School of Engineering

Report of Assessment Findings & Curricular Improvements
Academic Year 2009-10
Undergraduate Program

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) except civil engineering 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

Detailed information on each engineering program's assessment findings and corrective action are included in Appendix A-D. 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	**4.01**	4.18	-	4.18	4.08	3.6
OC2	**3.99**	3.98	-	4.15	4.3	3.5
OC3	**4.02**	3.85	-	3.96	4.16	4.1
OC4	**3.87**	4.07	-	3.72	4.0	3.7
OC5	**3.95**	4.03	-	4.05	4.2	3.5
OC6	**3.99**	4.25	-	3.82	4.4	3.5
OC7	**3.91**	4.02	-	3.94	4.16	3.5
OC8	**4.02**	4.05	-	3.82	4.0	4.2
OC9	**3.92**	4.19	-	4.12	3.85	3.5
OC10	**3.89**	4.08	-	3.6	4.12	3.75
OC11	**3.99**	4.03	-	4.16	4.25	3.5

Note: Civil engineering (CE) scores were not available at current writing.

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).

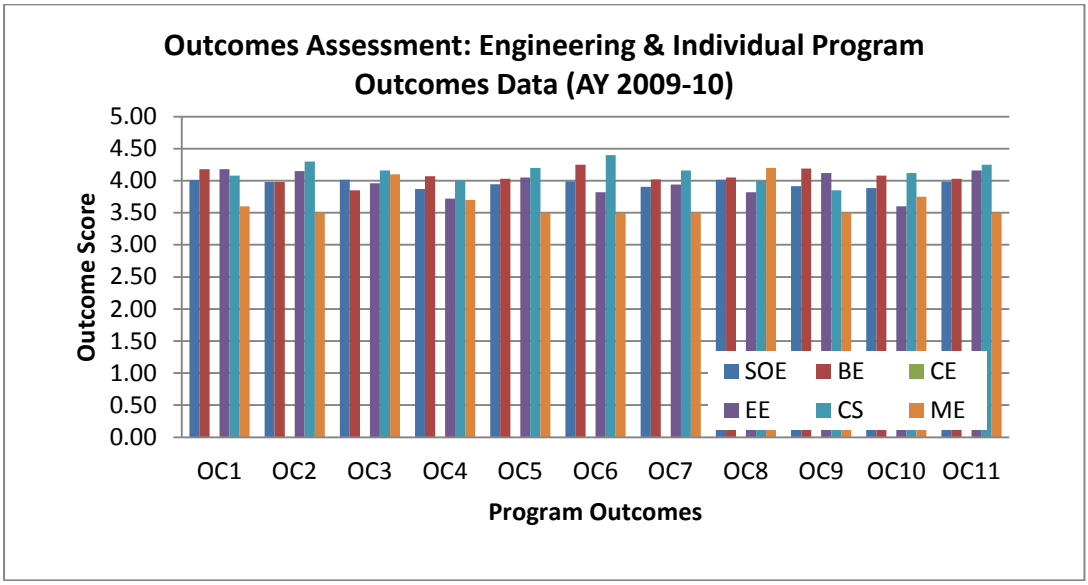

Figure 1: Bar graph of assessment scores by outcome for Engineering (aggregate) and by department.

2.2 Summary Data for Program Outcomes Assessment By Process

Process 1-FE Exam: From NCEES reports of the October 2009 FE exam results, 43.5% of engineering seniors passed the FE Exam (compared to 29% in 2008), a 50% improvement over the previous year. Evaluating each of the 13 topic areas covered in the morning portion of the examination revealed across the board improvements in each category by 25-30 percentage points. Because of 2008 assessment results, the course was restructured in Fall 2009 to enhance the review and preparation for the FE Exam.

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. Also, students commented that several departmental laboratories needed to be upgraded. In summer 2009, several departmental laboratories (i.e. acoustics, structural, thermal) were renovated in mechanical engineering to address findings from students. In general, all scores from this process were above the 3.5 out of 5.0 threshold.

Process 4-Alumni Survey: Alumni were last surveyed during AY 2004-05 for all engineering programs. 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: Employers of CUA graduates were last surveyed during AY 2004-05 for all engineering programs. In general, employers 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 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 fell below the target 3.5 mark. ME is currently monitoring the ME 441/442 design sequence.

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.

All assessment data for this process from BE, CS, EE and ME were above the expected threshold of 3.5 out of 5.

Process 8-SOE Senior Survey: Annually, the Dean has conducted surveys of all graduating engineering students utilizing Form 6. Results are summarized in Figure 2. As the results show, data are above the 3.5 out of 5 threshold for all 11 program learning outcomes.

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 all departments (i.e. BE, CE, EECS, and ME) show that results from this process are above the expected 3.5 threshold.

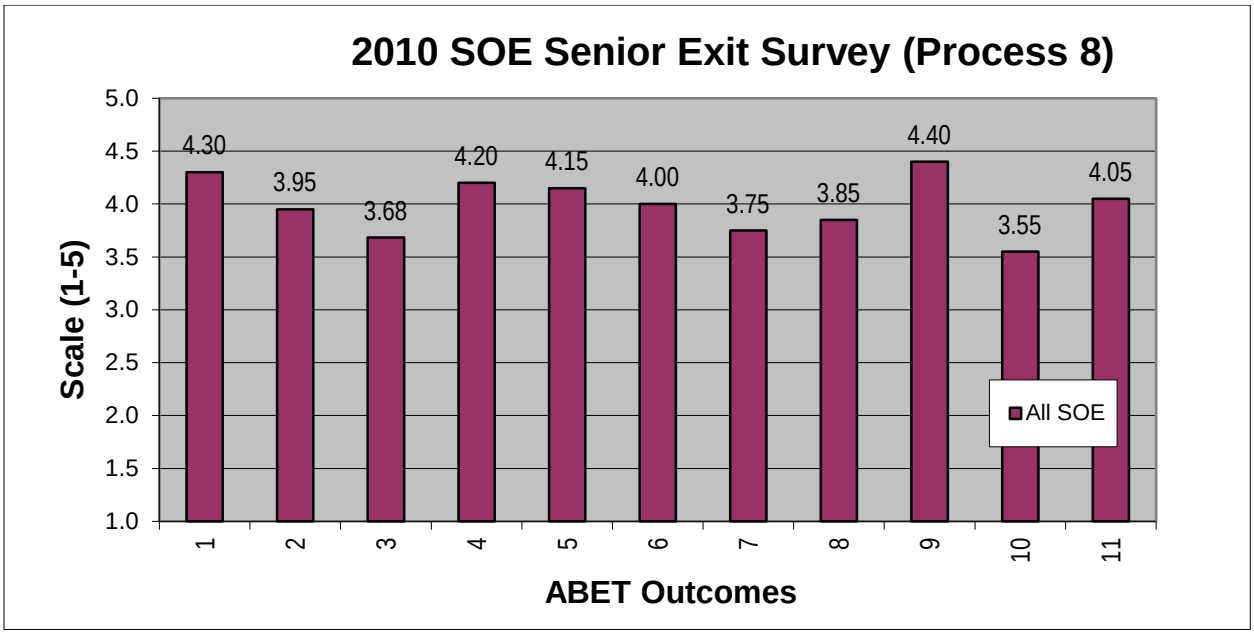

Figure 2: Senior exit survey results collected by Office of the Dean, Engineering.

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. The course now includes weekly homework assignments reviewing strategic exam topics and weekly online quizzes (in Blackboard) featuring exam-like questions. Guest topic reviewers are identified based upon percentage of questions on FE Exam and weak areas from previous years. These modifications provide students practice with exam-like questions. For AY 2010, more review material will be placed online for out-of-class review as well as extra voluntary review sessions. (Process 1)
   b. In 2009, SOE established an ad-hoc committee for UG core curriculum chaired by Dr. J.S. Brown. The committee submitted several implementable items which will be discussed by the Engineering UG Curriculum Committee (Process 1; Process 8)
   c. In AY 2009-10, SOE hosted it's 2nd annual school-wide Engineering Senior Design Day co-organized by Drs. Kilic, Vignola and Tran in which all senior design projects were presented via 15-minute oral presentations and in poster format. 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. Probability and statistics was a weakness in the 2009 FE Exam across all departments. This topic was added to ENGR 401's review seminars. We will also discuss this issue with Mathematics who teaches the MATH 309 course. Statics was also a weak area on the FE Exam and the department will discuss curricular changes to enhance this topic area including review within BE 202 (biomechanics). (Process 1).
   b. Based upon Advisory Board interviews with seniors, we will monitor the senior design course and, related to this, the infusion of professional ethics topics normally covered in this course. In Fall 2009, a new professor (Dr. Nef) taught this course and we will review whether changes in the course content occurred as a result.
3) In electrical engineering & computer science:
   a. EE has replaced one adjunct professor (for ENGR 212) as a result of departmental findings of poor instruction based upon instructor evaluation (Process 2) and student evaluations(Process 7). The chair is working with two other professors (ENGR 342 and ENGR 422-1st time adjunct) to improve instructional methods in these courses.
   b. EE will discuss how to emphasize/accentuate "contemporary issues" in their curriculum. (Process 8)
4) In mechanical engineering:
   a. ME Junior Design course has been redesigned to include more "hands-on" design and also to introduce engineering economics concepts (Process 1; Process 3; Process 8)

b. The Acoustics & Vibrations, Structural Mechanics, and Thermal Sciences Laboratories were upgraded in Summer 2010. (Process 3)

c. 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 2009 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.