Computer Engineering Undergraduate Program  
(CpE) Assessment report

During the academic year 2009/2010 the CpE program changed the undergraduate program educational objectives based on recommendations from our ABET accreditation reviewer.

The new education objectives are:

i. Core Knowledge: Our graduates will have careers in computer engineering, or be engaged in a related career path.

ii. Application of Knowledge: Our graduates will apply their knowledge and skills to solve practical engineering problems.

iii. Life-long Learning: Our graduates will continue to develop their skills and seek knowledge after graduation in order to adapt to advancing technology and the needs of society. This may be indicated by the graduate’s pursuit of an advanced degree or other formal instruction, and/or that the graduate has developed a professional specialty.

iv. Professionalism: Our graduates will have the necessary professional skills, such as high ethical standards, effective oral and written communications, and teamwork, to be productive engineers and to advance in their careers.

We conducted two surveys to gather students’ responses regarding the new CpE Program Educational Objectives.

One survey was conducted in spring of 2008, another in spring 2009. ABET visited our department in fall 2009, and we developed the new educational objectives based on that visit. We then conducted another survey this spring (2010), mainly to see whether the new educational objectives were implemented successfully. Questions for all surveys were similar, but not the same. A large number of Alumni did not respond to the spring 2010 survey because of the surveys distributed in the past couple of years. We acknowledge that those numerous surveys probably resulted in a rather low response this year. We will distribute this survey to employers and faculty in the fall semester for comparison. Our baseline for both surveys was 70%.

The 2010 Alumni Survey shows that 69.23% of the alumni are currently employed with a career in Computer Engineering (i). In these tough economic times, we are more than happy to see such positive results. This number nearly reaches our baseline, and in a time of recession we see the percentage as not just a great success, but also a positive sign that this program educates much needed employees.
In the 2008 Alumni Survey for the CpE Program, 68.52% of respondents said they are currently employed as an engineer (i). The year 2008 was a tough economical year as well, and we are pleased to see the number of employed alumni is pushing the baseline by a mere 0.48%. An even greater number responded in 2010 they are currently employed as an engineer (i); 92.31% percent answered this question with yes, which is 12 out of 13 respondents.

In 2010, 61.54% of respondents said they have been promoted in the last five years (i). We regard that number us unusually high, and view it as a sign that the CpE Program is highly successful in giving its students the core knowledge to succeed in an engineering career.

In 2008, 96.30% of alumni said the Computer Engineering Program helped them in an adequate to exceptional way to develop the ability to identify, formulate and solve engineering problems (ii). In 2009, 73% said they have the ability to apply knowledge of science and mathematics (ii). Only 65% said they have the ability to apply knowledge of science (ii). The spring 2009 study also shows that students regard their ability to identify, formulate and solve engineering problems as very high (ii). Percentages ranged from 78% to 88%. In 2010, 100% of all respondents said that they can apply their knowledge and skills to solve practical engineering problems (ii). This extremely high percentage indicates great programmal success when it comes to teaching CpE students how to apply their knowledge and skills to solve engineering problems. The number clearly surpasses our baseline of 70%, and is much higher in 2010 than in previous years. We regard that uptick as a big accomplishment.

In 2008, respondents also had to indicate how well the Computer Engineering Program helped them to recognize the importance of life-long learning and participation in professional societies (iii). Again, the baseline was surpassed, as 79.64% answered they had been adequately to exceptionally well prepared. The Alumni Survey 2010 also asked three questions regarding Educational Objective iii. Five out of 13 respondents (38.46%) said they have pursued a graduate degree since their graduation from CSUS (iii). In combination with the formerly mentioned 69.23% of students working in the field of Computer Engineering (i), we are pleased to see that many students decide to further advance their education. Many pursue a graduate degree in addition to a successful career in Computer Engineering. In addition, 76.92% have pursued other education opportunities such as workshops, conferences, lectures, professional societies, or studied on their own to advance their knowledge (iii). That is 10 out 13 respondents, and the number is well above our baseline. We regard these results as positive. 100% of the alumni questioned for this survey said they think they developed necessary professional skills (iii).

In 2008, 94.44% of students rated their ability to function effectively as part of a multi-disciplinary team to solve problems because of help by the Computer Engineering program as adequate to exceptional (iv). In 2009, students regarded their ability to function on multi-disciplinary teams as good, 60% said the engineering education prepared them in this area (iv).
In 2010, 92.59% of respondents said the program helped them to develop an understanding of professional and ethical responsibilities in an adequate to exceptional way (iv). Again, this is a very good result, especially because this number is up from 2009. In 2009, only 64% said their engineering education prepared them in this area.

The CpE Program regards the results of the 2010 survey as a great success. The numbers indicate that most time the baseline is well surpassed, and oftentimes the numbers are showing an uptick from previous surveys. We are especially proud to see this many students employed despite the nationwide recession. We feel encouraged by the high numbers, and plan to conduct frequent future surveys in order to stay on task with the new CpE Educational Objectives.
CpE Graduate Program Assessment Process

I. General information about the program, e.g., data on students, faculty, staff, facilities, etc. (most of which is supplied by the Office of Institutional Research)

This section details data on students, faculty, staff and facilities. The major sources of information are
(1) the website maintained by and fact books published by the campus Office of Institutional Research (OIR); and (2) the graduate website maintained by the CpE program (http://www.ecs.csus.edu/cpe/new%20cpe%20pages/cpe_ms_program.html). We have also included data on faculty expertise and department facilities in our ABET report submitted in Spring 2009.

The main requirements of the graduate program are as follows:

1) Students should complete a total of 30 units which includes coursework and project/thesis work.
3) Students should select one faculty member as their primary advisor from their area of study, and each student needs to submit an advising form to the department at least once an academic year.

II. A statement of intended student learning outcomes at the program level; methods for assessing them, including the use of direct measures; assessment results to date; and documentation of the use of assessment results in efforts to achieve program improvement (assistance with the preparation of which is available from the University Assessment Coordinator).

The CpE program has developed a detailed and clear assessment plan for the B.S. program. Our M.S. program assessment plan will be modeled on our undergraduate assessment plan. The Program has the following student learning outcomes (SLO) at the program level:

1) A knowledge of mathematics
2) A knowledge of basic engineering
3) The ability to apply knowledge of mathematics, science and engineering to solve problems in CpE
4) A knowledge of core CpE topics
5) The ability to use contemporary engineering techniques and tools for analysis and design
6) The ability to work with modern instrumentation, software and hardware, design and perform experiments, and analyze and interpret the results.
7) The ability to communicate effectively
8) An understanding of professional and ethical responsibility and a broad education to appreciate the impact of engineering solutions in the societal context.
9) Recognition of the need for and an ability to engage in “life-long” learning.
III. The results of a focused inquiry addressing issues of particular interest/concern to the program itself, in the context of what is currently important to the college and university.

The focused inquiry for the graduate program Self-Study focuses on quality and goals of the culminating experience of the students. In the CpE graduate program we have the following two options for students:

1) Plan A or Thesis Option. This option requires students to complete a 5 unit research-level work under the supervision of a primary faculty advisor and two additional advisors.
2) Plan B or Project Option. This option requires students to complete a 2 unit project work under the supervision of a primary faculty advisor and one additional advisor.

The Culminating experience is a direct achievement measure of the educational objectives of the program. The performance of students in the project/thesis is dependent on the training and learning obtained by students in the different courses. Specifically, the projects and theses are supervised by experienced and dedicated faculty in the five areas of specialization, and involve considerable effort in the execution of the projects and also to present a clear and high-quality project or thesis report. In the past, Project and Thesis work has resulted in patents, and publications in peer-reviewed conference proceedings and journals such as the IEEE (Institute of Electrical and Electronic Engineers) and IET (Institute of Engineering and Technology).

The CpE program will continue to improve the level of graduate project and thesis work, in tune with the state-of-the-art industry and research areas of the outside world. The culminating experience is aimed at training our graduate students to contribute effectively in their continuing careers, either in higher research, such as a Ph.D. or in industry. Hence, the program will provide specific measures to keep the quality of graduate projects and thesis at a high level.

IV Achievement of Program Outcomes

In this section we describe the processes to be used to assess the achievement of Student Learning Outcomes (SLOs) in the CPE program. Our ultimate goal is to utilize these assessment instruments to make ongoing improvements to our program. The CPE program performs outcomes assessment at two levels: Course and Program.

Processes Used to Assess Student Learning Outcomes are:

Course Level Assessment (Direct Measurement)

Course Embedded Assessment represents the “bricks and mortar” of our assessment program. Our experience shows that assignments and exams in individual courses provide immediate and valuable feedback to both the student and the faculty. Assignments and examinations including mid-terms and final are required in all courses. In addition, projects, Computer Aided Design and term papers are
required in several classes as appropriate. They allow the faculty to identify any potential problems in related courses, i.e. if the performance of several students in a given exam or assignment indicates that they do not understand a concept they should have acquired in a prerequisite course, that probably indicates a problem with the related course.

We have established a Course Embedded Assessment (CEA) process that focuses on a set of core classes required of all students in our major. Each course has detailed objectives, specific course outcomes, and indicators that are monitored to ensure successful achievement of those outcomes. The Course Coordinators for courses covered by CEA present a report to the Department faculty reflecting on student achievement on the specific course outcomes and course topics, whether prerequisites are appropriate, student reaction to the course, and suggested changes if any.

This process is useful because it enables faculty who are not directly involved in specific courses from the CEA group to get a full understanding of the courses in the CEA group and make any adjustments to their own courses. It allows new faculty and part-time faculty to acquire a thorough understanding of the curriculum and become familiar with the challenges by perusing the annual CEA reports. Also, the process ensures that faculty in related courses interact with each other on a regular basis when preparing the CEA report for a particular course. Equally important, the CEA reports provide the documentation to illustrate how the faculty uses assessment results for ongoing program improvement.

For courses that are not part of the CEA group, individual faculty members who teach the course are responsible for course-level assessment. Each course has clearly defined objectives, a set of measurable outcomes, and contributes to one or more of the program’s Student Learning Outcomes. The faculty member teaching the course is responsible for reporting any major issues that are revealed from outcomes assessment and initiating appropriate changes to ensure that the course objectives are met successfully.

**Program Level Assessment (Indirect Measurement)**

Outcomes assessment at the program level is carried out by using a variety of assessment tools:

1. Student and alumni surveys reflecting on program outcomes.
2. Site visits to industry.
3. Independent assessment by Department-level Industry Representatives.
4. Feedback from College’s Industry Advisory Board.
5. Exit Interviews with graduating seniors.

Since faculty is primarily responsible for assessment, we use faculty surveys to set indicators as appropriate for our program outcomes. In some instances it is more appropriate to use qualitative indicators to assess success of a particular outcome (typically feedback and action items resulting from independent assessment by the Department’s Industry Representatives).

**Assessment Instruments**
We will use the following assessment instruments in our program:

**Surveys of Graduating Seniors:** Graduating seniors are surveyed at the time of graduation for their perceptions about the program’s educational objectives and student learning outcomes, our relative success in achieving those outcomes, and suggestions for improvement.

**Alumni Surveys:** Alumni from our program are surveyed three to five years out to rank the importance of each of our Program Educational Objectives and Student Learning Outcomes in the context of their current professional position and their level of preparation with respect to that objective or outcome.

**Industry Focus Teams Visits:** Faculty teams visit a company or industry that employs several graduates from our program to meet with a group of our alumni. Typically the alumni include recent graduates (1-5 years out), as well as experienced engineers and managers (6-10 years out, 11 years and over). A set of open-ended questions is distributed to the site prior to the visit to provide a foundation for the participants. The interviews are audio taped and placed on the Web for faculty review following the visit. A written transcript is also produced and shared with all faculty members. The reports are analyzed and action items with appropriate timelines are developed for implementation.

**Industry Liaison Council:** The CPE program enjoys a relationship with engineers from industry representing all major areas of emphasis in the CPE program. The program meets with industry representatives biannually and the industry representatives provide the program and the faculty with independent feedback on its efforts to achieve the Program Educational Objectives.

**Industry Advisory Board:** At the College level, the IAB receives reports from each program on a biannual basis and evaluates each program’s success in implementing the strategic plan of the college. The IAB meets in executive session following the presentations and reports back to the Program Coordinators, Department Chairs and Deans with specific recommendations for follow up and action.

**Employer Surveys:** The College’s Career and Placement Office periodically surveys employers and provides salary information and relevant information on upcoming trends and opportunities to the programs.

**Exit Surveys:** Graduating students were surveyed (tables are incorporated in Criterion 4).