**16**
Second Year		
Fall Semester		
CSC 216 & CSC 217	Software Development Fundamentals and Software Development Fundamentals Lab [2]	4
CSC 226	Discrete Mathematics [2]	3
MA 242	Calculus III	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
	Hours	**16**
Spring Semester		
CSC 230	C and Software Tools	3
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	**15**

Third Year		
Fall Semester		
CSC 246	Concepts and Facilities of Operating Systems for Computer Scientists	3
CSC 411	Introduction to Artificial Intelligence [2]	3
ST 370	Probability and Statistics for Engineers	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
AI Restricted Electives (p. 2)		3
	Hours	**15**
Spring Semester		
CSC 326	Software Engineering	4
CSC 379	Ethics in Computing	1
CSC 422	Automated Learning and Data Analysis [2]	3
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. 5)		3
	Hours	**15**
Fourth Year		
Fall Semester		
CSC AI Restricted Elective (p. 3) [2]		3
CSC Restricted Elective (p. 4)		3
AI Restricted Elective (p. 2)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Basic Science Elective (p. 3)		3
	Hours	**15**
Spring Semester		
CSC 492	Senior Design Project	3
CSC AI Restricted Elective (p. 3) [2]		3
AI 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
	Hours	**15**
	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.
[4] One of the following two conditions regarding the major GPA is required: (l) 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

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 Developers - Applications
- 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.

Association of Information Technology Professionals (http://www.aitp.org/)
National Association of Professional Engineers (https://www.nspe.org/)