

COMPUTER SCIENCE (BS)

Bachelor of Science

The Computer Science major requires a total of 120 credits.

Course	Title	Credits
Required Computer Science and Engineering (CSE) Courses		
CSE 1010	Introduction to Computing for Engineers	3
CSE 2050	Data Structures and Object-Oriented Design	3
CSE 2500	Introduction to Discrete Systems	3
CSE 3000	Contemporary Issues in Computer Science and Engineering	1
CSE 3100	Systems Programming	3
CSE 3140	Cybersecurity Lab	2
CSE 3150 or CSE 3160	C++ Essentials Functional Programming Fundamentals	3
CSE 3500	Algorithms and Complexity	3
CSE 3666	Introduction to Computer Architecture	3
CSE 4939W	Computer Science and Engineering Design Project I	3
CSE 4940	Computer Science and Engineering Design Project II	3

Concentrations

Computer Science majors may complete one of the following concentrations.¹

Algorithms and Theory (p. 2)

Artificial Intelligence (p. 3)

Bioinformatics (p. 2)

Cybersecurity (p. 2)

Naval Science and Technology (p. 3)

Software Design and Development (p. 2)

Software Design for Mobile Computing (p. 3)

Systems and Networks (p. 2)

Additional Required Courses

MATH 2110Q	Multivariable Calculus	4
MATH 2210Q	Applied Linear Algebra	3

Select one of the following: 3

MATH 3160 Probability

STAT 3025Q Statistical Methods

STAT 3345Q Probability Models for Engineers

STAT 3375Q Introduction to Mathematical Statistics I

Additional Laboratory Course Sequence

Select one two-semester laboratory course sequence from either: 8

Chemistry

CHEM 1127Q & CHEM 1128Q General Chemistry I and General Chemistry II

CHEM 1137Q & CHEM 1138Q Enhanced General Chemistry I and Enhanced General Chemistry II

CHEM 1147Q & CHEM 1148Q Honors General Chemistry I and Honors General Chemistry II

Physics

PHYS 1401Q & PHYS 1402Q General Physics with Calculus I and General Physics with Calculus II

PHYS 1501Q & PHYS 1502Q Physics for Engineers I and Physics for Engineers II

PHYS 1601Q & PHYS 1602Q Fundamentals of Physics I and Fundamentals of Physics II

Additional Science Course

Select one additional science course from the following list (but not in the same department as the two semester sequence): 4

BIOL 1107 Principles of Biology I

or BIOL 1108 Principles of Biology II

or BIOL 1110 Introduction to Botany

CHEM 1127Q or CHEM 1128Q General Chemistry I
General Chemistry II

PHYS 1401Q General Physics with Calculus I

or PHYS 1402Q General Physics with Calculus II

or PHYS 1502Q Physics for Engineers II

or PHYS 1601Q Fundamentals of Physics I

or PHYS 1602Q Fundamentals of Physics II

ERTH 1050 Earth's Dynamic Environment

or EARTH 1051 Earth's Dynamic Environment (Lecture)

or EARTH 1052 Earth's Dynamic Environment (Laboratory)

Additional CSE Courses and Electives

Additional CSE courses as required to reach 43 credits in CSE courses

Elective courses to reach a minimum of 120 credits

¹ Each concentration specifies a required course and a set of elective courses. To complete a concentration, students must have a C or better grade from the required course and earn additional nine credits from the elective courses in the concentration.

Students who do not select a concentration must have 12 credits from 3000+ level CSE courses beyond the required CSE courses, excluding CSE 4997 Senior Thesis in Computer Science and Engineering.

Students can include at most three credits of CSE 4099 Independent Study in Computer Science and Engineering towards the 12-credit requirement.

The Computer Science program combines a rigorous education in computer science with added coursework in an area outside of computing, in the sciences, business or humanities. With a background that combines computer science and a non-computing discipline, our graduates have the breadth of understanding to apply computer science to other disciplines, which is particularly valuable as computing has become a key aspect of nearly all endeavors.

The Computer Science undergraduate program educational objectives are that our alumni/ae: practice and grow as computing professionals, conducting research and/or leading, designing, developing or maintaining projects in various technical areas of computer science; utilize knowledge and skills in Computer Science effectively for improving the society; and use new technical advancements of Computer Science to produce tangible contributions in the profession.

The Computer Science program is accredited by the Computing Accreditation Commission of ABET (<https://www.abet.org/>), under the commission's General Criteria and Program Criteria for Computer Science and Similarly Named Computing Programs.

Concentrations

Algorithms and Theory

Course	Title	Credits
CSE 3502	Theory of Computation	3
or CSE 5503	Theory of Computation	
Select three of the following:		9
CSE 3802	Numerical Methods in Scientific Computation	
CSE 4100	Programming Language Translation	
CSE 4412	Introduction to Quantum Computing, Cryptography, and Networking	
CSE 4502	Big Data Analytics	
or CSE 5717	Big Data Analytics	
CSE 4702	Introduction to Modern Cryptography	
CSE 4820	Introduction to Machine Learning	
or CSE 5819	Introduction to Machine Learning	
CSE 5500	Algorithms	
CSE 5512	Introduction to Quantum Computing	
CSE 5820	Reinforcement Learning	
CSE 5854	Modern Cryptography: Primitives and Protocols	
CSE 6512	Randomization in Computing	
Total Credits		12

Systems and Networks

Course	Title	Credits
CSE 3000	Contemporary Issues in Computer Science and Engineering	3
or CSE 5299	Computer Networks and Data Communication	
Select three of the following:		9
CSE 3250	Introduction to Cloud Computing	
CSE 3400	Introduction to Cryptography and Cybersecurity	
or CSE 5850	Introduction to Cyber-Security	
CSE 4300	Operating Systems	
or CSE 5305	Operating Systems	
CSE 4302	Computer Organization and Architecture	
or CSE 5302	Computer Architecture	
CSE 4412	Introduction to Quantum Computing, Cryptography, and Networking	
CSE 4709	Networked Embedded Systems	
or CSE 5309	Networked Embedded Systems	
CSE 5300	Advanced Computer Networks	
CSE 5312	Architecture of Internet of Things	
Total Credits		12

Cybersecurity

Course	Title	Credits
CSE 3400	Introduction to Cryptography and Cybersecurity	3
or CSE 5850	Introduction to Cyber-Security	
Select three of the following:		9

CSE 3300	Computer Networks and Data Communication	
or CSE 5299	Computer Networks and Data Communication	
or CSE 3502	Theory of Computation	
or CSE 5503	Theory of Computation	
or CSE 4300	Operating Systems	
or CSE 5305	Operating Systems	
CSE 3550	Blockchain Technology	
CSE 4400	Computer Security	
or CSE 5400	Computer Security	
CSE 4402	Network Security	
or CSE 5402	Network Security	
CSE 4412	Introduction to Quantum Computing, Cryptography, and Networking	
or CSE 5512	Introduction to Quantum Computing	
CSE 4702	Introduction to Modern Cryptography	
or CSE 5852	Modern Cryptography: Foundations	
CSE 5854	Modern Cryptography: Primitives and Protocols	
CSE 5910	Information Ecosystem Threats	
Total Credits		12

Bioinformatics

Course	Title	Credits
CSE 3800	Bioinformatics	3
or CSE 5800	Bioinformatics	
Select three of the following:		9
CSE 3810	Computational Genomics	
or CSE 6800	Computational Genomics	
CSE 4502	Big Data Analytics	
or CSE 5717	Big Data Analytics	
CSE 4820	Introduction to Machine Learning	
or CSE 5819	Introduction to Machine Learning	
CSE 4830	Computer Vision and Machine Learning for Image Analysis	
CSE 5810	Introduction to Biomedical Informatics	
CSE 5820	Reinforcement Learning	
CSE 5825	Bayesian Machine Learning	
CSE 5830	Probabilistic Graphical Models	
CSE 5840	String Algorithms and Applications in Bioinformatics	
CSE 5860	Computational Problems in Evolutionary Genomics	
Total Credits		12

Software Design and Development

Course	Title	Credits
CSE 2102	Introduction to Software Engineering	3
Select three of the following:		9
CSE 3150	C++ Essentials ¹	
or CSE 3160	Functional Programming Fundamentals	
CSE 3200	Mobile Application Development	
CSE 3250	Introduction to Cloud Computing	

CSE 4100	Programming Language Translation
CSE 4102	Programming Languages
or CSE 5102	Advanced Programming Languages
CSE 4300	Operating Systems
or CSE 4701	Principles of Databases
or CSE 5305	Operating Systems
CSE 5095	Special Topics in Computer Science and Engineering (as Social Media Mining and Analysis)
CSE 5103	Performance Engineering
Total Credits	12

¹ That was not used to meet core requirements.

Software Design for Mobile Computing

Course	Title	Credits
CSE 3200	Mobile Application Development	
Select three of the following:		9
CSE 2102	Introduction to Software Engineering	
CSE 3150	C++ Essentials ¹	
or CSE 3160	Functional Programming Fundamentals	
CSE 3250	Introduction to Cloud Computing	
CSE 3300	Computer Networks and Data Communication	
or CSE 5299	Computer Networks and Data Communication	
CSE 3400	Introduction to Cryptography and Cybersecurity	
or CSE 5850	Introduction to Cyber-Security	
CSE 4502	Big Data Analytics	
or CSE 5717	Big Data Analytics	
CSE 4701	Principles of Databases	
CSE 4705	Artificial Intelligence	
CSE 4820	Introduction to Machine Learning	
or CSE 5819	Introduction to Machine Learning	
Total Credits		9

¹ That was not used to meet core requirements.

Artificial Intelligence

Course	Title	Credits
CSE 4820	Introduction to Machine Learning	3
or CSE 5819	Introduction to Machine Learning	
Select three of the following:		9
CSE 4502	Big Data Analytics	
or CSE 5717	Big Data Analytics	
CSE 5520	Data Visualization and Communication	
or BADM 3302	Data Visualization	
CSE 4701	Principles of Databases	
CSE 4705	Artificial Intelligence	
CSE 4830	Computer Vision and Machine Learning for Image Analysis	

CSE 5095	Special Topics in Computer Science and Engineering (as Social Media Mining and Analysis)
CSE 5820	Reinforcement Learning
CSE 5825	Bayesian Machine Learning
or CSE 5830	Probabilistic Graphical Models
or CSE 5835	Machine Learning for Physical Sciences and Systems
CSE 5707	Discrete Optimization
or BADM 3301	Spreadsheet Modeling for Business Analysis
CSE 5713	Data Mining
CSE 5910	Information Ecosystem Threats
Total Credits	12

Naval Science and Technology

The concentration in Naval Science and Technology is designed to expose students to engineering concepts and topics of importance to the Navy and industries that support naval science and technology. It is focused on facilitating interactions between students and naval professionals as well as hands-on and experiential activities related to senior design projects or independent study projects that have naval science and technology connections.

All Computer Science majors must also complete nine credits of Naval Science and Technology Coursework topics, distributed as follows:

Course	Title	Credits
ENGR 3109	Navy STEM Professional Development Seminar (at least three credits)	3
Select two of the following: ¹		6
CSE 4095	Special Topics in Computer Science and Engineering	
CSE 4099	Independent Study in Computer Science and Engineering	
CSE 4939W	Computer Science and Engineering Design Project I	
CSE 4940	Computer Science and Engineering Design Project II	
Total Credits		9

¹ With at least one course outside the senior design sequence.

Students electing to complete the concentration must do so in their primary major, and as such select elective coursework from their primary discipline. Students electing to use their Senior Design course sequence must have their project topic approved by both their departmental senior design coordinator and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education.

Students electing to use Special Topics courses or Independent Study/Research courses must have the course or research topic approved by both their department and either the director of the Navy STEM Program or the Associate Dean for Undergraduate Education. Other courses relevant to naval science and technology may be considered for the concentration by petition to the director of the Navy STEM Program or the Associate Dean of Undergraduate Education. Students may not apply courses used in this concentration to fulfill requirements for other

concentrations or minors. The concentration in Naval Science and Technology is restricted to U.S. citizens.