

# ANNUAL ASSESSMENT REPORT

ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT

2009-2010

## INTRODUCTION

This annual assessment report details the activities, events, decisions and actions in relation to the process of continuous improvement in the Department of Electrical and Computer Engineering. The following sections discuss curricular changes and updates as well as proposed modifications to the data collection process for assessment within the department.

## CURRICULAR CHANGES

Various constituencies provide inputs to the cycle of continuous improvement in the department. One of the areas where input is sought is in the area of the curriculum. Over the past several years, inputs from students, graduates, alumni, industrial advisors, and teachers have been collected. As data have been collected, the department executive committee, curriculum committee, and assessment committee have discussed with faculty ways to respond to data from the constituents. This year, several changes have been made to the curriculum-- some changes are major, others are minor. This section documents these curricular adjustments. Since some of the changes apply to undergraduate courses that are taken by both electrical engineering and computer engineering majors, the list here has not been separated based on the program.

1. ECE 3710, Microcomputer Hardware and Software. Feedback from students during senior exit interviews indicated that the content of this course was outdated and that this course was not preparing students with a knowledge of modern tools and computer architectures. This course has been re-organized and modernized around the 8051 microcontroller. Modern software tools have been introduced.
2. ECE 5220, Electro-Optical Engineering. The department Industrial Advisory Committee suggested that a course on this topic be added to the curriculum. With their input, a course was developed and added to the curriculum. Based on the required prerequisites, the course is designed for senior-level undergraduates and first-year graduate students.
3. ECE xxxx, Power Systems Engineering. The department Industrial Advisory Committee suggested that, to keep pace with national and world needs, a course on power systems engineering should be added to the curriculum in the department. In response to their suggestion, a course was developed and was taught for the first time during the 2009-2010 year. A permanent course number has yet to be assigned to this course. Initially it was taught as a special topics class.
4. ECE 5460-6460 (cross list) VLSI 1 and ECE 5470-6470 (cross-list) VLSI 2. These courses have undergone extensive updating and revising. Based on inputs from newly hired faculty members, these courses have been re-organized with new up-to-date material and equip students with knowledge of modern design tools. The new courses are entitled "VLSI Design Automation" and "VLSI Design". Also to add depth to the course

offerings in this area, a new course ECE 7430 “VLSI Projects” has also been added. This gives students with interest in this area to pursue depth studies in this area for their graduate degrees.

5. Capstone courses. Capstone courses are junior and senior level classes that have significant design project elements. The projects in capstone courses can be extended into senior projects. This year a new course, Digital Radio, was taught for the first time and six student groups build radio receivers during the course of the semester. The Mobile Robots course was also converted into a capstone course and taught with a significant design project this year.
6. ECE 5720, Computer Systems Programming and Architecture. Using inputs from students and faculty, ECE 3720 was removed and the material moved to and combined with ECE 5720. This change was made to help prepare students for the graduate program in computer engineering.
7. ECE 7860, Computational E&M 1 and ECE 7890, Computational E&M 2. Students and faculty felt that more courses were needed in the electromagnetics area. These two courses replace what was formerly one course in this focus area.

## MODIFICATIONS TO ASSESSMENT DATA COLLECTION PROCESS

This section begins by describing part of the assessment data collection process as it relates to student outcomes. This process is currently under review by the Assessment Committee, and modifications are being considered. The current working model that will be proposed to the faculty is presented at the end of this section.

## CURRENT ASSESSMENT DATA COLLECTION PROCESS

To prepare graduates to attain the program educational objectives, the Electrical Engineering and Computer Engineering Programs within the ECE Department have adopted a set of eleven student outcomes. These coincide with the ABET Criterion 3 Student Outcomes A-K. As it is important to use multiple methods for assessment, both direct and indirect measures are performed as described below.

### INDIRECT ASSESSMENT

Associated with each course in the department are course outcomes. Based on these outcomes, a course may support one or more of the A-K student outcomes. The course-to-outcome map is organized into a table showing which courses support which of the A through K outcomes. At the end of each semester, a course assessment is completed for each course by the course instructor. To be clear, the course assessment evaluates the students as a whole against the subset of A-K pertaining to the particular course. It is quantized to the level of a course and summarizes attainment of the course outcomes on average. In the course assessment instructors also record information about the preparation of students upon entering the course, issues raised in the student course evaluations, and other matters pertaining to the course (what went well/not well, what could be changed to improve the course, etc.). The course assessment provides an indirect measure of student attainment of the course outcomes and the associated student outcomes.

### DIRECT ASSESSMENT

As it is important to have at least one direct measure for assessing each student outcome, in the Fall of 2006 direct measures were put in place. This process was guided by two principles: (1) every student should be evaluated on each of the A-K outcomes; (2) the assessment process should not be overly burdensome on faculty. To satisfy both of these constraints, direct measures, referred to as special assessments, were attached to specific assignments in

specific core classes that all students in both the Electrical Engineering and Computer Engineering programs were required to take (including transfer students) for graduation. Special assessments are usually filled out by teaching assistants, rather than instructors, once the related assignment has been completed. By the use of special assessments, a direct measure was in place for each student for each of the A-K outcomes.

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## DISCUSSION

The Fall 2006 special assessment plan kept the assessment burden low for most faculty because it only affected a few (about seven) core classes. Over time we have learned that the special assessment plan is difficult to maintain. Instructors of core classes have required constant reminding and following up to make sure that the special assignments were given to students and that the special assessment data was collected for that assignment.

Based on this experience, the Assessment Committee is introducing a third principle to guide the implementation of direct measures: (3) to the extent possible, data collection for direct measures should be a natural part of course administration. Even without the special assessments, direct measures are already abundantly available in every course through exams, quizzes, homework, lab reports, project reports, etc. Some of these are graded by the instructor while others are graded by teaching assistants. The Assessment Committee is developing a revised plan for collecting data on direct measures that is guided by the three principles listed above. An outline of this plan is given in the next section. Before implementing this plan, it must be approved by the faculty in the department and the department head.

## PROPOSED NEW ASSESSMENT DATA COLLECTION PROCESS

In the proposed assessment plan as it relates to assessing student outcomes, the student outcomes are divided into two groups: (1) hard outcomes (A, B, C, E, K); (2) soft outcomes (D, F, G, H, I, J). As shown in the course-to-outcome map, the hard outcomes are supported by nearly every course in the curriculum. The soft outcomes are supported by specific targeted assignments in relatively few courses. The soft outcomes will continue to be assessed in the same manner as in the Fall 2006 plan. Collecting direct measures for these outcomes is already a natural part of administering the courses that support the soft outcomes.

The new plan proposes to replace the special assessments of the hard outcomes, which were formerly single point measurements, with a new process in which every instructor of a course supporting the hard outcomes participates in the assessment process each time these courses are taught. Instruments for directly measuring students' attainment of the course objectives are plentiful in each course, and it only remains to collect the data. Therefore, we propose to integrate the collection of this data into the end-of-semester assessment process that is already in place. This keeps the burden on faculty low. Because the process is applied in every course including core courses, every student is assessed on every outcome, keeping in mind that the course outcomes directly support the A-K student outcomes. All that remains to be done is to map the measurement devices already in place in each course to the course outcomes. Then the instructor and/or teaching assistant can record the assessment data at the same time the scores are recorded. The silver lining in this extra bit of effort is that the summary data needed on the old course assessment form can be computed automatically by averaging the student assessments over all the students in a course.