

This document describes a set of proposed changes to the Software Engineering major as requested by faculty of the Computer Science Department. It provides relevant background, rationale for all the proposed changes, and a comparison with the existing program.

Background

The Software Engineering major was approved by the Faculty Assembly of SUNY Oswego in 2007, and subsequently approved by the State of NY Board of Education, and the Governor, in 2009. A condition of this approval was that the department would first seek, then be awarded accreditation from the Accreditation Board for Engineering and Technology (ABET)¹. ABET is the international accrediting body for Computer Science and Software Engineering programs.

An initial criteria of the ABET accreditation process is the successful graduation of one or more students from the program. To date, the program has had four graduates. The most recent two (Spring 2013 and Dec 2013) graduated completely under the specified program, i.e. without transfer credit and/or waivers for core courses. This will be the first cohort of students that will be reviewed by ABET.

Motivation

The successful completion of our first student cohort means that we can begin the accreditation process, and the department is eager to do so. However, two recent events signaled to us that we must make some modifications to the program in order to ensure that our application for accreditation will be successful.

The first change concerns the number of credit hours. The ABET guidelines state that a program should have at least 31 credits in Math and Science, and 48 total credits in the major. Our original proposal had 28 Math and Science credit hours, and these came largely from cognate requirements. In addition, when our program was first proposed (and approved), we assumed that a student majoring in Software Engineering would take an additional six credits in Math and/or Science under the General Education Guidelines of 2001. However, the SUNY Oswego Faculty Assembly voted to approve a new set of guidelines for General Education in 2013. Under these new guidelines, a student could choose to take no additional Math or Science courses, and this left the Software Engineering major with a potential deficit in this category.

The second change concerns the publication in December of 2013 of a new set of curriculum guidelines for Software Engineering programs, produced by the Association of Computing Machinery (ACM). The ACM is the international professional association of computer scientists, and their recommendations will surely become the expectation for future ABET accreditations (as did their 2004 guidelines). In particular, the new guidelines call for increased focus on Software Quality. The guidelines state,

¹ <http://www.abet.org/about-abet/>

"Software Quality is a pervasive concept that affects, and is affected by all aspects of software development, support, revision, and maintenance. It encompasses the quality of work products developed and/or modified (both intermediate and deliverable work products) and the quality of the work processes used to develop and/or modify the work products. Quality work product attributes include functionality, usability, reliability, safety, security, maintainability, portability, efficiency, performance, and availability"

There are two current offerings, Introduction to Software Engineering (CSC 380) and Software Design (CSC 480), that cover some of the topics outlined in this newly expanded category. However, the department faculty believe that the topics would be best presented and covered in a new course focused specifically on software quality. Such a venue would permit a comprehensive, unifying examination of the area.

The final change concerns the structure of the capstone sequence. The original proposal called for a two semester (6 credit hours) sequence (CSC 495 and 496) devoted to the design and implementation of a large scale software system. However, our experience has shown us that this arrangement is difficult, and in some cases undesirable, for a significant number of students to pursue. Students want more flexibility. They want to be able to expand upon a project begun in one of our Computer Science capstone courses, or enhance a project they undertook during an internship or co-op experience. The proposed change allows students to choose among courses (including internships) under advisement rather than mandating CSC 496 for three of these credits.

Proposed Changes

We first propose expansion of cognate requirements from 28 to 31 credits. The increase puts us at the amount required by ABET. Specifically, the increase comes from the category of cognate electives, and these selections are to be made under advisement.

We also propose the introduction of a new course, Software Quality (CSC 385), that will focus on the topics outlined in the new ACM Curriculum Guidelines for Software Engineering. As discussed, this course addresses a specific need, and demonstrates to ABET that we are adapting to the evolving requirements of the discipline. The course proposal has been submitted to the SUNY Oswego Undergraduate Curriculum Council (UCC) for review.

Finally, we propose to modify our electives requirement and capstone sequence to allow for more flexibility. The CSC 495 capstone course is preserved, but we now allow choice for three of these credits, which in effect increases elective credit requirements. In addition, we move the previous Application Domain sequences to Electives, as it reflects the student's ability to choose their concentration. Finally, we will require that students take enough elective credit to bring their total for Core and electives to 48 credits, as required by ABET.

Comparison to Existing Program (Side by Side)

<i>Existing</i>	<i>Proposed</i>
<p>Software Engineering Major (73-74 cr)</p> <p>A. Core Requirements (39-40 cr)</p> <ul style="list-style-type: none"> • CSC 212 - Principles of Programming credit: 3 • CSC 221 - Foundations of Computer Science credit: 3 • CSC 241 - Abstract Data Types and Programming Methodology credit: 3 • CSC 344 - Programming Languages credit: 3 • CSC 365 - Data Structures and File Processing credit: 3 • CSC 380 - Software Engineering credit: 3 • CSC 480 - Software Design credit: 3 • CSC 495 - Software Engineering Project Seminar I credit: 3 • CSC 496 - Software Engineering Project Seminar II credit: 3 <p>OR</p> <ul style="list-style-type: none"> • CSC 222 - Computer Organization and Programming credit: 4 • CSC 322 - Systems Programming credit: 3 <p>Application Domain Requirements—<i>Select one sequence:</i></p> <ul style="list-style-type: none"> • Human Computer Interaction Sequence <ul style="list-style-type: none"> ◦ CSC 420 - Graphical User Interfaces credit: 3 ◦ CSC 435 - Web Services credit: 3 ◦ CSC 454 - System Simulation and Modeling credit: 3 • Middleware Sequence: <ul style="list-style-type: none"> ◦ CSC 375 - Parallel Computing credit: 3 ◦ CSC 436 - Networked Systems credit: 3 ◦ CSC 445 - Computer Networks credit: 3 	<p>Software Engineering Major (79 cr)</p> <p>A. Core Requirements (30-31 cr)</p> <ul style="list-style-type: none"> • CSC 212 - Principles of Programming credit: 3 • CSC 221 - Foundations of Computer Science credit: 3 • CSC 241 - Abstract Data Types and Programming Methodology credit: 3 • CSC 344 - Programming Languages credit: 3 • CSC 365 - Data Structures and File Processing credit: 3 • CSC 380 - Software Engineering credit: 3 • CSC 385 - Software Quality credit: 3 • CSC 480 - Software Design credit: 3 • CSC 495 - Software Engineering Project Seminar I credit: 3 <p>OR</p> <ul style="list-style-type: none"> • CSC 222 - Computer Organization and Programming credit: 4 • CSC 322 - Systems Programming credit: 3 <p>(Application Domain moved to Elective Requirements)</p>

B. Elective Requirements (6 cr)

Choose from approved list, courses must be different from courses chosen for Application Domain.

C. Cognate Requirements (28 cr)

- MAT 210 - Calculus I credit: 4
- MAT 215 - Introduction to Discrete Mathematics credit: 3
- MAT 220 - Calculus II credit: 4
- MAT 318 - Statistics in the Sciences credit: 3

OR

- MAT 354 - Mathematical Statistics A credit: 3
- PHY 112 - General University Physics I credit: 4
- PHY 213 - General University Physics II credit: 4
- Two additional courses, in science or mathematics, under advisement.
- Note: A C-or better must be earned in all core and cognate courses.

B. Elective Requirements (17-18 cr)

• **Application domain concentration**

Select one of the following concentrations:

- Human Computer Interaction Sequence
 - CSC 420 - Graphical User Interfaces credit: 3
 - CSC 435 - Web Services credit: 3
 - CSC 454 - System Simulation and Modeling credit: 3

- Middleware Sequence:
 - CSC 375 - Parallel Computing credit: 3
 - CSC 436 - Networked Systems credit: 3
 - CSC 445 - Computer Networks credit: 3

• **Other Electives**

Choose elective courses under advisement that bring the total for Core and Electives to 48 cr.

C. Cognate Requirements (31 cr)

- MAT 210 - Calculus I credit: 4
- MAT 215 - Introduction to Discrete Mathematics credit: 3
- MAT 220 - Calculus II credit: 4
- MAT 318 - Statistics in the Sciences credit: 3

OR

- MAT 354 - Mathematical Statistics A credit: 3

- PHY 112 - General University Physics I credit: 4
- PHY 213 - General University Physics II credit: 4

- Three additional courses, in science or mathematics, under advisement.

Note: A C-or better must be earned in all core and cognate courses

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Changes in Resources

These changes do not present an immediate need for additional personnel or capital resources. We will adapt our existing policies regarding faculty staffing of capstone courses and laboratories to effectively increase the number of people eligible for these assignments. This will ease the responsibilities of those faculty who have traditionally staffed these courses, and thus allow them to cover the new Software Quality (CSC 385) course.

Summary

The proposed changes more closely align our program objectives with the expectations of ABET accreditation, and the newly revised ACM Software Engineering curriculum guidelines. In addition, these changes provide more flexibility for students looking for expanded capstone options.

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