Computer Science & Engineering
SCHOOL OF ENGINEERING

THREE UNDERGRADUATE MAJORS

**COMPUTER SCIENCE**
BS, 120 credits

**COMPUTER SCIENCE & ENGINEERING**
BSE, 126 credits

**COMPUTER ENGINEERING**
BSE, 126 credits

NINE CONCENTRATIONS
Theory and Algorithms
Systems and Networks
Cybersecurity
Bioinformatics
Software Design and Development
Computational Data Analytics
Naval Science and Technology
Unspecialized
Individually Designed

The Information Technologies Engineering (ITE) building on the main UConn campus is home to the CS and EE Departments.

The UConn-Stamford branch offers the full 4-year academic program for the Computer Science BS.

VIBRANT STUDENT LIFE
Engineering Learning Communities and over 700 student clubs or organizations.

OUTSTANDING FACULTY!

2020 Median Salary

2020-20 Job Growth

INDUSTRY SPONSORED SENIOR DESIGN PROJECTS
High School Students
Freshman Applicant Profile Sought by the School of Engineering

A freshman applicant to UConn must meet the following requirements:

• Be a graduate of an approved secondary school
• Have completed at least 16 units of work, of which 15 must be college preparatory in nature
• Be in the upper range of their high school class
• Have achieved an appropriate score on the ACT

Applications for freshman admission must include:

• Official high school transcript or official GED
• Official SAT or ACT scores
• Personal essay
• Application fee (non-refundable)

Minimum high school course requirements for the School of Engineering are as follows:

• 4 years of English
• 3 1/2 years of math (Algebra I, Algebra II, and Geometry; Pre-calculus preferred) **4 years is recommended**
• 2 1/2 years of social studies (including 1 year of U.S. History)
• 2 years of a **single** foreign language (3 years **strongly** recommended)
• 2 years of laboratory science
• 2 1/2 years of electives
• High School Chemistry
• High School Physics

Please refer to the current application for admission for more detailed information regarding requirements and application deadlines.

For more specific information regarding admission, please direct your inquiries to:

**The Office of Undergraduate Admissions**
University of Connecticut, 2131 Hillside Road, Unit 3088, Storrs, CT 06269-3088
Phone: (860) 486-3137
Website: [admissions.uconn.edu](http://admissions.uconn.edu)
E-mail: beahusky@uconn.edu
Bachelor Degree Programs

The Computer Science & Engineering Department offers two bachelor degree programs: a BSE in Computer Science & Engineering and a BS in Computer Science. In collaboration with the Electrical & Computer Engineering Department, we also offer a BSE in Computer Engineering. The first year of these programs is virtually identical, allowing students the opportunity to decide which program is right for them. The two BSE degrees continue this similarly throughout the sophomore year as well.

Which Degree to Choose?

The **Computer Science** program produces graduates with a broad understanding of both computing principles and computing practice. The program emphasizes the fundamental computing models through the design and analysis of algorithms and software. The structure of the program includes core courses in fundamental computing areas: functional and object-oriented programming, algorithms and data structures, computer architecture, and systems programming. In addition to taking the core courses, each student also completes a concentration in one of the following areas: theory and algorithms, systems and networks, cybersecurity, bioinformatics, software design and development, computational data analytics, naval science and technology, unspecialized or individually designed. This degree program was first offered in the fall of 1999 and has received accreditation from CAC/ABET since 2000.

The **Computer Science & Engineering** program produces graduates with a broad perspective in both software and hardware topics pertinent to computing systems. The core of this program includes additional courses in analog and digital circuits and performance analysis, consistent with its increased emphasis on hardware systems. Computer Science & Engineering students also complete a concentration in the same areas as the Computer Science students. This degree program was first accredited by EAC/ABET in 1972. Since 1993, the program has earned accreditation from both the Engineering and Computing commissions of ABET.

The **Computer Engineering** program produces graduates with skills in designing computer hardware and peripherals, and emphasizes the electrical characteristics of the computer itself. It is focused on the design of computer hardware, associated core software structures and their interfaces. It is well suited to students interested in designing computers or computer interfaces, real time applications, or networking solutions. This degree program has received accreditation from EAC/ABET since 2006.

All three of these programs require students in their senior year to complete a two semester team-oriented capstone design and development project. Students work in teams of four to six and many projects are sponsored by industry. Students demonstrate projects at the School of Engineering Senior Design Day held each May.
Concentrations

Theory and Algorithms
- Systems and Networks
- Cybersecurity
- Bioinformatics
- Software Design and Development
- Computational Data Analytics
- Naval Science and Technology
- Unspecialized
- Individually Designed

Theory and Algorithms

Theoretical computer science asks the most fundamental questions about computing: What does it mean to compute something? How difficult is it to do specific computations? How can we compare the “difficulty” of different computational problems? What problems cannot be solved by computers, no matter how powerful they are? At the same time, theoretical computer science gives a toolset and vocabulary for making good design decisions in real computing situations. It helps the students to recognize patterns and abstractions from classic problems that can be applied to new problems. It gives a framework for explaining why one approach is better than another without having to try both and see.

The Theory and Algorithms concentration prepares students who want to specialize in theoretical computer science. It requires a strong background and comfort level with math. Students completing the concentration requirements will graduate from UConn with an understanding of the theoretical foundations of computation, an appreciation for the limits of computation, and an ability to design efficient algorithms that scale well with input size.

Courses:
- CSE 3502: Theory of Computation or CSE 5503: Theory of Computation
- CSE 3802: Numerical Methods
- CSE 4100: Programming Language Translation
- CSE 4500: Parallel Systems
- CSE 4702: Introduction to Cryptography
- CSE 4704: Computational Geometry or CSE 5514: Computational Geometry
- CSE 4820: Introduction to Machine Learning or CSE 5819: Introduction to Machine Learning or CSE 5820: Machine Learning
- CSE 5500: Advanced Algorithms
• CSE 5503: Theory of Computation
• CSE 5506: Computational Complexity
• CSE 5512: Introduction to Quantum Computing
• CSE 5854: Modern Cryptography: Primitives and Protocols
• CSE 6512: Randomization in Computing
• CSE 6514: Computational Topology

In addition to the courses listed above, one special topics course (CSE 4095 or CSE 5095) or one independent study course (CSE 4099) on a topic related to this concentration may be counted towards the 12 credits concentration requirement with prior approval by one of the concentration coordinators and either the CSE Department Head or the Director of Undergraduate Computing Education.

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**Systems and Networks**

The Systems and Networks concentration focuses on the system aspects of computer science. How does a computer work? How and why did your program crash? How does the Internet work? These are just a few questions that this concentration answers. It includes a wide range of courses related to computer networking (principles on designing computer networks and their instantiation in various real networks, including the Internet, networked embedded systems and wireless networks), operating systems (principles and mechanisms for process creation, memory and resource management, and I/O management in a computer system), computer architecture (design principles and methodologies for modern microprocessors and computer memory system), and computer and network security (privacy and security issues related to computer and network systems).

This concentration equips students with both theory and practice on how computer systems (including both stand-alone and networked systems) are designed, organized, implemented and managed. It integrates software and hardware, covering a wide variety of topics related to performance, efficiency, reliability, fault tolerance, and security. This allows students to understand system related issues, which arise in many different contexts (e.g., data analytics, cybersecurity, software design).

**Courses:**

• CSE 3300: Networks or CSE 5299: Computer Networks and Data Communication
• CSE 3400: Intro to Computer and Network Security 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 4709: Networked Embedded Systems or CSE 5309: Networked Embedded Systems
• CSE 5300: Advanced Networks
• CSE 5306: Advanced Operating Systems
In addition to the courses listed above, one special topics course (CSE 4095 or CSE 5095) or one independent study course (CSE 4099) on a topic related to this concentration may be counted towards the 12 credits concentration requirement with prior approval by one of the concentration coordinators and either the CSE Department Head or the Director of Undergraduate Computing Education.

**Cybersecurity**

Cybersecurity is concerned with security in a computing environment. The concentration offers a blend of courses that investigate multiple dimensions. Specifically, it addresses questions related to software engineering, networking and the fundamental cryptographic primitives and protocols used in computer systems to provide authenticity, privacy and resistance to tampering. In the process, it investigates the mathematical foundations that form the basis of modern cryptography.

If Buffer overflows, SSL, X509 certificates, DDoS, Honeypots, MITM, Exploits, Advanced Persistent Threats, multi-party computation, homomorphic encryption, or quantum resistant cryptography are mysterious ideas or techniques that you wish to master, the cybersecurity concentration is for you.

The concentration equips students with skill sets that blend theory and practice and serves a population intent on becoming cybersecurity professionals. It is a fast-paced and rapidly evolving subfield of computing in which practitioners must be ready to engage in continuing education.

**Courses:**

- CSE 3300: Networks 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 3400: Introduction to Computer and Network Security or CSE 5850: Introduction to Cyber-Security
- CSE 4400: Computer Security or CSE 5400: Computer Security
- CSE 4402: Network Security or CSE 5402: Network Security
- CSE 4702: Introduction to Cryptography or CSE 5852: Modern Cryptography: Foundations
- CSE 5852: Modern Cryptography: Foundations
- CSE 5854: Modern Cryptography: Protocols and Primitives

In addition to the courses listed above, one special topics course (CSE 4095 or CSE 5095) or one independent study course (CSE 4099) on a topic related to this concentration may be counted towards the 12 credits concentration requirement with prior approval by one of the concentration coordinators and either the CSE Department Head or the Director of Undergraduate Computing Education.
Bioinformatics

Bioinformatics is an important and growing engineering field that focuses on the design and development of new algorithms, computational methods, and tools for the analysis of complex biological data. With recent advances in high-throughput technologies, the rate of growth in the amount of biological data (genetic sequence data in particular) has greatly outpaced increases in computing power governed by Moore's law. As a result, core computer science techniques including algorithms, data structures, data analytics, software engineering, statistical modeling, and machine learning, have become central to the analysis and interpretation of high-throughput data in both biology and medicine. Students taking the bioinformatics concentration will have the opportunity to deepen their knowledge of these computer science techniques and learn how they apply to biological data analysis.

Courses:

- CSE 3800: Bioinformatics or CSE 5800: Bioinformatics
- 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 or CSE 5820: Machine Learning
- CSE 5810: Introduction to Biomedical Informatics
- CSE 5825: Bayesian Machine Learning
- CSE 5815: Systems Biology: Constructing Biological Knowledgebase
- CSE 5830: Probabilistic Graphical Models
- CSE 5840: String Algorithms and Applications in Bioinformatics
- CSE 5860: Computational Problems in Evolutionary Genomics

In addition to the courses listed above, one special topics course (CSE 4095 or CSE 5095) or one independent study course (CSE 4099) on a topic related to this concentration may be counted towards the 12 credits concentration requirement with prior approval by one of the concentration coordinators and either the CSE Department Head or the Director of Undergraduate Computing Education.

Software Design and Development

The software design and development concentration is concerned with the study of methods, tools, and techniques used to design and develop software systems. The students will be exposed to both traditional and modern software engineering practices that span the entire software lifecycle, and the trade offs between these. The topics will include software architecture, procedural and object oriented software development paradigms, software requirements analysis, software testing and verification, software process models, software engineering process models, and formal methods. Emphasis will be placed on training the students in tools that embody these principles through hands on projects and exercises. SDD concentration will position the students competitively to seek employment in the ever growing software industry.
Courses:

- CSE 2102: Software Engineering (Required)
- CSE 3150: C++ Essentials
- CSE 4102: Programming Languages or CSE 5102: Advanced Programming Languages
- CSE 4701: Principles of Databases
- CSE 5103: Software Performance Engineering
- CSE 5105: Software Reliability Engineering
- CSE 5810: Introduction to Biomedical Informatics

In addition to the courses listed above, one special topics course (CSE 4095 or CSE 5095) or one independent study course (CSE 4099) on a topic related to this concentration may be counted towards the 12 credits concentration requirement with prior approval by one of the concentration coordinators and either the CSE Department Head or the Director of Undergraduate Computing Education.

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Computational Data Analytics

We live in an era of big data. In every domain of science and engineering voluminous data gets generated. Processing these datasets is a big challenge. A great deal of useful information is hidden in this data. Effective techniques are needed to unravel this information. For instance, the analysis of genomic data could lead to the discovery of causes for various diseases and subsequently the development of relevant drugs. Accurate weather forecasting is possible with the analysis of appropriate atmospheric data.

In this concentration, the students will be trained in analyzing various kinds of data. Examples include visual data, text data, sequence data, etc. The students will also be exposed to the principles of databases. Recently, Artificial Intelligence (and machine learning in particular) techniques have been employed to solve many challenging problems efficiently. Students will also get exposure to discrete optimization which lies at the core of decision making, i.e., Business Analytics.

Courses:

- CSE 4095: Dynamic Data Visualization or OPIM 3804: Data Visualization
- CSE 4502: Big Data Analytics or CSE 5717: Big Data Analytics
- CSE 4701: Principles of Databases or OPIM 3221 Business Database Systems
- CSE 4705: Introduction to Artificial Intelligence
- CSE 4820: Introduction to Machine Learning or CSE 5819: Introduction to Machine Learning or CSE 5820: Machine Learning
- CSE 5707: Discrete Optimization or OPIM 3803: Spreadsheet Modeling for Business Analysis
- CSE 5713: Data Mining or OPIM 3802: Data and Text Mining
- CSE 5095: Discrete Optimization or OPIM 3803: Spreadsheet Modeling for Business Analytics
• CSE 5825: Bayesian Machine Learning or CSE 5830: Probabilistic Graphical Models or CSE 5835: Machine Learning for Physical Sciences and Systems

In addition to the courses listed above, one special topics course (CSE 4095 or CSE 5095) or one independent study course (CSE 4099) on a topic related to this concentration may be counted towards the 12 credits concentration requirement with prior approval by one of the concentration coordinators and either the CSE Department Head or the Director of Undergraduate Computing Education.

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**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:

- At least three credits of ENGR 3109.
- Six credits from the following courses with at least one course outside the senior design sequence: CSE 4095, 4099, 4939W, 4940.

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.
**Unspecialized**

The various concentrations above focus on particular areas within computer science. An alternative to these is the Unspecialized concentration, which requires students to take fundamental courses in a number of the above areas, thus gaining a broader perspective of the field. If you are interested in more than one of the above areas, or if you are unwilling to commit to a single area, this concentration is a good choice for you.

For the Unspecialized concentration, students must take 3 different required concentration courses, plus any other 2000+ level CSE course not used to fulfill another requirement.

**Courses:**

- CSE 2102 : Software Engineering
- CSE 3300: Networks or CSE 5299: Computer Networks and Data Communication
- CSE 3400: Intro to Computer and Network Security or CSE 5850: Introduction to Cyber-Security
- CSE 3502: Theory of Computation or CSE 5503: Theory of Computation
- CSE 3800: Bioinformatics or CSE 5800: Bioinformatics
- CSE 4502: Big Data Analytics or CSE 5717: Big Data Analytics

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**Individually Designed**

Students may propose an individually-designed concentration to fit their academic or career interests. This will be a minimum of 12 credits at the 2000+ level, proposed by the student and approved by the student’s advisor and the CSE Department Undergraduate Committee. The expectation is that such a concentration will have a strong unifying theme. This may include non-CSE courses, but the student will still be subject to the overall requirement of 43 CSE credits for CS students and 50 CSE credits for CSE students.
## Computer Science Bachelor of Science Program
### Catalog year 2021-2022

### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Credits</th>
<th>Second Semester</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Lab Science(^1)</td>
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<td>Lab Science(^1)</td>
<td>4</td>
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<tr>
<td>MATH 1131Q – Calculus I</td>
<td>4</td>
<td>Math 1132Q – Calculus II</td>
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<tr>
<td>CSE 1010 – Intro Computing for Engineers</td>
<td>3</td>
<td>CSE 1729 – Intro to Principles of Programming</td>
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<tr>
<td>ENGR 1000 – Orientation to Engineering</td>
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<td>ENGL 1010 or 1011 – Seminar in Writing</td>
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<tr>
<td>Area 2 (Social Sciences)</td>
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### SOPHOMORE YEAR

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<tbody>
<tr>
<td>Lab Science(^1)</td>
<td>4</td>
<td>CSE 2304 or 3666 – Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CSE 2500 – Intro to Discrete Systems</td>
<td>3</td>
<td>CSE 3500 – Algorithms and Complexity</td>
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<tr>
<td>CSE 2050 – Data Structures &amp; Object-Oriented Design</td>
<td>3</td>
<td>CSE 3100 – Systems Programming</td>
<td>3</td>
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<tr>
<td>MATH 2110Q – Multivariable Calculus or</td>
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<td>Area 2 (Social Science)</td>
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<tr>
<td>MATH 2410Q – Elem. Differential Equations</td>
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<td>PHIL 1104 (Area 1) – Phil. and Soc Ethics</td>
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<td>Area 1 (Arts and Humanities)</td>
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<td>17 or 16</td>
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### JUNIOR YEAR

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<th>Credits</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>CSE xxxx - Concentration course 1</td>
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<td>CSE xxxx - Concentration course 2</td>
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</tr>
<tr>
<td>CSE 3140 – Cybersecurity Lab</td>
<td>2</td>
<td>Area 4 Course (Diversity and Multiculturalism)</td>
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<tr>
<td>STAT 3025Q-Stat. Methods</td>
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<td>CSE 3000 -Contemporary Issues in CSE</td>
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<td>MATH 2210Q-Linear Algebra</td>
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<td>CSE Elective(^2)</td>
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### SENIOR YEAR

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<th>Second Semester</th>
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<tbody>
<tr>
<td>CSE 4939W – CSE Design Project I</td>
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<td>CSE 4940 – CSE Design Project II</td>
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<tr>
<td>CSE xxxx - Concentration course 3</td>
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<td>CSE xxxx - Concentration course 4</td>
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</tr>
<tr>
<td>Area 4 (Diversity and Multiculturalism)</td>
<td>3</td>
<td>CSE Elective</td>
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<td>Elective</td>
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<td>Elective</td>
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Additionally the program must include one W course other than CSE 4939W, which may be used to satisfy other requirements or Free Electives.

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\(^1\) A two-course sequence must be selected from one of the following sequences. CHEM 1127Q, 1128Q; CHEM 1147Q,1148Q; CHEM 1137Q, 1138Q; PHYS 1401Q, 1402Q; PHYS 1601Q, 1602Q; PHYS 1501Q, 1502Q. An additional course must be selected from the department not selected for the sequence or from BIOL 1107, BIOL 1108, BIOL 1110, or GEOL 1050.

\(^2\) If needed to get at least 43 credits in CSE courses.

\(^3\) Sufficient to make 120 credits.

Revised 5/28/2021
Computer Science Concentration Requirements

Every Computer Science major must satisfy the requirements for a concentration. A concentration consists of four courses within a defined set of alternatives (one or more of the courses may be required for the concentration). A student must declare a single concentration to count toward graduation; that is the one that will be listed on his or her transcript. There are currently 9 concentrations available, these are listed below. For information about the concentration requirements, see the Guide to Course Selection, linked from the CSE department web page under Undergraduate Studies.

Concentration 1: Theory and Algorithms
Concentration 2: Systems and Networks
Concentration 3: Cybersecurity
Concentration 4: Bioinformatics
Concentration 5: Software Design and Development
Concentration 6: Computational Data Analytics
Concentration 7: 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.

Concentration 8: Unspecialized
For the Unspecialized concentration, students must take required courses from 3 different concentrations, plus any other 2000+ level CSE course not used to fulfill another requirement.

Concentration 9: Individually Designed
Students may propose an individually-designed concentration to fit their academic or career interests. This will be a minimum of 12 credits at the 2000+ level, proposed by the student and approved by the student's advisor and the CSE Department Undergraduate Committee. The expectation is that such a concentration will have a strong unifying theme. This may include non-CSE courses, but the student will still be subject to the overall requirement of 50 CSE credits.

Revised 5/28/2021
## FRESHMAN YEAR

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<tr>
<td>CHEM 1127Q or 1147Q-Gen. Chem. I or Honors Chem I</td>
<td>4</td>
<td>PHYS 1501Q-Engineering Phys. I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1131Q- Calculus I</td>
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<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
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<tr>
<td>PHYS 1502Q-Engineering Phys II</td>
<td>4</td>
<td>MATH 2410Q-Differential Equations</td>
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<tr>
<td>MATH 2110Q-Multivariable Calculus</td>
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<td>CSE 2500-Intro to Discrete Systems</td>
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<tr>
<td>CSE 2050 – Data Structures and Object-oriented Design</td>
<td>3</td>
<td>ECE 2001 – Electric Circuits</td>
<td>4</td>
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<tr>
<td>CSE 2301-Principles &amp; Practice of Digital Logic Design</td>
<td>4</td>
<td>PHIL 1104 (Area 1) - Phil. and Social Ethics</td>
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<tr>
<td><strong>Total</strong></td>
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<td>CSE 3100 - Systems Programming.</td>
<td>3</td>
<td>CSE xxxx - Concentration course 1</td>
<td>3</td>
</tr>
<tr>
<td>CSE 2304 or 3666 - Intro. to Comp. Arch.</td>
<td>3</td>
<td>CSE 3504- Prob. Perf. Analy. of Computer Sys.</td>
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</tr>
<tr>
<td>CSE 3500- Algorithms and Complexity</td>
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<td>CSE 3000-Contemporary Issues in CSE</td>
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<tr>
<td>Prob. and Stat.Course¹</td>
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<td>CSE 3140 – Cybersecurity Lab</td>
<td>2</td>
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<tr>
<td>Area 4 (Diversity and Multiculturalism)</td>
<td>3</td>
<td>Math 2210Q-Linear Algebra</td>
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<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td><strong>Elective</strong></td>
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<tr>
<td><strong>Elective</strong></td>
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<td><strong>Area 4 (Diversity and Multiculturalism)</strong></td>
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## SENIOR YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CSE 4939W-CS &amp; E Design Project I</td>
<td>3</td>
<td>CSE 4940-CS &amp; E Design Project II</td>
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<tr>
<td>CSE xxxx - Concentration course 2</td>
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<td>CSE xxxx - Concentration course 4</td>
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<tr>
<td>CSE xxxx - Concentration course 3</td>
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<td>CSE Elective²</td>
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<td>Elective</td>
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<td>Area 4 (Diversity and Multiculturalism)</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
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</tbody>
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Additionally the program must include one W course other than CSE 4939W, which may be used to satisfy other requirements or Free Electives.

¹ This course must be chosen from the list of MATH 3160Q- Probability, STAT 3025Q Statistical Methods I, STAT 3345Q- Probability Models for Engineers or STAT 3375Q Introduction to Mathematical Statistics.

² If needed to get 50 CSE credits. 126 total credits required, including 50 CSE credits.

Revised 5/28/2021
Computer Science & Engineering Concentration Requirements

Every CSE major must satisfy the requirements for a concentration. A concentration consists of four courses within a defined set of alternatives (one or more of the courses may be required for the concentration). A student must declare a single concentration to count toward graduation; that is the one that will be listed on his or her transcript. There are currently 9 concentrations available, these are listed below. For information about the concentration requirements, see the Guide to Course Selection, linked from the CSE department web page under Undergraduate Studies.

Concentration 1: Theory and Algorithms
Concentration 2: Systems and Networks
Concentration 3: Cybersecurity
Concentration 4: Bioinformatics
Concentration 5: Software Design and Development
Concentration 6: Computational Data Analytics
Concentration 7: 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.

Concentration 8: Unspecialized
For the Unspecialized concentration, students must take required courses from 3 different concentrations, plus any other 2000+ level CSE course not used to fulfill another requirement.

Concentration 9: Individually Designed
Students may propose an individually-designed concentration to fit their academic or career interests. This will be a minimum of 12 credits at the 2000+ level, proposed by the student and approved by the student's advisor and the CSE Department Undergraduate Committee. The expectation is that such a concentration will have a strong unifying theme. This may include non-CSE courses, but the student will still be subject to the overall requirement of 50 CSE credits.
# COMPUTER ENGINEERING 2021-2022

## FRESHMAN YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Credits</th>
<th>Second Semester</th>
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</thead>
<tbody>
<tr>
<td>MATH 1131Q – <em>Calculus I</em></td>
<td>4</td>
<td>MATH 1132Q – Calculus II</td>
<td>4</td>
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<tr>
<td>CHEM 1127Q – Gen. Chem. I</td>
<td>4</td>
<td>PHYS 1501Q1 – Engineering Physics I¹</td>
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<tr>
<td>CSE 1010 – Intro. to Computing for Engr.</td>
<td>3</td>
<td>CSE 1729 – Intro. Principles of Programming</td>
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<tr>
<td>ENGL 1010 or 1011 – Academic Writing</td>
<td>4</td>
<td>Arts and Humanities course²</td>
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<tr>
<td>ENGR 1000 – Orientation to Engineering</td>
<td>1</td>
<td>Social Sciences course²</td>
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## SOPHOMORE YEAR

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<tbody>
<tr>
<td>MATH 2110Q – Multivariable Calculus</td>
<td>4</td>
<td>MATH 2410Q – Differential Equations</td>
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<tr>
<td>PHYS 1502Q – Engineering Physics II¹</td>
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<td>ECE 2001 – Electric Circuits</td>
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<tr>
<td>CSE 2050 – Data Structures &amp; OO Design</td>
<td>3</td>
<td>CSE 2500 – Intro to Discrete Systems</td>
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<tr>
<td>CSE 2301 – Logic Design</td>
<td>4</td>
<td>PHIL 1104 – Philosophy and Social Ethics</td>
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## JUNIOR YEAR

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<tbody>
<tr>
<td>ECE 3101 – Signals and Systems</td>
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<td>ECE 3401 – Digital Systems Design¹</td>
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<tr>
<td>ECE 3201 – Electronic Circuit Design and Analysis</td>
<td>4</td>
<td>ECE 3411 – Microprocessor App. Lab or</td>
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<tr>
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<td>CSE 4903 – Microprocessor Lab</td>
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<tr>
<td>CSE 3100 – Systems Programming</td>
<td>3</td>
<td>CSE 4302 – Advanced Computer Architecture³</td>
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<tr>
<td>CSE 3666 – Intro. to Computer Architecture</td>
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<td>STAT 3345Q – Probability Models Engineers³</td>
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<tr>
<td>MATH 2210Q – Linear Algebra</td>
<td>3</td>
<td>Diversity and Multiculturalism course²</td>
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## SENIOR YEAR

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<tbody>
<tr>
<td>ECE 4901 – E&amp;CE Design I⁵</td>
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<td>ECE 4902 – E&amp;CE Design II</td>
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<tr>
<td>ECE 4900W – Communicating Engineering Solutions in a Societal Context⁶</td>
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<td>ECE 3421 – VLSI Design &amp; Simulation</td>
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<tr>
<td>CSE 4300 – Operating Systems</td>
<td>3</td>
<td>Professional Requirement⁷</td>
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<tr>
<td>Professional Requirement⁷</td>
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<td>Professional Requirement⁷</td>
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<tr>
<td>Design Laboratory⁸</td>
<td>3</td>
<td>Diversity and Multiculturalism course²</td>
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<tr>
<td>Elective</td>
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<td>15</td>
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¹ Either the two-semester sequence of PHYS 1401Q-1402Q or the three-semester sequence of PHYS 1201Q-1202Q followed by PHYS 1230 or 1530 may be taken instead to satisfy this requirement. However, only eight credits of PHYS 1201-1202-1230/1530 can be used toward the required 126 credits for the Engineering degree.

² The courses from content areas one (Arts and Humanities) and two (Social Sciences) must be from four different departments. One course from either content area one (Arts and Humanities) or content area two (Social Sciences) may also be used to fulfill one of the requirements from content area four (Diversity and Multiculturalism). One course from content area four must be an international course.

³ ECE 3401 can be substituted with ECE 5401; ECE 4302 can be substituted with ECE 5402/CSE 5302.

⁴ STAT3345 can be replaced with MATH3160, though STAT3345 is recommended.

⁵ Prerequisites: Senior standing; ECE 3201; C+ or better in ECE 2001 and ECE 3101.

⁶ One additional W course must be taken, typically as one of the content area courses.

⁷ Choose three (3) from: ECE 3111, ECE 3431/CSE 3802, ECE 3221, ECE 4112, ECE 4121, ECE 4131, ECE 4451, CSE 2102, CSE 3300, CSE 3500, CSE 3504, CSE 4707, and CSE 4709. At least one of the three must be ECE 4112 or CSE 3504.

⁸ Choose one (1) from: CSE 3350/ECE 4401, CSE 4901/ECE 4402, ECE 4114, and ECE 4132