The University of Connecticut

School of Engineering

COMPUTER SCIENCE

GUIDE TO COURSE SELECTION

AY 2016-2017

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for

Computer Science (CSci) Majors in the School of Engineering

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Introduction

The School of Engineering

The Bachelor of Science (BS) curriculum is designed to give sound knowledge of basic principles in mathematics, science; to provide education in the theory, principles, and practices of computing; and to present the opportunity to concentrate in a specific sub-discipline of Computer Science. Students gain hands-on experience in the laboratory courses that accompany classroom work, and develop design skills in course work beginning in the first two years. Design experience continues in junior and senior years in the student's chosen concentration area, culminating in the two semester Senior Design Project course.

The Computer Science Degree

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. Students are also given a foundational understanding of computer architecture. Included in the program is the opportunity to concentrate on a specific sub-discipline of Computer Science.

Punctuating the senior year are two design laboratory courses that, in combination, allow the students to work on a team project over two semesters.

This degree program provides the background necessary for a career in computing or further graduate study. It has sufficient flexibility to allow students to combine computer science with other disciplines. The required coursework builds a foundation in computer science, particularly software and theory, combined with a number of specializations within computer science.

This degree program is accredited by the Computing Accreditation Commission (CAC) of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700. It was first accredited by CAC/ABET in 2000.

Using this Guide

This Course Selection Guide will assist you in completing your educational goals at the University in the Computer Science Program, in conjunction with your faculty advisor and the University of Connecticut General Catalog. The Plan of Study current at the time of the student's admission or readmission to the School, whichever is later, lists the requirements for that student's graduation. Thus, this guide provides details on student degree requirements that may not be reflected in the University of Connecticut Catalog.

Accreditation of the Computer Science Program

The Computer Science program is accredited by the Computing Accreditation Commission (CAC) of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700. Accreditation is a peer review process which insures that educational programs meet established standards of quality and graduate students who are prepared for the requirements of their profession. As part of the accreditation process the Computer Science and Engineering department has developed the following Program Educational Objectives of the Computer Science program. These objectives describe the abilities of our graduates about five years after graduation.

The Computer Science undergraduate program educational objectives are that our alumni/ae: practice as computing professionals in various areas of computer science or the related areas to which it applies; advance in their professional practice; and enhance their skills and embrace new computing technologies through self-directed professional development or post-graduate education.

ABET's CAC requires that each student of the Computer Science program follow a curriculum that has the following minimum content:

- one and a third years (40 credits) of computer science coursework that must include:
  - Coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture.
  - An exposure to a variety of programming languages and systems.
  - Proficiency in at least one higher-level language.
  - Advanced course work that builds on the fundamental course work to provide depth.
- one year (30 credits) of science and mathematics:
  - At least a half year of mathematics that includes discrete mathematics. The additional mathematics might consist of courses in areas such as statistics, calculus, linear algebra, numerical methods, number theory, geometry, or symbolic logic.
  - A science component that develops an understanding of the scientific method and provides students with an opportunity to experience this mode of inquiry in courses for science or engineering majors that provide some exposure to laboratory work

The Computer Science program detailed in the Plan of Study meets these requirements. Detailed syllabi for the required Computer Science coursework is available on the Computer Science and Engineering website

Degree Requirements

University General Education Requirements

The University requires all baccalaureate degree students to satisfy a common core of course work known as the General Education Requirements. Course work in the Arts, Humanities and Social Sciences is also an integral part of the engineering program. Courses must be taken and distributed to cover the Four Content Areas and the Five Competencies listed below. Please see the University of Connecticut General Catalog for more detailed information.

Note that students must earn at least a 2.0 grade point average for all calculable course work to receive a degree.

The Four Content Areas

The courses taken to satisfy the General Education Content Areas One, Two, and Three must be selected from six different departments.

1. Arts and Humanities

Two courses from two different departments in this content area are required. These courses emphasize artistic, cultural, and historical topics. (PHIL 1104, required of all engineering students, meets a Content Area One course requirement.)

2. Social Sciences

Two courses from two different departments in this content area are required. These courses emphasize the ways in which people and institutions interact.

3. Science and Technology

Two courses from two different departments in this content area are required. These courses provide background in the sciences, including laboratory work. (Computer Science students take one year of chemistry or physics lab courses, and a lab course in another science, and thereby meet the Content Area Three requirement.)

4. Diversity and Multiculturalism

Two courses in this content area are required. These courses provide background on the global community and other cultures with which engineers will interact over the course of their careers. At least one of these courses must be classified as international. One course (only) may be used to meet both this requirement and a course requirement in Content Areas One or Two.

The Five Competencies

1. Second Language Competency

The minimum requirement is met by three years of a single foreign language in high school or equivalent, or completion of a two-semester course sequence in any foreign language at the University.

2. Writing (W) Competency

All students must take either ENGL 1010 Seminar in Academic Writing or ENGL 1011 Seminar in Writing through Literature. Students taking ENGL 3800 in the Honors Program and transfer students with both ENGL 1010 English Composition and ENGL 1011 Literature and Composition have met the requirement. In addition to these courses, Computer Science students must complete the two required writing (W) courses, CSE 4939W and another that they choose..

3. Quantitative (Q) Competency

All students must take two Quantitative (Q) courses. The mathematics course requirements for the Computer Science major meet this requirement.

4. Computer Technology Competency

By graduation, CSci students are expected to understand computer logic and basic structure and to have the ability to develop algorithms. These competencies are achieved by the courses in the major.

5. Information Literacy Competency

In addition to the basic competency achieved in ENGL 1010 or 1011 or equivalent, all Engineering students will receive instructions in ENGR 1000 or equivalent on how to conduct effective information searches, both in the library and on the web. As the student progresses, successive courses will require an increased level of Information Literacy competency. An advanced level of Information Literacy will be achieved at the completion of the program's major design experience course.

School of Engineering Requirements

All Computer Science students are required to complete the following School of Engineering Requirements:

Course	Title	Credits
CSE 1010	Introduction to Computing for Engineers	3
ENGR 1000	Orientation to Engineering I	1
MATH 1131Q/1151Q or (MATH 1125Q and MATH 1126Q) or MATH 2141Q	Calculus I or Calculus Ia and Ib or Advanced Calculus I	4
MATH 1132Q11/52Q or MATH 2142Q	Calculus II Advanced Calculus II	4
PHIL 1104	Ethics	3

Computer Science Requirements

In addition to the General Education and School of Engineering requirements, Computer Science majors must complete a core set of computing courses, a set of courses that define a concentration area in Computer Science, a number of cognate courses in Science, Math, and Statistics, and sufficient elective courses to reach the required 120 credits.

We discuss these requirements in turn.

Computer Science Core Requirements

Computer Science majors are required to complete the following courses, henceforth referred to as the CS core:

Course	Title	Credits
CSE 1729	Intro to Principles of Programming	3
CSE 2100	Data Structures Intro to Algorithms	3
CSE 2304 or 3666	Computer Architecture	3
CSE 2500	Introduction to Discrete Systems	3
CSE 3000	Contemporary Issues in Computer Science and Engineering	1
CSE 3100	Systems Programming	3
CSE 3500	Algorithms and Complexity	3
CSE 4939W	Computer Science and Engineering Design Project I	3
CSE 4940	Computer Science and Engineering Design Project II	3
	Total credits in the core	25

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 8 concentrations available, these are listed with their courses below.

Concentration 1: Theory and Algorithms

Course	Title	Credits
CSE 3502	Theory of Computation (Required)	3
CSE 3802	Numerical Methods	3
CSE 4500	Parallel Systems	3
CSE 4702	Intro to Cryptography	3
CSE 4704	Computational Geometry	3
CSE 5500	Advanced Algorithms	3
CSE 5820	Machine Learning	3

Concentration 2: Systems and Networks

Course	Title	Credits
CSE 3300	Networks (Required)	3

CSE 4300	Operating Systems	3
CSE 4302	Computer Organization and Architecture	3
CSE 4709	Networked Embedded Systems	3
CSE xxxx	Intro to Computer and Network Security (new course)	3
CSE 5300	Advanced Networks	3

Concentration 3: Cybersecurity

Course	Title	Credits
CSE 3502	Theory of Computation (Required)	3
CSE xxxx	Intro to Computer and Network Security (Required)	3
CSE 4702	Introduction to Modern Cryptography	3
CSE 4707	Computer Security	3
CSE 5852	Modern Cryptography: Foundations	3

Concentration 4: Bioinformatics

Course	Title	Credits
CSE 3800	Bioinformatics (Required)	3
CSE 3810	Computational Genomics	3
CSE 4095	Big Data Analytics	3
CSE 5810	Intro to Biomedical Informatics	3
CSE 5820	Machine Learning	3
CSE 5860	Computational Problems in Evolutionary Genomics	3

Concentration 5: Software Design and Development

Course	Title	Credits
CSE 2102	Software Engineering (Required)	3
CSE 4102	Programming Languages	3
CSE 4701	Principles of Data Bases	3
CSE 5103	Software performance engineering	3
CSE 5104	Software reliability engineering	3

Concentration 6: Computational Data Analytics

Course	Title	Credits
CSE 4095	Big Data Analytics (Required)	3
CSE 4701 or OPIM 3221	Principles of Data Bases or Business Database Systems	3
CSE 4095 or OPIM 4895	Dynamic Data Visualization or Visual Analytics	3
CSE 4705	Intro to Artificial Intelligence	3
CSE 5713 or OPIM 3802	Data Mining or Data and Text Mining	3
CSE 5095 or OPIM 3803	Discrete Optimization or Spreadsheet modeling for Business Analytics	3

Concentration 7: Unspecialized

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

Course	Title	Credits
CSE 3502	Theory of Computation	3
CSE 3300	Networks	3
CSE xxxx	Intro to Computer and Network Security	3
CSE 3800	Bioinformatics	3
CSE 2102	Software Engineering	3
CSE 4095	Big Data Analytics	3
CSE 2000+	CSE course not used to fulfill other requirement	3

Concentration 8: 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.

Minimum Computer Science Coursework Requirement

The minimum number of credits of Computer Science course work is 43 credits. Any additional CSE courses beyond CSE 1000, which can not be counted for credit in the CSE program, may be used to satisfy this requirement. If a student takes 12 credits of CSE courses in his or her concentration, this can be satisfied by taking CSE 1010, the required core courses, plus three more CSE credits. Students are certainly free to take more than 43 CSE credits.

Computer Science students are also required to satisfy the cognate requirements in Math, Science, and Statistics listed below.

It is recommended that students think about their choices as a whole, and consider using them deliberately to either gain breadth in their educational program or to focus on an area of particular interest. Students should consult their faculty advisor to plan a course of study which will best meet their individual educational goals.

Science, Mathematics, and Statistics Cognate Requirements

Science Requirements

Every Computer Science major must take one full year sequence from the following courses and one additional science course from either the other discipline if chosen from the first table or from the second table.

Course	Title	Credits
CHEM 1127Q-1128Q	General Chemistry	8
CHEM 1129Q-1130Q	Honors General Chemistry	8
CHEM 1137Q-1138Q	Enhanced General Chemistry	8
PHYS 1401Q-1402Q	General Physics with Calculus	8
PHYS 1501Q-1502Q	Physics for Engineers	8
PHYS 1601Q-1602Q	Fundamentals of Physics	8

Course	Title	Credits
BIOL 1107	Principles of Biology I	4
BIOL 1108	Principles of Biology II	4
BIOL 1110	Introduction to Botany	4
GEOL 1050	Earth and Life through Time with Laboratory	4

Mathematics Requirements

In addition to the Mathematics courses required by the School of Engineering, every Computer Science major must take MATH 2210Q, Applied Linear Algebra, plus a course in either multivariable calculus or differential equations; the options are listed in the following table. This course work may be also be applied towards a minor in Mathematics.

Course	Title	Credits
MATH 2210Q or MATH 2144Q	Applied Linear Algebra or Advanced Calculus IV	3 or 4
MATH 2110Q or MATH 2130Q or MATH 2143Q or MATH 2410Q or MATH 2420Q or MATH 2144Q	Multivariable Calculus or Honors Multivariable Calculus or Advanced Calculus III or Elementary Differential Equations or Honors Differential Equations or Advanced Calculus IV	3 or 4

Statistics Requirement

Every Computer Science major must take one of the following courses. This course work may also be applied towards a minor.

Course	Title	Credits
STAT 3025Q	Statistical Methods (Calculus Level)	3
STAT 3375Q	Introduction to Mathematical Statistics	3

Credit Restrictions and Graduation Requirements

To graduate, the student must complete 120 credits, subject to the following credit restrictions.

The following courses may not be counted for credit toward graduation in the School of Engineering: MATH courses numbered 1120Q and below; MATH 1110; PHYS 1010 and 1030Q; CSE 1000. Only one credit of MATH 1125 can be used toward the required credits for the degree. No course taken on a Pass/Fail basis may be counted for credit toward graduation or may be used to meet any course requirements of the School of Engineering. Only eight credits for courses numbered CHEM 1124Q, 1125Q, 1126Q, 1127Q, 1128Q, 1147Q, and 1148Q and only eight credits for courses numbered PHYS 1201Q through 1602Q may be applied toward the degree.

COMPUTER SCIENCE CURRICULUM
Catalog Year 2016-2017

FRESHMAN YEAR

First Semester	Credits	Second Semester	Credits
Lab Science	4	Lab Science	4
MATH 1131Q – Calculus I	4	Math 1132Q – Calculus II	4
CSE 1010 – Intro Computing for Engineers	3	CSE 1729 – Intro to Principles of Programming	3
ENGR 1000 – Orientation to Engineering	1	ENGL 1010 or 1011 – Seminar in Writing	4
Area 2 (Social Sciences)	3		15
	15		

SOPHOMORE YEAR

First Semester	Credits	Second Semester	Credits
Lab Science	4	CSE 2304 – Computer Architecture	3
CSE 2500 – Intro to Discrete Systems	3	CSE 3500 – Algorithms and Complexity	3
CSE 2100 – Data Structures and Intro Algorithms	3	CSE 3100 – Systems Programming	3
MATH 2110Q – Multivariable Calculus or MATH 2410Q – Elem. Differential Equations	4 or 3	Area 2 (Social Science)	3
Area 1 (Arts and Humanities)	3	PHIL 1104 (Area 1) – Phil. and Soc Ethics	3
	17 or 16		15

JUNIOR YEAR

First Semester	Credits	Second Semester	Credits
CSE xxxx - Concentration course 1	3	CSE xxxx - Concentration course 2	3
CSE Elective	3	Area 4 Course (Diversity and Multiculturalism)	3
STAT 3025Q-Stat. Methods	3	CSE 3000 -Contemporary Issues in CSE	1
MATH 2210Q-Linear Algebra	3	CSE Elective	3
Elective	3	Elective	3
	15	Elective	3
			16

SENIOR YEAR

First Semester	Credits	Second Semester	Credits
CSE 4939W – CSE Design Project I	3	CSE 4940 – CSE Design Project II	3
CSE xxxx - Concentration course 3	3	CSE xxxx - Concentration course 4	3
Area 4 (Diversity and Multiculturalism)	3	Elective	3
Elective	3	Elective	3 to 4
Elective	3		12 to 13
	15		

Additionally the program must include one W course other than CSE 4939W, which may be used to satisfy other requirements or Free Electives.

Plan of Study

Timing

Prior to registration in the first semester of the Junior year[1], or for transfer students in their second semester at the University of Connecticut, whichever is later, each student must complete a Plan of Study documenting the program the student intends to follow to satisfy degree requirements for Computer Science. A final revised Plan of Study form must be completed before the end of the fourth week of a student's last semester.

Preparation

Plans of Study are prepared within the Student Admin (Peoplesoft) System at https://student.studentadmin.uconn.edu/. Using information from the catalog and this document, students will plan out the courses that they plan on taking by semester in their academic planner. When this is complete, they can submit it for approval by hitting the appropriate button. The student will be notified when the plan is approved or disapproved.

Exemptions and Substitutions

Students who desire to be excused from any of the requirements or to substitute other courses for those prescribed must do so by submitting a petition to the Assistant Dean for Undergraduate Affairs. For example, a student who had calculus in high school and started in MATH 1132Q might request exemption from MATH 1131Q, or approval of the substitution of PHYS 1201Q, 1202Q, 1230 for PHYS 1501Q, 1502Q. Exemption from course requirements or substitution of alternative courses must be clearly indicated on the Plan of Study form and explained in the "Comments" section or an attachment. Note: Exemptions mean that the requirement is satisfied but no credits are given in the process of satisfying the requirement. This process should be initiated between the student and his or her advisor, and should be completed before the final plan of study is submitted.

Double Major

Students may pursue a double major in Computer Science and another major in a different department in the School of Engineering undergraduate curriculum. They should submit the request form available in the UG programs office, E-II 304; requests are generally considered in January and June.

Additional Degree

Students may earn two separate bachelor degrees from two different schools or colleges of the University. Students must meet the requirements of both schools or colleges, and a Plan of Study form must be submitted to each department for each degree. An example of this would be the Eurotech program (with the College of Liberal Arts and Sciences): a student pursuing this program would submit a form for both the Computer Science & Engineering and the Modern & Classical Languages departments.

The student must complete an Additional Degree Petition, which requires the consent signature of the dean of each school or college in which the student will be enrolled. Students may get Additional Degree Petitions from the Registrar forms page, http://registrar.uconn.edu/forms/ A student pursuing two or more degrees concurrently must designate one degree the primary degree.

[1] In practice, this is the first semester after the student has completed 54 credits.

The student must meet all requirements for each degree. The two degrees require at least 30 degree credits more than the degree with the higher minimum-credit requirement. For example, both the Computer Science degree and Arts and Sciences degrees require at least 120 credits. They have the same minimum-credit requirement, so the total is 120 + 30, or 150. (If the student pursues a third degree, the two additional degrees require at least 60 degree credits more than the degree with the highest minimum-credit requirement.) **At least 30 of the additional credits must be 2000-level courses, or above, in the additional degree major or closely related fields and must be completed with a grade point average of at least 2.0.**