

## **Disciplinary Communication Department of Computer Engineering**

### **Mission Statement, Department of Computer Engineering**

*Computer Engineering focuses on the design, analysis and application of computers and on their applications as components of systems. The UCSC Department of Computer Engineering sustains and strengthens its teaching and research program to provide students with inspiration and quality education in the theory and practice of computer engineering.*

### **Program Objective, B.S. in Computer Engineering**

*The UCSC Computer Engineering program prepares graduates for a rewarding career in engineering. UCSC Computer Engineering graduates will have a thorough grounding in the principles and practices of Computer Engineering and the scientific and mathematical principles upon which they are built; they will be prepared for further education (both formal and informal) and for productive employment in industry.*

### **Disciplinary Communication Outcome, B. S. in Computer Engineering**

*Graduates shall have an ability to communicate effectively.*

The B.S. in Computer Engineering is accredited by the Engineering Accreditation Commission (EAC) of ABET, Incorporated ([www.abet.org](http://www.abet.org)). Our mission, program objective, program outcomes, and processes of continuous improvement are documented on our web site, [abet.soe.ucsc.edu](http://abet.soe.ucsc.edu), a collaborative effort of the Baskin School faculty under the exceptional leadership of Professor Tracy Larrabee. As part of our accreditation, we seek to assess and achieve the EAC's requirement that "engineering programs must demonstrate that their students attain the following outcomes:.... (g) **an ability to communicate effectively.**" (*Criteria for Accrediting Engineering Programs, 2008-2009 Accreditation Cycle, ABET Engineering Accreditation Commission, November, 2007, [www.abet.org](http://www.abet.org).*)

### **Course Skills in Support of Communication Outcome**

Our approach to ensuring each graduate's proficiency in communication is documented on our web page dedicated to outcome (g), <http://abet.soe.ucsc.edu/outcomeg.html>. The outcome is supported by seven courses required for the major (computer engineering 80E, 100, 121, 123, 185, and computer science 12a and 12b), as well as many elective courses. The specific skills and core topics supporting outcome (g) are listed in the Extended Course Descriptions for each course, accessible from our ABET website. As an example, Course 185, Technical Writing, a degree requirement since program inception, created by Professor Kevin Karplus and Writing Coordinator Daniel Scripture, and

presently taught by Professor Tracy Larrabee and by Instructor Gerald Moulds, includes:

Required Skills to pass the course

1. Should be able to produce technical documentation for engineers, engineering managers, and other specialized audiences
2. Specific skills include
  - a. ability to produce a document with correct grammar and punctuation with well-formed sentences in appropriate paragraph form.
  - b. ability to produce a well-organized and readable document
  - c. ability to use visuals, including graphs, tables, figures
  - d. ability to produce a document for a specific audience or audiences

Core topics (must be taught)

1. Audience assessment
2. Writing letters
3. Writing memos
4. Writing for multiple audiences
5. Documenting programs
6. Proper citation/plagiarism
7. Using the library
8. Writing formal reports
9. Ethics
10. Oral presentations
11. Peer editing

Further details of the communication-related required skills to pass each course and mandatory core topics of each course are available on the web site.

### **Assessment of Communication Outcome**

The public articulation of program objectives and outcomes, and the ways in which a program seeks to achieve those outcomes, is a fundamental exercise in defining a curriculum. However, such effort may be wasted without methods of assessing achievement of the outcomes and objectives. Hence, good practice, not to mention ABET, requires a process of continuous assessment and improvement.

In the case of the communication skills of our graduates, we have four means of assessing achievement of our desired outcome (<http://abet.soe.ucsc.edu/outcomeg.html>).

First, in a quantitative measure, as part of the required 6-month Senior Design Program, CMPE123A/B, all students complete multiple presentations and a report, and also take part in our Senior Design Contest. In the Contest, a panel of alumni and advisory board members evaluate each project and presentation, specifically including the communications effectiveness of the soon-to-be graduates. All

students must receive a passing grade on their report and presentation to complete this degree requirement.

Second, in a quantitative measure, every student submits a portfolio prior to graduation. In addition to the senior design project report, the students submit two additional course project reports, and write a 2–3 page overview of the projects. We assess these reports to determine our success in achieving our program outcomes, including outcome (g), and to determine areas that need future improvements. Our goal is that all portfolios are assessed to a level of 4 or 5 on the 5-point rubric used to evaluate the portfolios.

Third, in a qualitative measure, our required senior exit survey asks each student to rate their perceived self-efficacy in oral and written communication. Although not objective, our monitoring of these surveys also can alert us to areas that may be advantaged by continuous improvement.

<http://www.soe.ucsc.edu/advising/undergraduate/exit-survey>

Fourth, in a qualitative measure, the department chair undertakes small group exit interviews with every graduating senior as a requirement of graduation. These interviews discuss all aspects of the program, and the chair works to improve issues as they arrive. Our training in disciplinary communication has only been mentioned positively, often even more so by alumni, who with their greater experience, fully grasp the key importance that every engineer be able to communicate effectively.

Our curriculum and assessment processes are themselves closely assessed through regular reviews by ABET. Our next review will take place in Fall 2009. Our previous review resulted in a maximal 6-year accreditation.

### **Resource Implications**

Course 185 is fully integrated within our Computer Engineering curriculum, a necessary requirement for the degree and a necessary prerequisite to our senior capstone experience. Offering the course has significant resource implications; with the exception of our 6-month senior design course, course 185 has the highest instructional cost of any of our courses, including intensive laboratory courses. To ensure sufficient feedback and mentoring of the students, usually including 4 or more native languages, the course is assigned one instructional staff per 20 students. That is, with 45–60 students, we assign one professor and two teaching assistants, as well as one or more undergraduate readers. Enrollments can be high, as 185 is the primary W course within the Baskin School of Engineering, and is a degree requirement for Bioengineering, Bioinformatics, and Electrical Engineering, in addition to our own program, and is taken by many computer science students as well. As a result, we look forward to the campus' continuing efforts to examine the teaching assistant allocation system.

*Richard Hughey, Chair, October 13, 2008*