Computer Science (BS): Game Development 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.

Game Development Concentration

Computer games are some of the most complex software development projects and employ some of the most advanced technologies of any application area of computer science. The entertainment software sector is a multi-billion dollar industry with increasing demand for new employees trained in these technologies and methods. In addition to the more familiar entertainment sector, these technologies also have applications to such areas as training, education, visualization, and social interaction forums — so-called "serious games." North Carolina is now among the top tier of US states with centers of game industry employment. As the game industry continues to grow, demand by North Carolina companies for new graduates with a strong background in computer science with a focus on game development will also expand.

Many aspects of computer game development are unique to the game industry and the Game Development Concentration provides specialized coursework in these areas. The Game Development Concentration focuses on game development technologies while preserving the breadth and depth of the general computer science BS degree. The concentration requires that students take 21 hours of games-focused courses. Of the nine credit hours required for other electives, students in the concentration must select three courses from a list that spans topics such as fiction writing, film, and music. These courses provide grounding in the creation of conventional media and provide the background in these disciplines needed to participate in the multidisciplinary aspects of the design of games. Finally, students must complete a games-focused semester-long project either through Senior Design or an independent study/research project.

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. 3)		3
Other Restricted Electives - Group B (p. 2)		3
ENG 331	Communication for Engineering and Technology	3
Concentration Courses/Groups/Electives		
CSC 481	Game Engine Foundations [2]	3
CSC Games Core (p. 2) [2]		3
CSC Games Restricted Electives (p. 2) [2]		6
Games Restricted Electives (p. 2)		9
Games Project (verify requirement) [4]		
College Requirements		
E 101	Introduction to Engineering & Problem Solving [1,3]	1

E 102	Engineering in the 21st Century [3]	2
E 115	Introduction to Computing Environments [1]	1
EC 205	Fundamentals of Economics	3
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.
4 Students must complete a departmentally approved Games-focused project as part of CSC 492, CSC 490, or CSC 499.

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 Games Core

Code	Title	Hours
CSC 461	Computer Graphics	3
CSC 486	Computational Visual Narrative	3

CSC Games Restricted Electives

Code	Title	Hours
CSC 411	Introduction to Artificial Intelligence	3
CSC 454	Human-Computer Interaction	3
CSC 461	Computer Graphics	3
CSC 462	Advanced Computer Graphics Projects	3
CSC 48*		3
CSC 582	Computer Models of Interactive Narrative	3
CSC 584	Building Game AI	3

Games Restricted Electives

Code	Title	Hours
CSC 281	Foundations of Interactive Game Design	3
COM 327	Critical Analysis of Communication Media	3
COM 427	Game Studies	3
ENG 282	Introduction to Film	3
ENG 288	Fiction Writing	3
ENG 376	Science Fiction	3
ENG 377	Fantasy	3
ENG 492	Special Topics in Film and Media Studies	3
MUS 306	Music Composition with Computers	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
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
DSC 405	Data Wrangling and Web Scraping	1
DSC 406	Exploratory Data Analysis for Big Data	1
DSC 410	Data Internship Preparation for Social Impact	1
DSC 412	Exploring Machine Learning	1
EC 3**		
EC 4**		
EC 5**		
ECE 3** (except for ECE 309)		

ECE 4**		
ECE 5**		
EED 401	Teaching Undergraduate Engineers	3
or EED 501	Teaching Undergraduate Engineers	
EED 411	Societal Foundations for Engineering Education	3
or EED 511	Societal Foundations for Engineering Education	
EED 414	Ethics for Engineering Education	3
or EED 514	Ethics for Engineering Education	
EED 495	Special Topics in Engineering Education	1-3
EED 502	Engineering Education : Content, Assessment, and Pedagogy	3
EED 509	Field Experiences in Engineering Education	3
EED 595	Special Topics in Engineering Education	1-3
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**		

CSC Restricted Electives

Code	Title	Hours
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3
CSC 302	Introduction to Numerical Methods	3
or CSC 580	Numerical Analysis I	
CSC 342	Applied Web-based Client-Server Computing	3
CSC 401	Data and Computer Communications Networks	3
or CSC 573	Internet Protocols	
CSC 402	Networking Projects	3
CSC 405	Computer Security	3
CSC 406	Architecture Of Parallel Computers	3
or CSC 506	Architecture Of Parallel Computers	
CSC 408	Software Product Management	3
CSC 411	Introduction to Artificial Intelligence	3
or CSC 520	Artificial Intelligence I	
CSC 412	Compiler Construction	3
or CSC 512	Compiler Construction	
CSC 414	Foundations of Cryptography	3
or CSC 514	Foundations of Cryptography	
CSC 415	Software Security	3
or CSC 515	Software Security	
CSC 416	Introduction to Combinatorics	3
CSC 417	Theory of Programming Languages	3
CSC 418	Software Analysis and Design	3
CSC 419	DevOps: Modern Software Engineering Practices	3
or CSC 519	DevOps: Modern Software Engineering Practices	
CSC 422	Automated Learning and Data Analysis	3
or CSC 522	Automated Learning and Data Analysis	
CSC 431	File Organization and Processing	3
CSC 433	Privacy in the Digital Age	3
or CSC 533	Privacy in the Digital Age	

CSC 440	Database Management Systems	3
or CSC 540	Database Management Concepts and Systems	
CSC 442	Introduction to Data Science	3
CSC 447	Introduction to Cloud Computing	3
or CSC 547	Cloud Computing Technology	
CSC 450	Web Services	3
CSC 451	Robot Motion Planning	3
CSC 453	Introduction to Internet of Things (IoT) Systems	3
CSC 454	Human-Computer Interaction	3
or CSC 554	Human-Computer Interaction	
CSC 455	Social Computing and Decentralized Artificial Intelligence	3
or CSC 555	Social Computing and Decentralized Artificial Intelligence	
CSC 456	Computer Architecture and Multiprocessors	3
or CSC 506	Architecture Of Parallel Computers	
CSC 461	Computer Graphics	3
or CSC 561	Principles of Computer Graphics	
CSC 462	Advanced Computer Graphics Projects	3
or CSC 562	Introduction to Game Engine Design	
CSC 467	Introduction to Quantum Algorithms	3
CSC 469	Quantum Programming	3
CSC 471	Modern Topics in Cybersecurity	3
CSC 472	Cybersecurity Practicum	3
CSC 474	Network Security	3
or CSC 574	Computer and Network Security	
CSC 481	Game Engine Foundations	3
or CSC 581	Game Engine Foundations	
CSC 482	Advanced Computer Game Projects	3
CSC 484	Building Game AI	3
or CSC 584	Building Game AI	
CSC 486	Computational Visual Narrative	3
CSC 490	Independent Study in Computer Science	1-6
CSC 491	Special Topics in Computer Science	1-6
CSC 499	Independent Research in Computer Science	1-6
CSC 501	Operating Systems Principles	3
CSC 503	Computational Applied Logic	3
CSC 505	Design and Analysis Of Algorithms	3
CSC 510	Software Engineering	3
CSC 517	Object-Oriented Design and Development	3
CSC 530	Computational Methods for Molecular Biology	3
CSC 537	Systems Attacks and Defenses	3
CSC 541	Advanced Data Structures	3
CSC 542	Neural Networks and Deep Learning	3
CSC 546	Management Decision and Control Systems	3
CSC 548	Parallel Systems	3
CSC 563	Visual Interfaces for Mobile Devices	3
CSC 565	Graph Theory	3
CSC 568	Enterprise Storage Architecture	3
CSC 570	Computer Networks	3
CSC 572	Optimizations and Algorithms	3
CSC 575	Introduction to Wireless Networking	3
CSC 576	Networking Services: QoS, Signaling, Processes	3
CSC 577	Switched Network Management	3
CSC 578	LTE and 5G Communications	3
CSC 582	Computer Models of Interactive Narrative	3
CSC 583	Introduction to Parallel Computing	3
CSC 591	Special Topics In Computer Science	1-6
CSC 595	Cybersecurity Practicum	3
ECE 482	Engineering Entrepreneurship Senior Design I	3
ECE 483	Engineering Entrepreneurship Senior Design II	3
MA 414	Foundations of Cryptography	3
MA 416	Introduction to Combinatorics	3
ST 442	Introduction to Data Science	3

Semester Sequence

This is a sample.

Semester Sequence[4, 5]

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, 3]	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 481	Game Engine Foundations [2]	3
ST 370	Probability and Statistics for Engineers	3
Games Restricted Elective (p. 2)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
Spring Semester		
CSC 326	Software Engineering	4
CSC 379	Ethics in Computing	1
CSC Games Core (p. 2) [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 Elective - Group B (p. 2)		3
	Hours	**15**
Fourth Year		
Fall Semester		
CSC 492	Senior Design Project [7]	3
CSC Games Restricted Elective (p. 2) [2]		3
Games Restricted Elective (p. 2)		3
Basic Science Elective (p. 2) [3]		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
Spring Semester		
CSC Restricted Elective (p. 3)		3
CSC Games Restricted Elective (p. 2) [2]		3
Games 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-.

5 Students must complete a departmentally approved Games-focused project as part of CSC 492, CSC 498, or CSC 499.

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. Games concentration students are prepared to design and develop the games of the future.

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)