SCHOOL OF ENGINEERING

Report of Assessment Findings & Curricular Improvements
Academic Year 2010-11

Undergraduate Programs

1.0 Overview of Assessment Process & Measures:

Following the unified assessment process (UAP) adopted by the School of Engineering (SOE) in 2005, all engineering departments (i.e. Biomedical-BE, Electrical & Computer Science-EECS, and Mechanical-ME) submitted annual assessment reports of their program outcomes according to guidelines set by the Accreditation Board for Engineering & Technology (ABET). These program specific annual reports are available for review upon request. Details of the UAP are available upon request in Engineering.

In addition to the SOE's unified assessment process, the University as a whole uses select data from the National Survey of Student Engagement (NSSE) to assess its general education goals. All SOE engineering programs use NSSE information to assess our seniors versus seniors at CUA and at our Carnegie Peers.

This engineering assessment report synthesizes and summarizes key aspects of the individual program reports.

2.0 Assessment Findings:

2.1 Program Learning Outcomes-Aggregate Scores

Here we summarize the key findings for each program learning outcome combining all 9 assessment processes adopted by engineering for Engineering and by Department (Table 1 & Figure 1). The expected acceptance threshold level is 3.5 out of 5.

Table 2: Summary of SOE/program assessment by program outcome.

	SOE	BE	CE	EE	CS	ME*
OC1	**4.19**	4.34	4.78	4.25	3.8	3.76
OC2	**4.09**	4.27	3.66	4.3	4.2	4.03
OC3	**3.91**	4.13	3.8	4.1	4.0	3.54
OC4	**3.82**	4.14	3.85	4.1	3.7	3.33
OC5	**3.92**	4.14	3.71	4.25	3.8	3.68
OC6	**3.87**	4.32	3.8	3.8	3.75	3.68
OC7	**4.04**	4.32	4.42	4.1	3.8	3.56
OC8	**3.90**	4.03	4.2	4.0	4.0	3.28
OC9	**3.98**	4.2	3.89	4.2	4.0	3.63
OC10	**3.86**	4.08	3.77	3.75	4.0	3.69

OC11	**3.98**	4.1	3.75	4.3	4.2	3.53

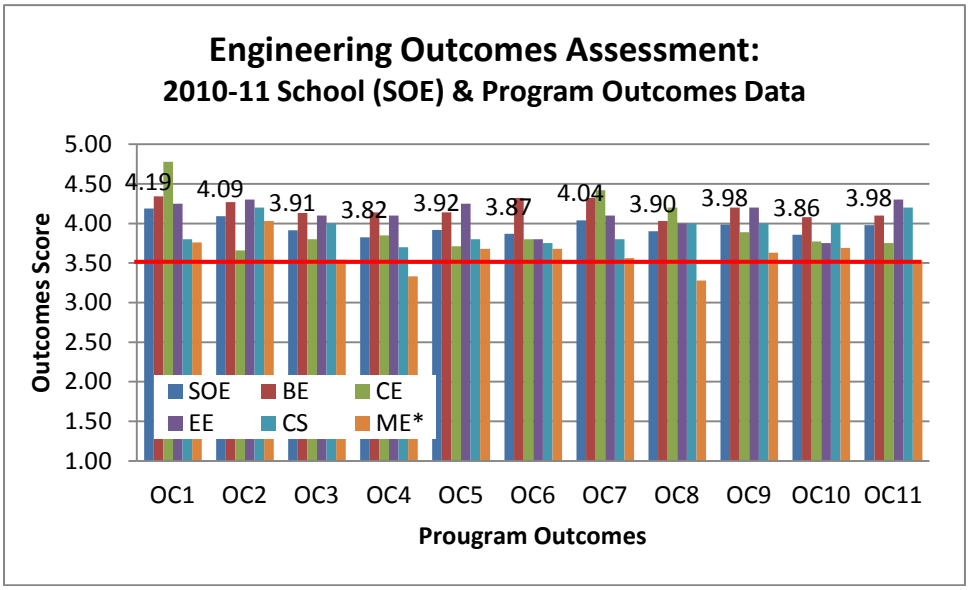

Figure 1: Bar graph of assessment scores by outcome for Engineering (SOE) and by department. Aggregate scores for SOE for each item are labeled.

In summary, the overall assessment data from Table 1 and Figure 1 show that all programs are meeting their program learning outcomes (i.e. scores ≥ 3.5 out of 5.0; red line in Fig.1) with the exception of ME (OC 4; OC 8).

2.2 Summary Data for Program Outcomes Assessment By Process

Process 1-FE Exam: From NCEES reports of the October 2010 FE exam results, 40.8% (n=49) of engineering seniors passed the FE Exam (compared to 29% in 2008; 43.5% in 2009). Students scores on this metric seems to have recovered from the low observed in 2008. The average score for SOE students on the FE examination was a 69.5% (passing=70%), up slightly from 69.0% in 2008. Evaluating each of the 13 topic areas covered in the morning portion of the FE exam revealed topic scores have stabilized over the past 2 examination periods (2009 and 2010). Since curriculums vary widely by department and not all curriculums contain all topics covered by the FE, interpretation of these results are best when done at the department/program level and not as an aggregate at the School-wide level.

Process 2-Course Review with Instructors: Annual course reviews were conducted by the Chair in consult with individual instructors. Several programs mentioned several core courses taught by adjunct professors need to be enhanced. Overall, aggregate scores of all courses reviewed for each year for this process do not indicate any areas needing monitoring and review.

Process 3-Program Senior Survey: Seniors students met with department chairs and were surveyed using Form 5 (Program Graduating Senior Questionnaire). Overall, seniors are quite satisfied with their engineering programs from academic advising, administration support, full-time faculty, curriculum, etc. There continues to be frustration with the strict guidelines for

selection of liberal studies courses within the school. In general for the School, all scores from this process were above the 3.5 out of 5.0 threshold. Within specific departments, some outcomes were below expected levels. In BE and CE, students expressed a lack of opportunities to work on interdisciplinary teams (i.e. across disciplines; OC 4) and also "understanding of bioethics, philosophy and religion to assess broader impacts of engineering solutions in a global and societal context" (OC 8). Through this interview process, CE seniors were below expected levels in their "ability to identify, formulate and solve civil engineering problems" (OC 5) and also in the area of exposure to "modern engineering tools" (PO 11). In BE, due to an abrupt departure of a faculty member who had been advising this group of BE seniors, students were significantly less satisfied with advising than in previous years.

Process 4-Alumni Survey: For CE and ME, alumni were last surveyed during AY 2007-08. BE and EECS re-surveyed its alumni survey during AY 2010-11. In general, alumni are surveyed every 3-5 years. All results from all departments showed results were above the expected 3.5 out of 5.0 threshold level.

Process 5-Employer Survey: For CE and ME, employers of graduates were last surveyed during AY 2007-08. BE and EECS re-surveyed employers of graduates during AY 2010-11. In general, alumni are surveyed every 3-5 years. All results from all departments showed results were above the expected 3.5 out of 5.0 threshold level. It should be noted that response rates from employers of graduates are extremely low (~1-3% at best).

Process 6-Senior Design: Following the rubrics established by SOE's UAP and using Form 10 (A-D), student senior design projects were assessed by internal and external reviewers. For biomedical (BE), electrical (EE) and computer science (CS), assessment data showed all outcomes were well above the 3.5 mark. Several program outcomes from the mechanical (ME) senior design assessment continue to be below the target 3.5 threshold. ME is currently monitoring the ME 441/442 design sequence for corrective actions. Corrective actions will be evaluated and proposed after consultation with the ME faculty during AY 2010-11. In 2010, CE modified its curriculum to provide a capstone design experience for its seniors. This resulted in the introduction of a 2-semester sequence (CE 519-Fall; CE 520-Spring). This change will be monitored by the department.

Process 7-Student Course Evaluations: Student course evaluations are conducted by the University for all undergraduate level courses each semester. This method has been adopted as a part of the outcomes assessment process since before 2001.

As an aggregate of courses, most assessment data for this process from BE, CS, EE and ME were above the expected threshold of 3.5 out of 5. However, at an individual course level, one section of CSC 113 with a new faculty member received extremely low evaluation scores. Some other sections of courses taught by adjuncts also were flagged for monitoring. In AY 2011-12, the School will re-evaluate its utilization of adjunct faculty for core undergraduate at the lower division levels.

Process 8-SOE Senior Survey: Annually, the Dean has conducted surveys of all graduating engineering students utilizing Form 6. This was not completed during AY 2010-11.

Process 9-Advisory Board Survey of Seniors: As part of Engineering's UAP, senior students in each program are interviewed by their respective department's advisory board who then complete Form 3 of the UAP. Results from BE, CE, and EECS show that results from this

process are above the expected 3.5 threshold. ME seniors were not interviewed by their Advisory Board in Spring, 2011.

3.0 Curricular Improvements Resulting from Assessment Results

As a result of our assessment data, the following curricular changes have been made. For each change, processes used to identify weak areas are denoted in parentheses.

1) School-wide changes by Engineering:
   a. ENGR 401 (Senior Seminar) continues to be improved to prepare students for the FE Exam. This course is being taught by Drs. Abot & Brown for Fall 2011 (previously, by Drs. Abot/Tran). Review for the FE Examination has been an expanded emphasis for this offering. (Process 1)
   b. During summer 2011, the ad-hoc committee for UG core curriculum chaired by Dr. J.S. Brown submitted a follow-up report (first version, Spring 2010) focusing specifically on the core engineering curriculum and the impact of FYE on engineering programs. In general, the results indicate the engineering core curriculum remains adequate to address future training of our students. However, the committee suggested re-evaluating liberal studies requirements to provide more "free" liberal studies electives for engineering students. Prior to FYE, students had 4 "free" electives. Currently, there are only 2 (Process 1; Process 8).
   c. In AY 2010-11, SOE hosted it's 3rd annual school-wide Engineering Senior Design Day co-organized by Drs. Kilic, Vignola and Tran. In all, approximately 150 attendees (students, faculty, external guests) attended the event. External reviewers judged the design projects and the top projects were recognized by SOE. This day has become very successful in showcasing to the University community the accomplishments of engineering students. (Process 6;)
2) In biomedical engineering:
   a. Two new faculty joined BE in AY 2010-11. To address the advising concerns, the chair will work with these faculty to train them regarding student advising, curriculum requirements, and overall policies.
   b. Town Hall meetings were established starting in AY 2010-11 and continue where the chair meets with freshmen and sophomores by group in the mid-semester timeframe in the Fall to address any concerns and issues that may arise.
3) In civil engineering:
   a. One new faculty joined the faculty in AY 2010-11. The department will continue to work with faculty to improve the student advising process.
   b. The department will also target improving the integration of "modern tools" (PO 11) into their curriculum.
4) In electrical engineering & computer science:

a. EE has replaced one adjunct professor (for CSC 113) as a result of departmental findings of poor instruction based upon instructor evaluation (Process 2) and student evaluations (Process 7).

5) In mechanical engineering:
   a. The department will continue to monitor the ME 441/442 Senior design projects courses. (Process 6)

3.0 Overall Summary of Assessment and Program Improvements:

Overall, a review of the unified assessment processes (UAP) adopted by the School of Engineering (SOE) to assess its students shows that SOE is meeting its 11 program learning objectives. Each engineering program has used the data from the various assessment processes to make curricular changes for continuous improvement.

Additionally, since 2007, the School of Engineering has utilized information from the National Survey of Student Engagement (NSSE), in addition to the existing unified ABET processes, to assess the our students ability to meet the University's general education goals. A review of the 2010 NSSE data for engineering seniors (from the previous year) shows students:

1. exceeded CUA's and Carnegie Peers in the category related to "proficiency in oral and written communication."
2. exceeded CUA's and Carnegie Peers in the category related to "critical thinking and reasoned analysis."
3. exceeded CUA's and Carnegie Peers in the category related to "understanding of scientific and quantitative reasoning."
4. scored below CUA and Carnegie Peers in the category related to "ability to find information effectively using appropriate resources and technologies, critically assess information, and utilize it in ethical/legal ways."
5. scored below CUA and Carnegie Peers in the category related to "demonstrating knowledge of different cultures and religions."

In summary, as a whole, our assessment reveals that the School of Engineering is achieving its desired learning outcomes.