Bachelor of Science in Engineering (Civil Engineering)
Calendar Year 2016 Outcome Assessment Report
February 21, 2017

Civil & Environmental Engineering and Construction
Howard R. Hughes College of Engineering
University of Nevada, Las Vegas
Overview

This report summarizes student outcome assessment data collected in calendar year 2016 with the addition of new course assessment data primarily from Fall 2016 collected for the Bachelor of Science in Engineering (Civil Engineering) degree program. The department instituted a revised assessment program after the Fall 2016 Accreditation Board for Engineering and Technology (ABET) visit to address ABET’s concerns about the prior assessment approach.

The revised evaluation process was adopted by the faculty in October 2016 consists of:

1. Outcome assessments will be completed for each calendar year based upon the data available in that year.
2. Course Assessment PLANS will be developed for each outcome to be evaluated in each course scheduled for assessment per the matrix in Table 1 below. The selection of courses and outcomes may vary to ensure all outcomes are covered and assessment tools are appropriate. A PDF-form was developed to improve consistency in assessment plans; a separate plan is required for each outcome to be assessed in a course. Most courses have only 1 outcome to assess.
3. Course Assessment REPORTS will be prepared for each identified outcome at the end of each semester. A PDF-form was developed to improve consistency in assessment reports; a separate report is required for each outcome to be assessed in a course. Most courses have only 1 outcome to assess.
4. All other assessment-related data gathered during the prior calendar year will also be assembled. These include FE Exam results and Graduating Senior Exit Surveys on an annual basis and Alumni and Employer Surveys every third year.
5. The Curriculum and Assessment Committee will synthesize the available data by program-level or university-level outcome. They will present outcome summaries and recommendations at a faculty meeting during the month of February.
6. The Civil Engineering faculty will discuss each outcome individually and recommend appropriate responses and corrective action on an annual basis. The success of modifications made in prior years will be considered in this assessment.
7. The Curriculum and Assessment Committee will prepare an annual Outcome Assessment Report including recommendations and a plan for implementation.

On February 4, 2017, department faculty reviewed the revised plan using 2016 assessment data.

The Bachelor of Science in Engineering (Civil) is accredited by ABET. In its Criterion 3, ABET specifies 11 program-level student learning outcomes (SLOs) that must be addressed by accredited civil engineering undergraduate degree programs. A simplified three-level form of Bloom’s taxonomy is used to describe the intended degree of SLO attainment for each SLO. The levels are, in order of increasing sophistication, Introduction (beginning), Application (middle), and Synthesis (end). The SLO’s are shown below, with the required level of achievement is in parentheses:
(a) an ability to apply knowledge of mathematics, science and engineering (application)
(b) an ability to design and conduct experiments, as well as to analyze and interpret data (synthesis)
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (synthesis)
(d) an ability to function on multidisciplinary teams (application)
(e) an ability to identify, formulate, and solve engineering problems (application)
(f) an understanding of professional and ethical responsibility (application)
(g) an ability to communicate effectively (application)
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (application)
(i) a recognition of the need for, and an ability to engage in, life-long learning (application)
(j) a knowledge of contemporary issues (introduction)
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. (application)

ABET’s program-level SLOs are very broad, addressing both application of general education outcomes and technical aspects of the BS Civil Engineering degree. Department faculty completed a mapping of ABET SLOs to the UULOs, shown in Table 1 below, to facilitate assessment of student attainment of the UULO’s in the major.

**Table 1.** ABET student learning outcomes mapped to the University Undergraduate Learning Outcomes (UULOs).

<table>
<thead>
<tr>
<th>University Undergraduate Learning Outcome (UULO)</th>
<th>Relevant ABET Outcomes</th>
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<tr>
<td>Intellectual Breadth and Lifelong Learning (abbreviation IBL) – Graduates are able to understand and integrate basic principles of the natural sciences, social sciences, humanities, fine arts, and health sciences, and develop skills and a desire for lifelong learning.</td>
<td>a, b, i, j</td>
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<td>Inquiry and Critical Thinking (abbreviation ICT) – Graduates are able to identify problems, articulate questions, and use various forms of research and reasoning to guide collection, analysis, and use of information related to those problems.</td>
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<td>Communication (abbreviation COM) – Graduates are able to write and speak effectively to both general and specialized audiences, create effective visuals that support written or spoken communication, and use electronic media common to one’s field/profession.</td>
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Global/Multicultural Knowledge and Awareness (abbreviation GMK) – Graduates will have developed knowledge of global and multicultural societies, and an awareness of their place in and effect on them.

Citizenship and Ethics (abbreviation CET) – Graduates are able to participate knowledgeably and actively in the public life of our communities and make informed, responsible, and ethical decisions in their personal and professional lives.

c, f, h, j

d, h

Calendar Year 2016 Assessments by Outcome

The Civil Engineering faculty implemented the newly adopted Assessment Plan for uses in Fall 2016. The new assessment plan includes course-level and program-level assessments. The process was shortened somewhat to meet the required timeline, and the data are more limited than they will be in ensuing years. However, the faculty felt that it was important to exercise the new plan to ensure it facilitates outcome assessment and resulting decisions in the manner expected.

For course-level assessments, department faculty mapped required courses to the ABET SLO’s and UULOs (Table 2). Using a standardize Assessment PLAN template they prepared Outcome Assessment plans for each outcome to be assessed in each course per the schedule in Table 2. Instructors for each course use those plans when they teach the course as a template for assessment. After faculty completed their assessments, they reported the results on a similar Assessment REPORT template. Reports were prepared from all courses offered during Fall 2016 and, to facilitate this first round of assessment, some Spring 2016 courses that had not previously not been included in the 2016 ABET Self-Study Report.

Table 2. BSE Civil Engineering Outcome Assessment Map and Calendar

<table>
<thead>
<tr>
<th>CEE Course</th>
<th>Faculty</th>
<th>Sem.</th>
<th>ABET UULO</th>
<th>IBL, ICT</th>
<th>ICT, CET</th>
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The Civil Engineering faculty met on Friday, February 3, 2017 to discuss available assessment data from 2016 by SLO. Prior to that meeting, each SLO was assigned to one faculty. They were provided with all available assessment data and completed questionnaires to summarize the available assessment data and associated targets, analyze that data, propose recommendations for curriculum (and associated) changes resulting from the assessment data, and identify any changes needed to ensure a robust assessment process for that outcome. Each of those faculty served as rapporteur at the faculty meeting for the outcome, took notes on faculty comments and suggestions, and provided revised questionnaires that reflected the overall faculty assessment. Those questionnaires are in Attachment C of this report.

Table 3 summarizes the Civil Engineering faculty’s assessment of each ABET outcome and identifies specific changes to both curriculum and the assessment process to ensure our program is continuously improving the quality of graduates produced.

**Assessment of UULOs**

**A. Intellectual Breadth and Life-Long Learning (ABET a, b, i, j)** – Graduates are able to understand and integrate basic principles of the natural sciences, social sciences, humanities, fine arts, and health sciences, and develop skills and a desire for lifelong learning.

1) **Information Sources:** The civil engineering program uses eight instruments in six categories to evaluate collective student attainment of this UULO from the beginning to beyond the end of the student's academic career, consisting of:

   a. A student survey administered in EGG 307 Engineering Economics, a junior-level course taken by all civil engineering students,
   b. Course-level assessment in CEE 250, using one quantitative homework assignment and a library-based review of technical information relating to the Flint water crisis.
   c. Results of the NCEES Fundamentals of Engineering Examination. All students are required to take the exam prior to graduation. NCEES only allows students with senior status to take the exam.
   d. Internal and external (local industry) evaluations of Senior Design (Capstone) projects completed in the students' final semester,
   e. Graduating senior exit surveys completed in the students' final semester, and
f. Alumni and employer surveys completed several years after graduation.

2) **Results of data evaluation.** The evidence regarding attainment of the Intellectual Breadth and Lifelong Learning UULO is mixed. Of the eight instruments used, four showed collective levels of attainment that met or exceeded desired thresholds, and results from four other instruments did not show collective performance at a sufficient level.

1. **For satisfactory performance,** CEE 250 students exceeded the target of at least 70% of students scoring 90% or higher on both the quantitative homework assignment and the Flint water crisis. Alumni and employer evaluations and student self-evaluations in Senior Design indicate that students are satisfactorily attaining this UULO.

2. However, Fundamentals of Engineering examination data, graduating senior survey results, one of four EGG 307 survey question results, and 5 of 11 external judge evaluations of senior design reports were all below desired thresholds.

3. Overall, the evidence shows that collective performance regarding this UULO needs to improve.

3) **Closing the Loop/Actions Taken.** Programmatic responses to improve student attainment include:

1. Addition of two new required courses, CEE 340, Introduction to Construction Engineering and CEE 371, Numerical Methods in Civil Engineering, that address topics covered on the Fundamentals of Engineering examination and

2. Additional pedagogical emphasis on relevant lifelong learning topics (acquisition and evaluation of information, need for continuing education, and use of additional or new student exercises to improve in-depth analysis of information in three courses, EGG 101, CEE 340 and CEE 498.

**B. Inquiry and Critical Thinking (ABET b, c, e, g, h, i)** – Graduates are able to identify problems, articulate questions, and use various forms of research and reasoning to guide collection, analysis, and use of information related to those problems.

1) **Information sources.** Four types of assessments were conducted to evaluate student attainment of the Inquiry and Critical Thinking Learning outcome:

a. Evaluation of student performance in five required courses. Course work assessments were conducted from the sophomore through the senior year, allowing for an evaluation of progressive development in learning ranging from Beginning (Introductory, course CEE 210) to Middle (Analysis 362, 450) to End (Synthesis, courses CEE 413 and 498).

b. Fundamentals of Engineering Examination performance. Students generally complete the examination in their final semester of study.

c. Graduating senior exit surveys, completed in the final semester of study.

d. Alumni and employer surveys, conducted post-graduation.

2) **Results of data evaluation.** The objective evidence (faculty ratings against rubrics) regarding attainment of the Inquiry and Critical Thinking UULO shows that students
were having difficulty collectively attaining desired performance levels in three of four assessed courses, but that improvements can occur when efforts are made to improve content and pedagogy.

a. Student performance in the courses CEE 210, 362 and 413 all improved when changes in content and pedagogy were applied.

b. Three instruments with seven total data collection events were used in CEE 450. Collective student performance generally attained or exceeded the 70% threshold in five (homework, final exam) of the seven events

i. Four homework problems. Student performance on four CEE 450 homework assignments showed that between 90% and 100% of earned score exceeded the acceptable 70% threshold.

ii. Two midterm examinations. Two midterm problems where majorities of students scored 70% were repeated later in the course. More than 90% of students scored 70% or greater on the repeated problems.

iii. Final examination. More than 70% of students collectively scored 70% or greater on six of eight evaluated final exam problems Thirty-one percent (31%) were below 70% on the 7th problem, and 49% were below 70% on the eighth problem.

c. FE exam results on 20 administrations over the past 10 years are generally below desired thresholds (collective mean scores similar to means for our comparator schools) in most categories except for environmental engineering, where scores have exceeded our comparator institutions over the five most recent administrations. Pedagogical revisions have contributed to recent improvements in collective scores in several categories. Additional work in content and pedagogy is needed to bring collective student up to the same level as UNLV's comparator schools.

d. Instructor ratings of senior design projects indicate that, while a majority of students are attaining the two highest rating levels, collective performance is still not at the desired threshold of 100% of all student design reports, in the two highest levels and a majority of design reports at the highest level.

e. In terms of subjective data (CEE 498, graduating senior, alumni and employer surveys), student self-rating of critical thinking abilities was higher than instructor's ratings. Neither student nor instructor ratings were at the desired threshold, except for one category. Graduating seniors, alumni and employers were generally satisfied with skills upon graduation, but desired thresholds of agreement (generally 4.0 or 4.5 on a 5-point Likert scale, indicating a majority of ratings or “agree” or “strongly agree.”

3) **Closing the Loop/Actions Taken.** Programmatic responses to improve student attainment include; (1) adjustments in required course content and pedagogy to improve FE examination performance and (2) increased emphasis on desired levels of design.
project performance through distribution and discussion of examples of best practices and rating rubrics for best practices early in the semester, especially in the area of articulating design constraints.

C. Communication (ABET d,g,k)– Graduates are able to write and speak effectively to both general and specialized audiences, create effective visuals that support written or spoken communication, and use electronic media common to one’s field/profession.

1) Instruments used. Ten assessments in five categories were conducted to evaluate student attainment of the Communications outcome from the beginning of the students’ academic careers (sophomore level classes, CEE 298 and CEE 250) at the end of their academic career (Unit Operations in Environmental Engineering (CEE 450/L) and Senior Design capstone course (CEE 498). Graduating senior exit survey) and employer and alumni surveys were used to evaluate this UULO after graduation.

a. Evaluation of student performance in two prerequisite courses at the sophomore level. Course work assessments were conducted for CEE 250 – Sustainability in Civil Engineering and CEE 298 – Introduction to Project Management

b. CEE 450 Lab report evaluations

c. CEE 498 Senior Design report evaluations

d. Graduating senior exit surveys, completed in the final semester of study

e. Alumni and employer surveys, conducted post-graduation

2) Results of data evaluation Aggregate average rating scores generally show that

a. Students were able to attain written communications learning outcomes at the level desired by the faculty after receiving considerable feedback from writing evaluators in CEE 210/L and CEE 450/L;

b. Average rating scores on preparation to be an effective team member and working on multidisciplinary teams in CEE 498 indicate that most (80% for effective team member, 90% for multidisciplinary team work) of the students are attaining this outcome at a level deemed satisfactory by the faculty.

3) Closing the Loop/Actions Taken.

a. The department has hired technical writers/editors to work with students to improve their written communication skills. These were first hired in 2013 for CEE 450L, and evaluations have continued every fall since then. Students submit their laboratory reports through Turnit-in® using UNLV’s WebCampus online platform. Each term, student writing performance improves significantly over the first three submitted laboratory reports and then hits a plateau. Subjective student feedback has been very positive; their primary concern was that CEE 450L is a Senior-level course.

b. Based upon this feedback, writing support has been added to CEE 367L in 2014. Student feedback has again been positive with the same concern that “this should begin much earlier in the curriculum.” In Spring 2016, similar support was provided for CEE 210.
c. COM 101 was added as a curriculum requirement in 2013 to provide students with a better foundation for oral communication. Oral presentations are required and rated in CEE 450/L and in CEE 498.

**Actions recommended to be taken in the future.** Increased in-class use of redacted examples of good and poor communications performance is recommended early in each semester, showing redacted reports and speeches and their corresponding rubric ratings to students early in the academic term for both sophomore and senior level classes. Students would be expected to then write their reports or prepare their oral communications and project plans to attain the top-level rubric rating. Evaluated reports, presentations and plans would be returned to the students for revision and resubmission. This process should be reinforced across the curriculum, from beginning to middle to end of students’ academic careers.

**D. Global/Multicultural Knowledge and Awareness** (ABET d, h) – Graduates will have developed knowledge of global and multicultural societies, and an awareness of their place in and effect on them.

1) **Instruments used:** Two assessments were conducted to evaluate student attainment of the Global and Multicultural outcome at the end of students’ academic year (Graduating senior exit survey) and then to beyond the end of their academic career (employer and alumni surveys).

   a. Graduating senior exit surveys were completed in the final semester of study.

   b. Alumni and employer surveys were conducted post-graduation.

2) **Results of data evaluation.** Three of five annual averages for the Graduating senior exit survey (60%) and five of eight recorded response sets for the alumni employer survey (62%) indicate that a majority of both student and alumni self-evaluations and employer evaluations rated program graduates as attaining the multicultural and global UULO at an average level of “agree” or higher.

   However, this level of attainment was still below the program goals, which are that 100% of aggregated student and alumni self-evaluations would exceed a level of “agree,” with no responses below “neutral.” Two of five graduating senior exit survey average scores (40%) and three of eight alumni employer survey average scores (38%) were below the threshold.

3) **Closing the Loop/Actions Recommended to be taken in the future.** Recommended remediation includes

   a. Provide Beginning/Introductory level coverage of multicultural and global issues in the EGG 101 Engineering First-year Seminar,

   b. Emphasize and assess multicultural and global issues at the Middle/Analysis level in the CEE 250 – Sustainability in Civil Engineering Milestone Course, and then

   c. Include global and multicultural criteria in Senior Design for an End/Synthesis level coverage and assessment.
E. Citizenship and Ethics (ABET c, f, h, j) – Graduates are able to participate knowledgeably and actively in the public life of our communities and make informed, responsible, and ethical decisions in their personal and professional lives.

1) Instruments used: Four assessments, two objective and two subjective were conducted to evaluate student attainment of the Citizenship and Ethics outcome from the beginning of the students’ academic career to the end of their academic year and then to beyond the end of their academic career. The objective assessments are evaluation of collective student performance on:

a. An essay in CEE 198 – Ethics and Professional Practice of Engineering usually taken in the freshman or sophomore year.

b. Ethics Section on the Fundamentals of Engineering Examination. The exam is usually taken in the last semester prior to graduation.

The subjective assessments are evaluation of collected data from:

c. Graduating senior exit surveys, completed immediately prior to graduation.

d. Alumni and employer surveys, conducted post-graduation.

2) Results of data evaluation.

a. CEE 198 essay evaluations, and FE exam results, were below desired thresholds

b. two of five graduating senior self-assessments, and two of two alumni self-assessments of design constraints that include ethics were below desired thresholds.

c. Three of five graduating senior self-assessments and four of four employer assessments were above thresholds.

In general, a majority of collected objective and subjective data collected to date indicate that an insufficient number of students are attaining the desired assessment thresholds for the Citizenship and Ethics UULO.

3) Closing the Loop/Actions Taken. CEE faculty have implemented several course and curriculum changes to address these results.

a. Pedagogical revisions include:

i. more ethics in the CEE 250 Sustainability course, both topical coverage and in terms of a student term-project, and

ii. more explicit requirements regarding ethical constraints in the CEE 498 Senior Design capstone course,

b. Content revisions include:

i. dropping the 1 credit CEE 198 course, which was only ½ semester of Ethics, and instead requiring all students to take the 3-credit PHIL 242 Ethics for Engineers and Scientists class,

ii. adding ethics in the CEE 499 – FE exam review course. Assessment data will continue to be collected to determine if these changes improve collective student attainment of the Citizenship and Ethics learning outcome.
Summary evaluation for each UULO

Intellectual breadth and Lifelong Learning – Student performance attains or exceeds thresholds in half (4 of 8) of the instruments used, and is below thresholds in the other half. Faculty responses to the data include, a) adding two required courses with content areas that fill in “gaps” in FE exam coverage and b) additional pedagogical emphasis in skill areas relevant to life-long learning in three existing courses.

Inquiry and Critical Thinking – A majority of responses were at or above desired thresholds in two of four utilized objective assessments. Collective student performance on the FE exam and on senior design reports needs to improve. Faculty responses to data include; a) making content and pedagogical changes in the five surveyed courses and b) continued review of FE exam topics and their incorporation into class learning, using problems similar to FE exam questions on homework assignments and on examinations.

Communication – A majority of responses were above desired thresholds in three of 10 utilized assessments and below desired thresholds in seven of 10 assessments. Faculty responses are to carry out increased use of redacted examples of good and poor performance in classes where writing is emphasized, including CEE 250, CEE 367/L, CEE 450/L and CEE 498, showing redacted reports and speeches and their corresponding rubric ratings to students early in the academic term for both sophomore and senior level classes. Students would be expected to then write their reports or prepare their oral communications and project plans to attain the top-level rubric rating.

Global/Multicultural Knowledge and Awareness – A majority of responses were above the desired 4.0 ‘Agree’ threshold in one assessment, and were below the 100% threshold in one assessment. Recommended remediation includes including more coverage of multicultural and global issues in the

  a. Engineering First-year Seminar,
  b. The CEE 250 milestone course and
  c. The CEE 498 Senior Design course.

Citizenship and Ethics – A majority of responses were above desired thresholds in one assessment, and below thresholds in three assessments. Recommended remediations include pedagogical revisions in CEE 250 and CEE 498, and curricular revisions that include dropping CEE 198 as a required course (PHIL 242 – Engineering Ethics is still required) and adding Ethics content in CEE 499 – FE Examination Review.

Summary of Recommendations for Revisions to the Assessment Process

The faculty evaluation of assessment data produced curricular, pedagogical, and process-related recommendations. A detailed evaluation is presented in Table 3 at the end of this report. Pedagogical revisions include:

  1. Provide feedback to students' first few lab reports and require re-writes to reinforce learning. (Communications UULO, ABET SLO’s B & G)
2. Add a lecture on report writing in CEE 370 whose companion lab CEE 370L is one of the first middle of curriculum labs that students take. (Communications UULO, ABET SLO’s B&G)

3. Re-introduce a peer assessment by team members in Senior Design. (Global and Multicultural UULO, ABET SLO D)

4. Senior Design instructor will emphasize the importance and usefulness of good problem definitions and the process of refining problem definitions. Teams will be required to discuss more with the clients and stakeholders. (Inquiry and Critical Thinking UULO, ABET SLO E)

5. Students will be asked to cite appropriate Code of Ethics canon when completing worksheets for ethics cases. (Citizenship and Ethics UULO, ABET SLO F)

6. Increase the number of essay assignments in Civil Engineering courses. (Communications UULO, ABET SLO G)

7. Increase coverage of the 4 impacts of engineering solutions in CEE 250 Sustainability. (Global and Multicultural UULO, ABET SLO H)

8. Identify opportunities to encourage and assess student participation in professional activities outside of classroom, such as attendance in professional workshops, meetings, etc. (Global and Multicultural UULO, ABET SLO H)

9. Monitor Senior Design teams closely to ensure they are using the appropriate tools to complete their project successfully. (Inquiry and Critical Thinking UULO, ABET SLO K)

Recommendations for improved outcome assessment were also provided. Some of those were:

1. Eliminate assessment for ABET SLO A in CEE 498.

2. Modify assessment strategies for Inquiry UULO and ABET SLO C to collect individual data rather than team data.

3. Use completed team final report in CEE 498 to assess "team performance" instead of only focusing on “Organize and manage workflow” for the Global/Multicultural UULO and ABET SLO D.

4. Test questions in CEE 367 will be modified to attain more granularity of performance for assessing Inquiry and Critical Thinking UULO and ABET SLO E.

5. The Citizenship and Ethics UULO and ABET SLO F will be assessed in PHIL 242 starting in Fall 2017.

6. Modify assessment tools for Communications UULO and ABET SLO G in CEE 210 or CEE 498 to focus on individual performance.

7. The CEE 250 assignment used to assess Global and Multicultural UULO and ABET SLO H needs to be revised to require students to integrate information across at least two of the four contexts identified in this criterion. Then, the rubric needs to be revised to rate collective student performance in attainment of a quality objective for each of the contexts.
9. CEE 450 will assess Citizenship and Ethics UULO, ABET SLO J in future Fall semesters to improve the data set.
10. Assess Inquiry and Critical Thinking UULO, ABET SLO K in CEE 301 in Spring 2017 using an instrument that provides information on individual performance. Modify or eliminate question in the Senior Exit Survey.

The faculty also reached some broader conclusions to be addressed soon:

1. Part-time instructors have been used to teach CEE 241 Statics in the summer session. While the assessment data were not sufficiently granular to clearly identify this as a problem in terms of outcome attainment or student performance on the FE examination, overall FE exam performance indicate that the department should change who teaches that fundamental course during summer.
2. The current Senior Exit Survey needs to be revised. Specifically, it should be shortened and the questions modified to better address issues on which graduates can provide useful input.
3. The proposed revised program assessment plan is workable and will provide adequate assessment data upon which to make future decisions regarding revisions to curriculum and pedagogy.
<table>
<thead>
<tr>
<th>Primary Outcome(s) affected</th>
<th>Level</th>
<th>Outcome Achieved?</th>
<th>Outcome Assessment</th>
<th>Recommendations for continued improvement</th>
<th>Quality</th>
<th>Evaluation of Assessment Data and Recommendations</th>
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</thead>
<tbody>
<tr>
<td>ABET SLO A – apply knowledge; Intellectual Breadth UULO</td>
<td>Application</td>
<td>Yes</td>
<td>Work with Physics department to improve preparation in PHY 180 prerequisite to CEE 241 Statics. Continue focus on CEE 241 Statics as a critical foundation course. Change CEE 241 summer instructors to full-time faculty; continue to focus faculty on using FE results as a basis for on-going course revision.</td>
<td>Satisfactory</td>
<td>Select specific representative data in CEE 241; eliminate team-based assessment in CEE 498.</td>
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<tr>
<td>ABET SLO B – design &amp; conduct experiments; Inquiry &amp; Critical Thinking and Communications UULO’s</td>
<td>Synthesis</td>
<td>Yes</td>
<td>Provide feedback to students' first few lab reports and require re-writes to reinforce learning in CEE 367/L, ; add a lecture on report writing in CEE 370 where CEE 370?L is the first of these labs that students take.</td>
<td>Satisfactory</td>
<td>Assessment data are adequate and appropriate. Most are team-based, but assigned report sections allow for individual assessment.</td>
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<tr>
<td>ABET SLO C – ability to design within constraints; Citizenship and Ethics UULO</td>
<td>Synthesis</td>
<td>Yes</td>
<td>Safety was the primary issue in the team reports in CEE 362; consider changing pavement design lectures with traffic safety. New course in Project Management (CEE 340) starting in Fall 2017 should help with lack of preparation that has been identified in Senior Design. Faculty will discuss the potential for expanding Senior Design to 2 semesters.</td>
<td>Satisfactory</td>
<td>All assessments were team-based; future assessments must collect individual data either in CEE 362 or another identified course.</td>
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<td>ABET SLO D – ability to function multidisc teams; Global Multicultural UULO</td>
<td>Application</td>
<td>Yes</td>
<td>Re-introduce a peer assessment by team members in Senior Design. This helps ensure equitable student performance and grading.</td>
<td>Satisfactory</td>
<td>Use complete final report to assess &quot;team performance&quot; instead of only focusing on “Organize and manage workflow” in the senior design report,</td>
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<td>ABET SLO E – identify, solve engineering problems; Inquiry and Critical Thinking UULO</td>
<td>Application</td>
<td>Yes</td>
<td>Senior Design instructor will emphasize the importance and usefulness of good problem definitions and the process of refining problem definitions. Teams will be required to discuss problem definition more with the clients and stakeholders. For FE exam, recent efforts to improve preparation and ensure that course topics align appropriately with FE exam topics seem to be paying dividends in terms of improved collective performance in some categories. These efforts will be continued.</td>
<td>Satisfactory</td>
<td>Test questions in CEE 367 will be modified to enable more granularity in performance evaluation. For example, instead of assessing all conservation principles in a single problem, test questions will be selected to test each conservation principle separately as applied to engineering problems. Furthermore, some direct methods such as polls during class, and in-class problem solving will be used to collect quantitative data about performance. More HW problems that can provide assessment data will be identified.</td>
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<td>ABET SLO F – professional and ethical responsibility; Citizenship and Ethics UULO</td>
<td>Application</td>
<td>Yes</td>
<td>Students will be asked to cite appropriate code of ethics canon when completing worksheets for ethics cases.</td>
<td>Satisfactory</td>
<td>2016 evaluations were from CEE 198 which will not be offered after Spring 2017. This outcome will be assessed in PHIL 242 starting in Fall 2017.</td>
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<td>ABET SLO G – ability to communicate effectively; Communications UULO</td>
<td>Application</td>
<td>Yes</td>
<td>Essay assignments in more CEE courses. Additional lab report review and rewriting. Some efforts to improve free-body diagram development and problem solution skills within the credits allocated to PHYS 180/L.</td>
<td>Satisfactory</td>
<td>Writing assignments used for assessment in CEE 210 and CEE 498 were team-based assignments; need some individual assignments as part of the assessment.</td>
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<td>ABET SLO H – broad education to understand impact of engineering solutions in 4 contexts; Global and Multicultural UULO</td>
<td>Application</td>
<td>Yes</td>
<td>It is suggested that additional coverage of the 4 impacts of engineering solutions be built into CEE 250, Sustainability, which is the designated course for assessment of this student learning outcome. Starting in Spring 2017, CEE 250 students will submit interim individual essays that will be rated against the same rubric. The rubric was handed out to the students at the beginning of the course. Students will be able to improve their final submission per feedback on the rubric.</td>
<td>Satisfactory</td>
<td>Assessment data needs improvement; Survey data are subjective. Objective data are currently only available for one course for one semester. The CEE 250 assignment needs to be revised to require students to integrate information across at least two of the four contexts identified in this criterion. Then, the rubric needs to be revised to rate collective student performance in attainment of a quality objective for each of the contexts.</td>
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<td>ABET SLO I – Recognition of ability to engage in lifelong learning; Intellectual Breadth UULO</td>
<td>Application</td>
<td>Yes</td>
<td>The department should identify opportunities to encourage and assess student participation in professional activities outside of classroom, such as attendance in professional workshops, meetings, etc. These have normally been done in CEE 298 which is being phased out; it has already been included in EGG 101, but it would be good in other courses as well.</td>
<td>Satisfactory</td>
<td>As CEE 298 is being phased out, activities and evaluation of this outcome should be transferred to CEE 210. It is also suggested that the survey currently being done in EGG 307 be also done at exit interviews. CEE 381 should not be required to assess this outcome.</td>
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<td>ABET SLO J – knowledge of contemporary issues; Intellectual Breadth UULO</td>
<td>Introduction</td>
<td>Yes</td>
<td>While the data collected in CEE 250 were quantitative and useful, the faculty concluded that more assessment data is needed to ensure compliance with this outcome.</td>
<td>Satisfactory</td>
<td>Additional data needed. CEE 450 will assess Outcome J in future Fall semesters.</td>
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Table 3. Synthesis of Spring 2017 Faculty Evaluation of Calendar Year 2016 Student Outcome Assessment Data

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<tr>
<td>ABET SLO K – ability to use modern tools for engineering practice; Communications UULO</td>
<td>Application</td>
<td>Yes</td>
<td>Senior design teams should be monitored for performance during the term with early intervention for those who need it. Emphasize rigor in documenting and sourcing tools and data used.</td>
<td>Satisfactory</td>
<td>While the data are adequate, it is concerning that it is all team based information. This outcome will be assessed in CEE 301 in Spring 2017 on an individual basis. For CEE 210L, outcome K expectations should be revised to “introduction” level. Senior exit survey: Students don’t really have the perspective they need to answer the question as posed; modifications to the survey will be recommended.</td>
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