The University of Connecticut

School of Engineering

# COMPUTER SCIENCE

## GUIDE TO COURSE SELECTION

## AY 2013-2014

*Revised May 23, 2013*

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 obtain additional instruction and experience in a discipline outside 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 areas of software engineering, computer hardware and architecture, and in applications areas of the student's choosing, 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 coursework in a computing application area outside of Computer Science, such as business or mathematics.

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

Students interested in applying computer technology in non-engineering occupations will benefit from this degree program. It is ideally suited, for example, to students who wish to integrate computers with biology, chemistry, business and geography. Coursework builds a foundation in computer science, particularly software and theory, combined with more extensive coursework in a non-computer science subject area.

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<br>(MATH 1125Q and MATH 1126Q)<br>or MATH 2141Q | Calculus I or<br>Calculus Ia and Ib or<br>Advanced Calculus I | 4 |
| MATH 1132Q11/52Q<br>or MATH 2141Q | Calculus II<br>Advanced Calculus II | 4 |
| PHIL 1104 | Ethics | 3 |

# Computer Science Requirements

Computer Science majors are required to complete the following:

| Course | Title | Credits |
|---|---|---|
| CSE 1102 | Object Oriented Design and Programming | 3 |
| CSE 2100 | Data Structures and Introduction to Algorithms | 3 |
| CSE 2102 | Introduction to Software Engineering | 3 |
| CSE 2304 or 3666 | Computer Architecture | 3 |
| CSE 2500 | Introduction to Discrete Systems | 3 |
| CSE 3000 or CSE 3002 | Contemporary Issues in Computer Science and Engineering or Ethics and Professionalism in Computer Science and Engineering | 1 or 3 |
| CSE 3500 | Algorithms and Complexity | 3 |
| CSE 3502 | Theory of Computation | 3 |
| CSE 4300 | Operating Systems | 3 |
| CSE 4939W | Computer Science and Engineering Design Project I | 3 |
| CSE 4940 | Computer Science and Engineering Design Project II | 3 |
| MATH 2210Q | Applied Linear Algebra | 3 |

In addition, a course in probability and statistics, an additional calculus course in either multivariable calculus or differential equations, a course in the programming languages area, three Computer Science Professional Requirement courses, three Related Area courses, any additional computer science coursework to bring the total computer science coursework to a minimum of 42 credits without including CSE 2500, and sufficient additional elective course work to bring the total number of credits for the degree to a minimum of 120 credits.

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.

## Probability/Statistics Course

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 |

## Mathematics Requirement

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

| Course | Title | Credits |
|---|---|---|
| MATH 210Q or MATH 220Q | Multivariable Calculus or Honors Multivariable Calculus | 4 |
| MATH 211Q MATH 221Q | Elementary Differential Equations or Honors Differential Equations | 3 |

## Science Requirement

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 |

## Computer Science Programming Language Requirement

Every Computer Science major must take one of the following courses.

| Course | Title | Credits |
|---|---|---|
| CSE 4100 | Programming Language Translation | 3 |
| CSE 4102 | Programming Languages | 3 |

## Computer Science Professional Requirement

Every Computer Science major must take three of the following courses.

| Course | Title | Credits |
|---|---|---|
| CSE 3300 | Computer Networks and Data Communications | 3 |
| CSE 3800 | Bioinformatics | 3 |
| CSE 3802 | Numerical Methods in Scientific Computation | 3 |
| CSE 4095 | Special topics in CSE (with permission) | 3 |
| CSE 4500 | Parallel Systems | 3 |
| CSE 4701 | Principles of Data Bases | 3 |
| CSE 4703 | Computer Graphics | 3 |
| CSE 4705 | Artificial Intelligence | 3 |
| CSE 4707 | Data Security | 3 |
| CSE 5xxx/6xxx | Any CSE grad course of 3 or more credits | 3 |

## Minimum Computer Science Coursework Requirement

The minimum number of credits of Computer Science course work, not including CSE 2500 is 42 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.

## Related Area Course Requirement

A minimum of three 3-credit courses at the 200-level in a single related area forming a cohesive body of knowledge outside of Computer Science must be taken by all Computer Science majors. While it is not a requirement that all three courses be in the same academic department, they must be related in some way. Three courses from the same minor requirements work for this requirement. The coursework used to satisfy the related area course requirement may also be used in a minor.

## Free Electives

Nine credits of any University courses, not on the credit restriction list, must be completed. If the General Education requirements are met by seven courses, an additional 3 credits of an elective course (12 credits total) are required. Elective course work may also be applied toward a minor.

## Credit Restrictions

Many general University restrictions are shown in the University Catalog. Courses which may not be counted for credit toward graduation include:

- MATH courses numbered 1120Q and below
- PHYS 1010Q and PHYS 1030Q
- CSE 1000
- STAT 1000
- Any course outside of the School of Engineering which is labeled "independent study" or "variable topics"
- Any courses taken on Pass/Fail basis (also may not be counted for any course requirement of the School of Engineering.)
- Any course prerequisite to a second in the same department, if the student has passed the second course.
- Only eight credits of chemistry courses numbered CHEM 1124Q, 1125Q, 1126Q, 1127Q, 1128Q, 1147Q, or 1148Q and only eight credits of physics courses numbered PHYS 1201Q through PHYS1602Q may be applied toward the degree.

# *COMPUTER SCIENCE CURRICULUM*

### *Catalog Year 2013-2014*

### FRESHMAN YEAR

| First Semester | Credits | Second Semester | Credits |
|---|---|---|---|
| Lab Science[1] | 4 | Lab Science[1] | 4 |
| MATH 1131Q- Calculus I | 4 | MATH 11132Q-Calculus II | 4 |
| CSE 1010 or CSE 1729[2]-Computing for Engineers | 3 | CSE 1102-Object Oriented Design | 3 |
| Area 2 (Social Science) | 3 | ENGL 1010 or ENGL 1011-Acad. Writing | 4 |
| ENGR 1000-Orientation to Engineering | 1 | | |
| | 15 | | 15 |

[1] See "Science Requirement" above

[2] This course has been approved but is not yet in the catalog.

## SOPHOMORE YEAR

| First Semester | Credits | Second Semester | Credits |
|---|---|---|---|
| Lab Science[1] | 4 | CSE 2304 – Computer Architecture | 3 |
| MATH 2110Q-Multivariable Calculus or<br>MATH 2140Q - Differential Equations | 4 or<br>3 | CSE 3500 – Algorithms and Complexity | 3 |
| CSE 2100 – Data Structures & Intro to Algorithms | 3 | CSE 2102 – Intro to Software Engineering | 3 |
| CSE 2500 - Discrete Structures | 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 4300-Operating Systems | 3 | CSE 3502-Theory of Computation | 3 |
| CSE Professional Requirement[3] | 3 | CSE Professional Requirement[3] | 3 |
| STAT 3025Q-Stat. Methods or<br>STAT 3375Q - Intro Math Statistics | 3 | CSE 3000 -Contemporary Issues in CSE or<br>CSE 3002 -Social, Ethical and Prof. Issues in CSE | 1 or 3 |
| Related Area Course I[4] | 3 | Related Area Course II | 3 |
| MATH 2210Q-Linear Algebra | 3 | Area 4 Course (Diversity and Multiculturalism) | 3 |
| | 15 | | 13 or 15 |

## SENIOR YEAR

| First Semester | Credits | Second Semester | Credits |
|---|---|---|---|
| CSE 4939W-CS & E Design Project I | 3 | CSE 4940-CS & E Design Project II | 3 |
| CSE 4102 – Programming Languages or<br>CSE 4100 – Programming Language Translation | 3 | CSE Professional Requirement[3] | 3 |
| Related Area Course III | 3 | Free Elective | 3 |
| Area 4 Course (Diversity and Multiculturalism) or<br>Free Elective Related Area Course III | 3 | Free Elective | 3 |
| Free Elective | 3 | Free Elective[5] | 1 to 4 |
| | 15 | | 13 to 16 |

# Plan of Study

*NOTE: Preparation and submission of Plans of Study are being moved to the Peoplesoft system, so electronic forms and signatures will replace the hard-copy forms described below. At time of writing this document, not all of the infrastructure was in place, but it is expected to be fully operational by Fall 2013. When that is completed the preparation and approvals will be*

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3 The CS Professional Requirement Courses must be selected from the following courses: CSE 3300, CSE 3800, CSE 3802, CSE 4500, CSE 4701, CSE 4703, CSE 4707, CSE 4705, CSE 4709, any CSE graduate course, or CSE 4095's with prior approval.

4 The CSci degree requires at least 9 credits at the 2000 or higher level that relate to each other, e.g. in the same department. These may *not* be courses that fulfill other CSci degree requirements.

5 Sufficient to make 120 credits, with at least 45 credits in CSE courses.

*electronic.*

## Timing

Prior to registration in the first semester of the Junior year, or for transfer students in their second semester at the University of Connecticut, whichever is later, each student must complete a Plan of Study form 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

Forms are available at the School of Engineering Undergraduate website (www.engr.uconn.edu/soe_ugrad.htm). To successfully prepare a plan of study, students must:

- carefully read both the *University of Connecticut Catalog* and the *Course Selection Guide*
- work with the faculty advisor to determine a Plan of Study that meets all degree requirements and student needs.

## 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.

## Approval Process

After an initial consultation with the faculty advisor, the student should prepare two original copies of the Plan of Study form, in ink. The student's transcript should be reviewed to insure that completed courses are appropriately listed. After the student and advisor agree on the plan, each will sign the two original copies and submit them to the Coordinator of Undergraduate Studies in Computer Science for review and approval. The student should check back with the advisor to see if any corrections must be made after review by the Coordinator. Upon completion of this stage of approval, the Plan of Study forms are forwarded to the Office of the Assistant Dean for Undergraduate Affairs in Engineering. If the Assistant Dean's approval is not given, the Plan will be returned to the department and then to the advisor for resolution. If approval is given, the Office of the Assistant Dean will return two approved tentative Plan of Study forms to the advisor. One original will be kept in the student's folder, and a photocopy will be returned to the student.

## Changes

Each subsequent registration period, students must bring their approved Plan of Study to their advisor when they select courses for the next semester. An approved Plan of Study form can be modified and submitted at any time, in consultation with the student's advisor. Problems can be best avoided if changes are reviewed early. No modifications that jeopardize the meeting of requirements will be approved. A revised Plan of Study form may be created either by forming two new originals or by marking the changes on the formerly approved original, with each change initialed and dated by the advisor. If extensive changes are to be made, or if a second revision is necessary, a new Plan of Study form should be submitted following the same process. In the student's last semester, the student must file a "final" Plan of Study form. This form must accurately list all of the courses that were taken to satisfy degree requirements.

# Filling out the Plan of Study Form

The Plan of Study form should be filled out neatly and in ink. All approval signatures and initials should be in ink and dated. Some guidelines follow to assist you in completing the form.

## Expected date of graduation and catalog year

It is important that the intended date of graduation (month and year) be accurately listed, and that the form correctly reflect the catalog year in which the student is filing. The Registrar needs both items to certify the completed degree requirements by the student's graduation date. If the student is using a catalog year other than the one in which they were most recently admitted to the School of Engineering, a form to change the catalog year must also be completed. The change of catalog year form can be found at (http://www.registrar.uconn.edu/change.doc).

## Courses taken

The Plan of Study form must show exactly the courses used to satisfy degree requirements.

### General Education Requirements

For the second language competency line, the words "High School" should be circled if the student has met this requirement in high school. If not, the appropriate courses should be listed with the credits earned.

### Required courses

Required courses are printed on the form. If there are alternatives listed, the course that the student intends to take should be circled (e.g., where it says MSE 201/2101 or 243/2001, one course should be circled).

### Transfer Courses

Transfer courses should be listed on the Plan of Study form, and indicated with a superscript "T". Courses which are the result of Advanced Placement work done in High School, whether through AP Tests results or formal arrangement with UConn (UConn Early College Experience Program formerly UConn High School Coop Program) do not need to be marked with a T and are counted as UConn coursework. Columns for sub-totaling "UConn Credits" and "Transfer Credits" are listed to the right of the form. Students with transfer credits should separate all credits earned at the University of Connecticut from those completed elsewhere, fill in the columns, and sum them across each row.