ABET
Self-Study Report
for the
Environmental Engineering Program
at
Utah State University
Logan, UT, USA

July 1, 2014

CONFIDENTIAL

The information supplied in this Self-Study Report is for the confidential use of ABET and its authorized agents, and will not be disclosed without authorization of the institution concerned, except for summary data not identifiable to a specific institution.
# Table of Contents

BACKGROUND INFORMATION ..............................................................................................................1

A. Contact Information ...............................................................................................................1

B. Program History ..................................................................................................................1

C. Options ...................................................................................................................................1

D. Program Delivery Modes .......................................................................................................1

E. Program Locations ................................................................................................................2

F. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them ..............................................................................................................2

CRITERION 1. STUDENTS .................................................................................................................3

A. Student Admissions ..............................................................................................................3

B. Evaluating Student Performance ........................................................................................4

C. Transfer Students and Transfer Courses ..............................................................................5

D. Advising and Career Guidance .............................................................................................6

E. Work in Lieu of Courses ......................................................................................................9

F. Graduation Requirements ...................................................................................................10

G. Transcripts of Recent Graduates ........................................................................................11

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES ..............................................................12

A. Mission Statement ..............................................................................................................12

B. Program Educational Objectives ........................................................................................12

C. Consistency of the Program Educational Objectives with the Mission of the Institution.. 13

D. Program Constituencies ......................................................................................................13

E. Process for Review of the Program Educational Objectives ..............................................15

CRITERION 3. STUDENT OUTCOMES ..........................................................................................17

A. Student Outcomes ...............................................................................................................17

B. Relationship of Student Outcomes to Program Educational Objectives ............................17

CRITERION 4. CONTINUOUS IMPROVEMENT .............................................................................19

A. Student Outcomes..............................................................................................................19

B. Continuous Improvement ...................................................................................................32

C. Additional Information .......................................................................................................40

CRITERION 5. CURRICULUM .........................................................................................................41

A. Program Curriculum...........................................................................................................41

B. Course Syllabi ....................................................................................................................51

CRITERION 6. FACULTY ................................................................................................................52
List of Tables
Table 1-1: Index Scores for Environmental Engineering Freshmen and Transfer Students ........ 3
Table 1-2: Index Scores for College of Engineering Freshmen and Transfer Students .............. 3
Table 1-3: Index Scores for College of Engineering Transfer Students ........................................ 6
Table 2-1: Membership of the CEE Department Advisory Board .............................................. 14
Table 4-1: Evaluation Schedule for Program Student Outcome .................................................. 19
Table 4-2: Courses Used to Assess Student Outcomes (elective classes are shaded) ................ 20
Table 4-3: Senior Exit Interview Rubric for Student Outcome Self-Evaluation Questions .......... 22
Table 4-4: Student Outcome Assessment Data for Required EnvE Classes ............................... 23
Table 4-5: Aggregated Assessment Results for Required EnvE Classes .................................... 27
Table 4-6: EnvE Graduates Passing FE Exam vs. National Annual Pass Rate .............................. 30
Table 4-7: Response Rate for Senior Exit Interview Self-Evaluation of Outcome Attainment ..... 30
Table 5-1: Environmental Engineering Curriculum (effective Fall 2012) .................................. 42
Table 5-2: Course Mapping to Student Outcomes (elective classes are shaded) ...................... 46
Table 6-1: Faculty Qualifications ................................................................................................ 53
Table 6-2: Faculty Workload Summary (2013-14) ...................................................................... 56
Table 7-1: Summary of Classroom Space used by the CEE Department ................................. 62
Table 9-1: EnvE Courses that Meet Program Criteria #1 ............................................................ 75
Table 9-2: EnvE Laboratory Courses that Meet Program Criteria #3 ......................................... 76
Table C-1: Environmental Teaching Laboratory Equipment ..................................................... 174
Table C-2: Surveying Laboratory Equipment ............................................................................ 175
Table C-3: Hydraulics Laboratory Equipment ........................................................................... 176
Table D-1: Environmental Engineering Program Enrollment and Degree Data ....................... 184
Table D-2: Civil Engineering Program Enrollment and Degree Data ....................................... 185
Table D-3: Personnel ................................................................................................................. 186
List of Figures
Figure 1-1: Environmental Engineering BS Degree Checklist...................................................... 7
Figure 4-1: Aggregated Assessment Results for Required EnvE Classes ........................................ 27
Figure 4-2: Exit Interview Ratings for Outcomes........................................................................ 32
Figure 4-3: Student Peer Evaluations for CEE 3640 Group Projects .......................................... 39
Figure 5-1: Environmental Engineering BS Degree Progression Flow Diagram.......................... 49
Figure D-1: Organizational chart for USU College of Engineering.............................................. 179
Figure D-2: Organizational Chart for the Office of the Provost.................................................... 180
Figure D-3: Organizational Chart for the Office of the President .................................................. 181
BACKGROUND INFORMATION

A. Contact Information
Dr. Craig D. Adams, Department Head
Civil and Environmental Engineering
Utah State University
4110 Old Main Hill
Logan, UT  84322-4110
(435) 797-9115
(435) 797-1185 – fax
craig.adams@usu.edu

B. Program History
Utah State University (a land-grant institution) was founded in 1888 as the Utah Agricultural College. Research began with the inception of the Utah Agricultural Experiment Station in 1890 and with the Engineering Experiment Station in 1917. In 1929 the Department of Civil and Irrigation Engineering was created, and the first student from the department graduated in 1932. The institution became Utah State University in 1957. The first accreditation cycle for the Civil Engineering Program occurred in 1936. The Utah Water Research Laboratory was established in 1963 and had a significant influence on the department in both research and academics. The Department of Civil Engineering became the Department of Civil and Environmental Engineering (CEE) in 1965; the Department of Agricultural and Irrigation Engineering was also established in 1965 and later became the Department of Biological and Irrigation Engineering (BIE). In 2011, the irrigation engineering faculty left the BIE Department and joined the CEE Department.

In 1995, the Civil and Environmental Department began offering an accredited Bachelor of Science degree specifically for Environmental Engineering (EnvE). The most recent ABET review occurred in 2008. The EnvE program consists of seven tenured and two research faculty, and is supported by faculty from the civil engineering (CE) program. The environmental engineering and civil engineering programs within the department are academically interdependent; the EnvE curriculum includes CE courses and the CE curriculum includes EnvE courses.

C. Options
The Environmental Engineering Program consists of a pre-professional program (freshmen and sophomore years) and a professional program (junior and senior years). The Environmental Engineering Program has a single track that focuses on developing engineering proficiency in the field of environmental engineering.

D. Program Delivery Modes
The Environmental Engineering Bachelor of Science program is offered as an on-campus day program. One Co-op course is available as a technical elective. Although the department encourages students to have off-campus Co-op (internship) experiences as part of their degree
program, it is not a program requirement. The curriculum has traditional lecture and laboratory courses, offered weekdays during 15-week semesters. The majority of courses are offered during fall and spring semesters. The EnvE Program currently has one web-based technical elective course that is shared with the University of Texas at Austin. The CEE Department plans to expand the number of web-based technical electives. Courses taught in the summer semester are limited to four to five sophomore and junior year engineering courses.

E. Program Locations

This program is offered at the USU campus in Logan UT.

F. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

During the last accreditation review (2008), the Environmental Engineering program received one concern:

Criterion 3. Program Outcomes This criterion requires that programs demonstrate the students attain outcomes "a" through "k." The assessment program is subjective and relies on perceptional survey responses to measure achievement of outcomes. Performance on the Fundamentals of Engineering exam is an example of a metric-driven assessment process the program is using.

This concern was addressed by implementing a system of quantitative assessment of student outcome attainment as documented in Criterion 4 of this report.
CRITERION 1. STUDENTS

A. Student Admissions

USU and the Environmental Engineering Program have adopted student admission policies consistent with the institution’s mission as both a land-grant and a research university. Students with fewer than 24 semester credits are considered entering freshmen and are evaluated and admitted on the basis of an Index Score, which is a reflection of high school grades and ACT or SAT scores (see Supplement 1). To ensure admission, students should have an ACT composite score of 15 or higher and a cumulative high school grade point average of at least 2.1. Current USU policies regarding the Index Score are that entering freshman residents having an Index Score of 71 or higher are likely to be admitted. Students with an Index Score between 133 and 142 are offered a Presidential Scholarship which covers four years of tuition and fees.

The admission criteria for engineering majors are more restrictive than those for admission to the university itself. Any prospective students with a GPA less than 2.5 in the math, science, and engineering core courses are evaluated individually and are likely to be denied. Thus, it is possible, and in fact often occurs, that a student with an overall GPA of 2.5 or better is denied admission to the College of Engineering programs because of poor performance in the math, science, and pre-engineering core courses.

A history of admission Index Scores for freshmen and transfer students enrolled in the Environmental Engineering Program and the College of Engineering for the past five years are in Tables 1-1 and 1-2, respectively.

Table 1-1: Index Scores for Environmental Engineering Freshmen and Transfer Students

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Index Score</th>
<th>Number of Freshmen and Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2013</td>
<td>115-129</td>
<td>120</td>
</tr>
<tr>
<td>Fall 2012</td>
<td>99-133</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>99-135</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>99-131</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>92-133</td>
<td>111</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>102-128</td>
<td>117</td>
</tr>
</tbody>
</table>

Table 1-2: Index Scores for College of Engineering Freshmen and Transfer Students

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Index Score</th>
<th>Number of Freshmen and Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2013</td>
<td>83-140</td>
<td>116</td>
</tr>
<tr>
<td>Fall 2012</td>
<td>90-140</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>81-140</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>88-138</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>83-138</td>
<td>117</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>83-140</td>
<td>116</td>
</tr>
</tbody>
</table>
Requirements for admission to the university and its individual programs are reviewed annually. At the university level, recommendations that emerge from annual assessments are forwarded to the University’s Executive Committee for consideration. The Admissions Committee works closely with the Vice President for Student Services to ensure that all requirements remain consistent with the institution’s mission and goals. In the College of Engineering, changes and refinements are developed in collaboration with each program and then reviewed by the Associate Deans and the Dean.

B. Evaluating Student Performance

Utah State University uses a standard 4-point grading scale, and its equivalent letter grading system, as the framework for student evaluation. From the 4-point scores, cumulative and major grade point averages are determined at the end of each semester. An undergraduate student who has earned a cumulative GPA of 2.0 or better is considered in good standing at the university. The university’s policies for those cases where a student’s cumulative GPA falls below 2.0 are outlined in the General Catalog and printed in the university’s policies and procedures (see Supplement 2). Briefly, students with fewer than 36 credits are placed on Academic Warning, while those with 36 or more credits are placed on Academic Probation. If the GPA does not improve, the student will be placed on Academic Suspension. Further poor performance will result in the student leaving the university.

Utah State University uses Degree Works, a web-based product that enables students and their advisors to review past, present, and future academic coursework to evaluate which degree requirements are complete and which degree requirements are remaining. In addition, the College has a spreadsheet/progression flow diagram advising system in place to assist students with their academic progress. The prerequisite structure for the Environmental Engineering degree is programmed into Degree Works which blocks students from enrolling in a course without the appropriate prerequisites in place. Thus, at the time of registration, a student cannot register for a course if he or she has not met the prerequisite requirements. If the student is in the prerequisite course at the time of registration, the student is allowed to register for the course. If the student does not meet the “C-” or better requirement for the basic science or engineering courses required in the pre-professional program, the student must withdraw from these basic science or engineering courses. The student is notified that he or she no longer meets the prerequisites for a course and they are asked to come to see an advisor to revise their course schedule. If the student does not meet with an advisor or withdraw from the course that he or she no longer meets the prerequisite requirements, the student is administratively withdrawn from the course.

Prerequisite enforcement has improved over the past several years. But, on some occasions, a student may take a course simultaneous with a prerequisite course if the student’s progress toward graduation will be impeded (where a student must come back one semester for one course). Special permission from the instructor must be obtained by the student. This normally only occurs near the end of the student academic program where there have been prior undue schedule conflicts.

A student in good standing with the university can be in a warned status within the College of Engineering. This disparity is created by the additional requirement that pre-professional Environmental Engineering majors (freshmen and sophomores) must have a cumulative GPA of
at least 2.3 in the core prerequisites (math, science, and pre-professional engineering courses) in order to be admitted to the professional program (junior and senior years). No more than 10 hours of D or D+ credit may be applied toward meeting graduation requirements in engineering/math/science classes. College of Engineering courses may be repeated only once.

College of Engineering advisors review the transcript of each engineering major at the end of each semester to detect any problems with student performance or progress. When necessary, a warning letter is sent to the student and the Environmental Engineering Program is notified. The College of Engineering maintains a complete file on each student as he or she progresses through the program. The Environmental Engineering Program maintains an abbreviated file for each student to assist in faculty mentoring and advising. Students have regular contact with their College advisor, the EnvE program advisor, and other faculty.

C. Transfer Students and Transfer Courses

Transfer students are evaluated and admitted to a non-engineering program at USU by the Admissions Office of the university if they have fewer than 24 semester credits earned at another institution (or at one of USU’s regional campuses) and a transfer GPA of 2.50 or higher. Those with GPAs between 2.20 and 2.49 are considered on an individual basis. However, transfer students who are applying for engineering majors are evaluated and admitted by the College of Engineering Admission Committee comprised of three academic advisors and the Associate Dean for Academic Affairs. The most important part of the transfer process is the evaluation of the transfer credits that will be accepted at Utah State University and subsequently allowed toward the requirements of the Environmental Engineering degree. Over the last 20 years, the Utah System of Higher Education and its member colleges and universities have initiated, monitored, and revised a detailed series of “transfer tables.” These are institutional agreements that are reviewed each year. For the College of Engineering, these tables are programmed into the Degree Works system for the most common “feeder” schools to USU and are also available on the College webpage. See Supplement 3 for a list of schools and a sample transfer table. In a few instances, a student from a college or university that does not have a transfer table agreement wishes to be admitted. Their transcript is evaluated on a case by case basis by the college advisor and the program’s faculty advisor.

There are two common advising problems associated with transfer students: (1) transfer credits from schools operating on a quarter calendar may not accurately map to USU’s semester calendar; and (2) there continue to be variations in the credits assigned to core math, science, and pre-engineering coursework. An example of the first problem is the transfer of a 5-credit quarter hour course to what is generally a 4-credit semester course at USU. Technically, 5 quarter credits transfer to 3.67 semester credits. An example of the second problem is a 3 semester credit course at one school being transferred to USU where the requirements for that subject are 4 semester credits.

The College of Engineering Advisors address these problems using the following approach. When the potential transfer credits are greater than USU’s requirements, the allowable credits toward the Environmental Engineering degree are limited to the USU requirements. When the transfer credits are less than the USU requirements, the student must enroll and pass an equivalent USU course. This equivalency is generally subject by subject, but alternatives are possible when USU elective courses cover the missing material.
The Index Scores and number of students transferring into the College of Engineering over the past five years are provided in Table 1-3.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Index Score</th>
<th>Number of Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>85</td>
<td>140</td>
</tr>
<tr>
<td>Fall 2012</td>
<td>94</td>
<td>129</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>94</td>
<td>138</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>91</td>
<td>127</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>90</td>
<td>124</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>83</td>
<td>127</td>
</tr>
</tbody>
</table>

D. Advising and Career Guidance

The Environmental Engineering Program recognizes two general functions of student advising: (1) academic advising relating to course selection and sequencing, and (2) career guidance and mentoring. Both of these functions occur and are coordinated at both the program and the College of Engineering level. The academic advising process is initiated as the student enters Utah State University. After a student is admitted to the university and the student enrolls in Student Orientation and Registration (SOAR), a Degree Works report is initiated by Registrar’s office to track a student’s academic progress. At the College level, all entering freshman and transfer students are assigned a college academic advisor who acts as such until the student graduates. There are four advisors for the College of Engineering, with one (Kathy Bayn) specifically assigned to Civil, Environmental, International, ROTC students and part of Mechanical Engineering.

In addition to student academic monitoring at the University level (Degree Works), the College of Engineering academic advisor also tracks student progress using an Environmental Engineering baccalaureate degree spreadsheet checklist (Figure 1-1). The checklist program is used each semester by the advisor to help individual students prepare their program of study for the following semester. The results of the program checklist and Degree Works are available to students and advisors; the academic advisor reviews the data in both tracking systems to insure accuracy and resolve discrepancies. The students are asked to bring academic record discrepancies to the attention of their advisor for resolution. The spreadsheet checklist provides students with a list of the completed and current courses, a “progression flow diagram” for completing their degrees, and GPA data. In the event that a student's GPA falls below a 2.0, the spreadsheet checklist automatically displays a warning. The spreadsheet checklist is updated following each semester and each advisement session. The spreadsheet checklist is stored on a server for easy access by the student. The CEE Department also has a staff member (Marlo Bailey) who functions as undergraduate academic advisor for both the EnvE and CE programs. The role of this program undergraduate advisor is primarily related to reviewing programs of study for compliance with graduation requirements.
**Environmental Engineering Bachelor of Science Degree Checklist**

**Department of Civil and Environmental Engineering  Utah State University**

**2013-2014 Catalog - 130 Credits Total**

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr.</th>
<th>Grade</th>
<th>Date</th>
<th>Gr. Pts.</th>
<th>Subs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 2101*</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGL 3800</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4870 (see major)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4880 (see major)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr.</th>
<th>Grade</th>
<th>Date</th>
<th>Gr. Pts.</th>
<th>Subs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth (BAS)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth (BCA)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth (BRU)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth (BLS) BIOL 1010</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth (ESS)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth (EHA) MGT 3110</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr.</th>
<th>Grade</th>
<th>Date</th>
<th>Gr. Pts.</th>
<th>Subs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1210</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2200*</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2250*</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 2400</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 3000 or CEE 3500</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4210</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4215</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4220</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4225</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4250</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 2211</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 2212</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Required for admission to the Professional Program
* Course required for admission to the Professional Program
* A student must earn a "C-" or better in each of the required engineering courses.
* An overall GPA of 2.3 (USU) is required.
* No more than 10 credits of "D" or "F" may be applied toward meeting graduation requirements.
* Only three required or elective courses completed as a part of a professional can be repeated in order to meet graduation requirements.
* MATH 1210, CEE 1100, and CEE 2240 have fundamental math prerequisites or other appropriate test scores (see current USU catalog).

**Technical Electives/Senior Design (7-8 Cr.)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE Tech. Elect.</td>
<td>3</td>
</tr>
<tr>
<td>CEE Tech. Elect.</td>
<td>2</td>
</tr>
<tr>
<td>CEE Tech. Elect.</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total Credits**

- Pre-Professional GPA > 2.3
- Upper Division Eng/Math/Sci GPA > 2.0
- Overall GPA > 2.0

**Figure 1-1: Environmental Engineering BS Degree Checklist**
There are four special cases, described below, where the advisors play a particularly important role in promoting quality in the Environmental Engineering Program.

**D.1 Pre-Professional Academic Discipline.** Utah State University’s BANNER system includes features that allow an advisor to place a “registration hold” on student registration where academic standing is at the warning or probation stage. An automatic hold is placed on registration if a student has not declared a major by the time he or she has earned 60 semester credits. The system also automatically “locks-out” registration into courses for which the prerequisites have not been previously taken and passed. In all of these cases, the college advisor is authorized to release the registration hold after a face-to-face consultation with the student. A student may appeal an advisor’s decision, in writing, to the Associate Dean for Academic Affairs. An appeal in this circumstance is rare and has not occurred in the interval since the last ABET visit.

**D.2 Application to the Professional Program.** When students have completed the pre-professional requirements (generally at the end of the sophomore academic year), they formally apply for admittance to the professional program (encompassing the junior and senior academic years). If their records satisfy all of the pre-professional program criteria, the advisors are authorized to approve the professional admission. In a few cases, a student in good standing may lack one or two pre-professional requirements and the advisors may allow enrollment in some professional level courses for one semester while the pre-professional requirements are completed. These situations are evaluated on a case-by-case basis and in no cases are professional level courses allowed if the prerequisites are not satisfied.

At the program level, the criteria with which the College advisors evaluate performance, schedule coursework, evaluate applications to the professional program, and address other aspects of student advising, are defined by the faculty of the Environmental Engineering Program. A detailed summary of these requirements is published in the on-line General Catalog and included in Supplement 4. Occasionally when a student fails to meet these criteria, then the application for admission to the professional program is denied by the academic advisor. The academic advisor is not authorized to admit a student to the professional program who is not in good academic standing. A student thus rejected is invited to appeal, in writing, to the Associate Dean for Academic Affairs. The Associate Dean for Academic Affairs evaluates the student record, considers the written appeal, meets with the student when necessary or desired, meets with the Department Head or representative and then makes a final admission or denial decision.

**D.3 Professional Academic Discipline.** As noted above, a student’s GPA in math, science, and pre-engineering core courses must be at a minimum of 2.3 to enter the professional level program of Environmental Engineering. Once admitted, a student must maintain a cumulative GPA of 2.0 per university graduation requirements, an upper division GPA of 2.0 (math, science and engineering courses), may not repeat more than three courses in the professional program, and may have no “D” or “D+” grades. Occasionally students fail to meet one or more of these standards and are notified by the College Advisor that they are no longer eligible for graduation from the program. These students are further advised that they will need to seek a program more suitable to their talents. This notification may be appealed first to the Department Head or
his/her delegate within the program faculty and then to the Associate Dean for Academic Affairs. Exceptions may be granted when the academic standing is adversely affected by severe medical or emotional problems and are documented by a licensed medical or psychiatric professional.

**D.4 Career Guidance and Mentoring.** Throughout a student’s academic career the responsibility for career guidance and mentoring rests with the program faculty. This takes the form of student-faculty discussions, professional society engagement, internships, and undergraduate collaborative research. When an EnvE student is admitted into the Professional Program (section D.2), the College of Engineering assigns a faculty mentor for each student. Currently, since the program is small, Dr. Laurie McNeill serves as faculty mentor to all EnvE students. Students meet with their faculty mentor annually or more often as needed to discuss some or all of the following: course options, program-of-study options, internships, career paths, and graduate studies. Students who engage in the optional Undergraduate Research Program interact very closely with faculty research mentors.

Students are also guided and mentored by faculty and fellow students through participation in extra-curricular activities such as student chapters of the American Society of Civil Engineers (ASCE), Engineers Without Borders (EWB), and the Water Environment Association of Utah (WEAU). There is also an active club called the Society of Environmental Engineering Students (SEES) through which students attend professional meetings, take tours of local engineering facilities, and host guest speakers.

During their senior year, all students participate in a capstone-senior design course (CEE 4880) in which, as a team (four to five students per team), they conduct a civil or environmental engineering design project that features multi-disciplinary components (e.g., structural, hydraulic, geotechnical, environmental, and/or transportation). Each student team is assigned a faculty mentor and a practicing engineer mentor. Students receive guidance and mentoring from both mentors with respect to their project; mentoring and guidance related to professional engineering practice is also available to the students via their practicing engineer mentor.

EnvE students are also encouraged to do a co-op/internship. There are two types of internships: informal and for credit. The internship program offers work experience, full or part-time directly related to a student’s field of study. An EnvE student can earn up to 3 credits toward their degree in by doing an internship. The purpose of an internship is to help a student gain technical, critical thinking, and communication skills, and to learn standards of participation, responsibility, and time management. Internships can provide students the opportunity to apply their knowledge and skills in real world environments. Internship experience increases and expands the opportunities for enhanced full time employment after graduation. Students may work with the EnvE program internship advisor (Dr. Ryan Dupont, see Criterion 5.A), their faculty mentor, the College of Engineering internship coordinator (Kristina Glaittli), and Career Services to be aware of and to secure an internship.

**E. Work in Lieu of Courses**

There are several ways that a student can take an examination to earn credit towards a degree at Utah State University. They are: AP (College Board Advanced Placement Examination), CLEP (College-Level Examination Program), IB (International Baccalaureate Examination),
ACT/SAT Proficiency Examination, and Credit by Examination. Specifics of credits available from each examination are provided in Supplement 5 and summaries are given below.

Advanced Placement (AP) examinations are offered at the high school level only. A variety of examination areas are available, but not all high schools offer all available AP examinations. Generally, the major areas chosen include English, American history, mathematics, chemistry, and physics. Students may receive 3 to 10 credits for a composite score of 3, 4, or 5 on any Advanced Placement examination. Earned credits may be applied toward the University Studies requirements and may also be accepted as equivalent to specific courses.

CLEP examinations were designed for students who wish to utilize previous knowledge and experience in lieu of required coursework. CLEP is a national program of credit-by-examination, allowing students to obtain recognition for college-level achievement. Credits may be acquired through the CLEP examinations. These credits may be used to fill General Education Requirements and may also be accepted as equivalent to specific courses.

The IB program is recognized by Utah State University. Students that have been awarded an IB diploma can be awarded up to 30 credits. These credits may be appropriate for Breadth and Communications Literacy requirements. Students who have not completed an IB diploma may receive 3 or more up to a maximum of 30 credits for scores of 4 to 7 on “standard- or higher level” exams. Each student’s transcript is evaluated based on the courses completed or scores achieved.

ACT test or SAT test scores may be used as a placement tool for recommending the level of courses to be taken. Students may not receive college credit for ACT/SAT scores, but those scores may waive a requirement. An ACT English score of 29 or higher, an SAT Critical Reading score of 640 or higher, or a score of 3 or higher on the AP English Language exam or the AP English Literature exam will waive the ENGL 1010 requirement and qualify a student for placement into ENGL 2010.

Credit by departmental examination is available. A matriculated student in good standing with the knowledge and skills taught in a university course may qualify to take an examination for credit. Departments determine if a course is appropriate for challenge.

The CEE Department does not allow work experience or military service for credit toward the baccalaureate degree in Environmental Engineering.

**F. Graduation Requirements**

The graduation process initially starts when the student enters USU. At the time of admittance, a Degree Works report is generated for each student. In addition an advising spreadsheet is initiated. As students progress, their Degree Works report and the advising spreadsheet are monitored by both the student and their advisor.

All students anticipating graduation from the Environmental Engineering Program must document that they have completed all of the graduation requirements of both Utah State University and the program. This documentation is provided within the data in an official transcript, Degree Works and where applicable, the allowable transfer credit mapping. An advising spreadsheet checklist is used by the College and the CEE Program Advisor to concurrently summarize a student’s progress in the program. Advising for graduation is a review of the advising spreadsheet checklist, the Degree Works report, and a plan for completion.
A four-level process is used to ensure that all graduation requirements are met: (1) the student’s advising spreadsheet and Degree Works report, (2) the Environmental Engineering Program, (3) the College, and (4) the University. During the semester prior to the anticipated graduation, the student makes an on-line request to the Registrar’s Office for graduation application. This application is filled out by the student and the EnvE Program Advisor, then reviewed first by the Department Head or designate, and then by the College of Engineering academic advisor. Prior to its final submission to the university, the application is signed by the Dean or designate. This process has strategic redundancy built in so that there are multiple checks and reviews of graduation requirements.

The demographics of engineering students at Utah State University are interesting. Nearly 60% of the students interrupt their studies for a two-year church service assignment and a number volunteer for military service. Most engineering majors are married by their senior year and work off-campus at least part time. The result of these dynamics is that the average duration of the baccalaureate degree is about six years. In this timeframe a number of program changes are likely. The graduation requirements for an individual student are those that are in place when he/she enters the professional program and, thus, may be at some variance with the requirements defined in the USU catalog at the time of admission. These variances are detailed in Degree Works, on the advising spreadsheet checklist, and graduation application. These variances or exceptions are part of the program and College validation and are carefully scrutinized.

The degree awarded at graduation is a Bachelor of Science in Environmental Engineering.

G. Transcripts of Recent Graduates

The Environmental Engineering program will provide transcripts from some of the most recent graduates to the visiting team along with any needed explanation of how the transcripts are to be interpreted.
CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

Utah State University Mission Statement

The mission of Utah State University is to be one of the nation's premier student-centered land-grant and space-grant universities by fostering the principle that academics come first, by cultivating diversity of thought and culture, and by serving the public through learning, discovery, and engagement.

College of Engineering Mission Statement

The mission of the USU College of Engineering is to foster a diverse and creative learning environment that will empower students and faculty with the necessary knowledge and facilities to be international leaders in creating new technologies and services that will improve tomorrow’s economy and environment.

B. Program Educational Objectives

Program educational objectives (PEOs) are broad statements that describe what graduates are expected to attain within five years of graduation. The PEOs support the mission of the institution and are based on the needs of the program’s constituencies.

The PEOs for the Environmental Engineering Program that within five years of graduation:

PEO 1: Graduates will be successfully employed in environmental engineering or related careers and will become independent thinkers and effective communicators, team members, and decision makers.

PEO 2: Graduates will incorporate economic, environmental, social, ethical, and sustainability considerations into the practice of environmental engineering and will promote public health and safety.

PEO 3: Graduates will continue engagement in life-long learning to improve their professional knowledge and skill level by pursuing advanced degrees or additional educational opportunities through coursework, professional conferences and training, or participation in professional societies.

PEO 4: Graduates will pursue professional licensure or other appropriate certifications.

The PEOs are posted on the CEE department website (see Supplement 6) and in the USU General Catalog (see Supplement 4).
C. Consistency of the Program Educational Objectives with the Mission of the Institution

The mission of the university emphasizes academics, diversity, and service. The Environmental Engineering Program PEOs support USU’s mission of continuous learning, diversity of thought and culture, and successful careers.

PEO 1 focuses on students attaining career success. Primary indicators of career “success” include a good knowledge of fundamental engineering principles, good problem-solving skills, effective oral and written communication skills, and effectively working as part of a team. Successful development of these skills is dependent upon, and an indicator of, a solid educational foundation. In addition to experience in the workplace, post-graduate degrees in environmental engineering are another effective means for developing these professional skills and serve as an indicator of career success.

PEO 2 focuses on cultivating diversity of thought. Indicators of successful diversity of thought cultivation are solutions to environmental engineering problems that extend beyond accurate engineering calculations and implementation of standard practices. Sound environmental engineering solutions will incorporate societal and environmental considerations, as well as sustainability. Ethical behavior is also a key component of a successful career.

PEO 3 focuses on success academically (PEO 1) and in engineering service. During the pursuit of an academic degree, students must gain the ability to learn and apply information and skills related to their field of practice, even if not explicitly taught while in the academic program (i.e., life-long learning). Life-long learning is essential for keeping up with improvements in standard engineering practice and productivity tools (technology) as well as diversifying engineering skills and knowledge base. Life-long learning can be enhanced/supported through participation in professional societies and training resources as well as through independent study of professional/research literature.

PEO 4 primarily addresses the University’s mission statement on service. The ability of a practicing environmental engineer to give service to their constituency and employer is significantly enhanced by obtaining/maintaining professional licensure and/or other appropriate certifications. The knowledge and experience required to obtain professional licensure is also the knowledge and experience that help assure safe and appropriate solutions to society’s infrastructure needs.

D. Program Constituencies

The constituencies of the program are: (1) the students in the program, (2) the faculty that support the program, and (3) the industries/organizations where our graduates are employed.

PEOs and the Needs of Students

Students attend college to prepare for careers. Therefore, students need a solid education in the fundamentals of math, science, and engineering followed by focused education in the depth areas of this program. Besides a solid background in theory, students need to develop skills required for engineering practice. This program’s four PEOs focus specifically on requirements for successful careers in environmental engineering for graduates.
**PEOs and the Needs of Faculty**

Faculty needs relate to their teaching and research roles. All faculty members in the Environmental Engineering program are expected to teach courses and to maintain an active research program. Productivity in teaching and research, much like productivity in a company, depends upon the preparation of the participants. Undergraduate and graduate students engage with faculty teaching and research activities and students often have the opportunity to work as teaching assistants or course graders as well as participate in research projects. The knowledge and skill sets of student teaching assistants and researchers are critical to the success of the project. Therefore PEO 1 supports the needs of faculty just as much as it supports the needs of industry. PEOs 2 and 3 are especially relevant in research where the goal is to advance the state of knowledge.

**PEOs and the Needs of Employers**

Employer representation is obtained through the CEE Department Advisory Board, which currently consists of the individuals and companies shown in Table 2-1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marv Allen</td>
<td>Hansen, Allen &amp; Luce</td>
</tr>
<tr>
<td>Mark Bowen</td>
<td>CH2M Hill</td>
</tr>
<tr>
<td>Carlos Braceras</td>
<td>Utah Dept. of Transportation</td>
</tr>
<tr>
<td>Shelley Dyer</td>
<td>USU Research Foundation</td>
</tr>
<tr>
<td>Jon Ginn</td>
<td>Select Engineering Services</td>
</tr>
<tr>
<td>Barbara Hall</td>
<td>Hill AFB, Environ. Mgmt.</td>
</tr>
<tr>
<td>Dee Hansen</td>
<td>HDC Engineering</td>
</tr>
<tr>
<td>Cheryl Heying</td>
<td>Dept. of Water Resources</td>
</tr>
<tr>
<td>Brandon Jones</td>
<td>Jones &amp; Associates</td>
</tr>
<tr>
<td>Adam Murdock</td>
<td>CH2M Hill</td>
</tr>
<tr>
<td>Zan Murray</td>
<td>JUB Engineering</td>
</tr>
<tr>
<td>Mark Nielsen</td>
<td>City of Logan</td>
</tr>
<tr>
<td>Larry Peterson</td>
<td>Kleinfelder &amp; Associates</td>
</tr>
<tr>
<td>Rick Rosenberg</td>
<td>Rosenberg &amp; Associates</td>
</tr>
<tr>
<td>Boyd Wheeler</td>
<td>HDR Engineering</td>
</tr>
<tr>
<td>Brent White</td>
<td>ARW Engineers</td>
</tr>
</tbody>
</table>

The needs of industry are complementary to the needs of students. Students have knowledge, skills, and an increased ability to learn; students need jobs. Employers have jobs and need qualified engineers. Because the PEOs are adapted to meet the needs of students, the PEOs automatically meet the needs of industry. Employers need engineers who are prepared to add value when hired and who make increasing contributions over time. This is made possible when students leverage their formal education and training by gaining new knowledge and skills over time. All four Program PEOs focus on what new program graduates know and what they can do, as well as their potential for further learning and skill development.
E. Process for Review of the Program Educational Objectives

The PEOs of the Environmental Engineering program are reviewed regularly by all of the constituents. The paragraphs below describe the roles of the constituents.

Faculty

The EnvE faculty have the collective responsibility for establishing the PEOs. The CEE Department Assessment Committee is allocated time on the agenda for faculty meetings each month. As needed, proposals to modify the PEOs are presented to the faculty at these meetings by the Assessment Committee. Following parliamentary procedures, motions are made, discussed, and voted on.

The annual CEE Faculty Retreat is a day-long faculty meeting held in August just prior to the start of each school year. The Assessment Committee is allocated time on the retreat agenda. Each year the assessment processes in the department are reviewed. This provides opportunities to instruct newly hired faculty about department assessment processes and provides reminders about the process to faculty not involved in the day-to-day activities of the Assessment Committee. The PEOs are reviewed and discussed every year by the faculty at the retreat. The department mission statement is also reviewed and the consistency of the PEOs with the mission statement is discussed.

Students

Beginning in 2014-2015, the PEOs will be presented to the students in the Freshman Orientation course (CEE 1880) to help emphasize the broader educational perspective associated with knowledge and skillsets that will form the basis for a successful engineering career. The PEOs will also be reviewed with graduating seniors as part of the exit interview process as a reminder of the additional professional development goals that follow completion of the undergraduate EnvE program. Although these activities are mainly intended to inform the students about the PEOs, if students have comments on the PEOs, that feedback will be gathered and reviewed by the Assessment Committee each year.

Employers

The Advisory Board meets once a year most years. Many members of this group of professionals are alumni of our program and are relied upon for input and feedback with industrial perspective. Before implementing changes to the PEOs, we solicit their opinions on proposed changes. Due to the diverse needs of the companies and organizations represented on the Advisory Board, a multitude of views are expressed and discussed. This process has helped us arrive at the current PEOs. In many cases, members of the Advisory Board are managers at companies where our new graduates work. Thus, they are uniquely positioned to provide insights on how graduates of our program are performing in their organizations. This information is presented to the faculty during faculty meetings, and this information is forwarded to the curriculum committee where curriculum changes can be considered to implement changes as needed.

Recent History

During the Spring 2013 semester, the PEOs were modified. The previous PEO statement, which was presented in paragraph format, was broken up and re-formulated into the four PEOs
listed in Criterion 2.B of this report. The new format and wording provide better mapping to Student Outcomes. The PEOs were presented, discussed, and unanimously ratified by the faculty at a faculty meeting on April 24, 2013 and by the Advisory Board at an annual meeting November 15, 2013. The assessment data on the departmental website and University General Catalog (online) have been updated to reflect these changes. As discussed above, the PEOs will be presented to the freshman and senior classes starting in the 2014-2015 school year for discussion and feedback.
CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

The Environmental Engineering Program uses 11 student outcomes to prepare graduates of the program to attain the program educational objectives. The student outcomes are:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(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
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

These student outcomes are posted to the CEE department website (see Supplement 6) and in the USU General Catalog (see Supplement 4).

B. Relationship of Student Outcomes to Program Educational Objectives

All of the Student Outcomes support one or more of the Program Educational Objectives as outlined in Table 3-1.

<table>
<thead>
<tr>
<th>PEO</th>
<th>Student Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>PEO 1 – successful employment</td>
<td>✓</td>
</tr>
<tr>
<td>PEO 2 – incorporate relevant considerations</td>
<td>✗</td>
</tr>
<tr>
<td>PEO 3 – engage in life-long learning</td>
<td>✗</td>
</tr>
<tr>
<td>PEO 4 – professional licensure/certification</td>
<td>✓</td>
</tr>
</tbody>
</table>

PEO 1, which deals with attainment of career success, is supported by Student Outcomes (a), (b), (c), (d), (e), (g), (h), and (k). To achieve success in the field of environmental engineering, engineers must have a good understanding of math, science, and engineering fundamentals [(a), (c), (e)]; think critically [(b)]; work well with others [(d)]; communicate well with clients, the
public, and team members [(g)]; understand the context within which they are working [(h)], and have a proficiency with engineering tools [(k)].

PEO 2 describes the broad-minded approach to engineering problem solving that is both appropriate and necessary for finding safe, sustainable solutions that are environmentally and ethically appropriate. Student Outcome (f), (h), and (j) support PEO 2.

PEO 3 describes the need for life-long learning, and is supported by outcomes (i) and (j). It is difficult to find the correct answer if we do not know what the question is. Developing a good understanding of contemporary issues is a vital step in the process of finding contemporary solutions; sustainable and more environmentally friendly engineering solutions represent current research topics. Life-long learning is a fundamental part of understanding contemporary issues and solutions.

PEO 4 expresses the importance of professional licensure and appropriate certification. The collective intent of all of the Student Outcomes and PEOs is to provide a solid foundation for a successful career in the environmental engineering profession. Qualifying for professional licensure and appropriate certifications is a manifestation of the quality of that engineering foundation. All Student Outcomes map indirectly to PEO 4.
CRITERION 4. CONTINUOUS IMPROVEMENT

A. Student Outcomes

Program Assessment Process

All CEE faculty members participate in the assessment process. Evaluation of the assessment process is conducted by the CEE Department Assessment Committee, which consists of four permanent faculty members (two each from the CE program and EnvE program), as well as several rotating faculty depending on specific outcomes being assessed each year. The Assessment Committee meets annually at the end of each academic year (May) to review all assessment data. In May 2014, the committee evaluated data for all student outcomes (a through k) from the 2013-2014 and 2012-2013 school years. In subsequent years, the committee will assess three or four student outcomes per year, so that in the next six-year ABET cycle, each student outcome will be assessed at least twice (Table 4-1). If outcomes needing improvement are identified during the annual Assessment Committee review, recommendations will be made by the Committee and that outcome will be reevaluated the following year during the annual review. At the end of the sixth year (2020), all of the outcome assessment data from the preceding six years will be review and summarized as part of the EnvE Program self assessment review.

Table 4-1: Evaluation Schedule for Program Student Outcome

<table>
<thead>
<tr>
<th>Evaluation Date</th>
<th>School Year(s)</th>
<th>Outcomes evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2014</td>
<td>2012-13, 2013-14</td>
<td>a through k</td>
</tr>
<tr>
<td>May 2015</td>
<td>2014-15</td>
<td>a, b, c, d</td>
</tr>
<tr>
<td>May 2016</td>
<td>2015-16</td>
<td>e, f, g, k</td>
</tr>
<tr>
<td>May 2017</td>
<td>2016-17</td>
<td>h, i, j</td>
</tr>
<tr>
<td>May 2018</td>
<td>2017-18</td>
<td>a, b, c, d</td>
</tr>
<tr>
<td>May 2019</td>
<td>2018-19</td>
<td>e, f, g, k</td>
</tr>
<tr>
<td>May 2020</td>
<td>2019-20</td>
<td>h, i, j</td>
</tr>
</tbody>
</table>

Three independent sources of information are used in the assessment process:
1) Student coursework (homework, exams, projects, lab exercises, reports, etc.)
2) Results from the NCEES Fundamentals of Engineering (FE) exam
3) Exit interviews with graduating seniors.

Student Course Work

All engineering courses in the EnvE curriculum are mapped to specific student outcomes (Table 4-2). Each time a course is taught, the instructor assesses at least one outcome by evaluating the performance of each student in the class on a specific homework problem, quiz, exam question, lab report, project report, or other assignment. Student performance is rated as a 0, 1, or 2:

0 = student did not understand the fundamental principle or component
1 = student applied some but not all of the fundamental principles in their solution.
2 = student applied the correct fundamental principles in their solution
We note that nearly all classes in the curriculum have both EnvE and Civil Engineering students enrolled. An analysis of student grades in four of our core classes, as well as overall GPA, found no statistically significant differences between EnvE and CE students (see Supplement 7), so the decision was made to assess all students together in all classes. The exceptions are CEE 2890–Sophomore Seminar, which has only EnvE students, and CEE 3670 and CEE 5610, which have a significant population of biological engineering students. For those classes, only performance of EnvE students is reported here.

The EnvE program has two goals for student performance, as measured by the student course work assessment data:

- **Goal 1:** a minimum of 70% of the students will perform at a 2 level
- **Goal 2:** a minimum of 80% of the students will perform at the 1 or 2 level.

Each assessment result is documented in a standardized form and archived (electronically and as a hard-copy) with an example of student work on that problem or assignment. These data will be available for review during the PEV visit.

**Table 4-2: Courses Used to Assess Student Outcomes (elective classes are shaded)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Outcome Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>ENGR 2010 Statics</td>
<td>✓</td>
</tr>
<tr>
<td>ENGR 2030 Dynamics</td>
<td></td>
</tr>
<tr>
<td>ENGR 2270 Computer Drafting</td>
<td>✓</td>
</tr>
<tr>
<td>ENGR 2450 Numerical Methods</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 1880 CEE Orientation</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 2240 Engineering Surveying</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 2870 Intro to Programming</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 2890 Sophomore Seminar</td>
<td></td>
</tr>
<tr>
<td>CEE 3430 Engr. Hydrology</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3500 Fluid Mechanics</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3510 Hydraulics</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3610 Environ. Mgmt.</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3640 Water/Wastewater Engr.</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3670 Transport Phenomena</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3780 Solid/Haz. Waste Mgmt.</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3880 CEE Design I</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 4200 Engr. Economics</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 4870 CEE Design II</td>
<td>✓</td>
</tr>
<tr>
<td>Course</td>
<td>Student Outcome Assessed</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>CEE 4880 CEE Design III</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5250 Env. Co-op</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5430 Groundwater Engineering</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5610 Environ. Quality Analysis</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5620 Aquatic Chemistry</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5670 Haz. Chem. Safety</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5680 Soil-Based Waste Mgmt.</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5730 Environ. Org Contaminants</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5750 Air Quality Measurements</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5830 Mgmt. Biosolid/Waste</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5860 Air Quality Mgmt.</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5930 Env. Eng. In Develop Countries</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
</tbody>
</table>

**FE Exam**

Passing the FE exam is an important step toward professional licensure and reinforcing lifelong learning skills and provides good external, independent assessment data. Students have always been required to take the FE Exam, and starting in the 2014-2015 academic year, all EnvE students are required to pass the FE exam prior to graduation. The program’s overall pass rate for the FE is a significant indicator with respect to the success of the academic program, attainment of the many of the student outcomes, and student preparedness for meeting the PEOs after graduation.

It is not possible to correlate the results from the overall FE exam performance data nor the individual subject FE test results for each individual FE exam offering with a level of Student Outcome attainment because students can, and often do, take the FE exam multiple times, which skews the data set. As a result, we only assess the percentage of students in the program who pass the FE exam prior to graduation on an annual basis. Our goal is to have 100% pass rate on the FE exam; our minimum acceptable level of performance is a pass rate at or above the national average.

**Graduating Senior Exit Interviews**

All graduating seniors fill out an exit interview form where they rate their perceived progress in meeting each of the student outcomes (a-k) on a scale of 1 to 6 (see Supplement 8). The results from fall and spring semesters in each academic year are combined and rated according to the 0, 1, 2 scale. Table 4-3 shows the mapping of the 1 to 6 scale to the 0-1-2 scale. The performance goal is at least 80% of the students rating their attainment as a 1 or 2.
Table 4-3: Senior Exit Interview Rubric for Student Outcome Self-Evaluation Questions

<table>
<thead>
<tr>
<th>Exit Interview Score</th>
<th>Assessment Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>very poor</td>
</tr>
<tr>
<td>2</td>
<td>poor</td>
</tr>
<tr>
<td>3</td>
<td>fair</td>
</tr>
<tr>
<td>4</td>
<td>good</td>
</tr>
<tr>
<td>5</td>
<td>very good</td>
</tr>
<tr>
<td>6</td>
<td>excellent</td>
</tr>
</tbody>
</table>

Program Assessment Evaluation

The Assessment Committee (Barr, Dupont, McNeill, and Tullis) met at the conclusion of the Spring 2014 semester (May 9, 2014) to review the student outcome assessment data (student course work, FE exam results, and senior exit interview data). The data and evaluation results are summarized in the following sections.

Student Course Work

The assessment data for student work in required courses is summarized in Table 4-4. As previously discussed, all course work assessments were based on a 0-1-2 scale. The assessment items listed in Table 4-4 are organized by student outcome and include the course, instructor, term, course enrollment, type of information assessed (i.e., HW, exam question, report, etc.), and problem description. Each assessment item has a reference number that refers to the problem statement and sample work located in the assessment binder, which will be available during the site visit.
Table 4-4: Student Outcome Assessment Data for Required EnvE Classes

<table>
<thead>
<tr>
<th>Class</th>
<th>Name</th>
<th>Instructor</th>
<th>Term</th>
<th>Enrol.</th>
<th>Method</th>
<th>Ref #</th>
<th>Description</th>
<th>0 %</th>
<th>1 %</th>
<th>2 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome a</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 2240</td>
<td>Surveying</td>
<td>Caliendo</td>
<td>F 2013</td>
<td>93</td>
<td>HW</td>
<td>a-2240-2</td>
<td>surveying (Engineering)</td>
<td>24</td>
<td>10</td>
<td>67</td>
</tr>
<tr>
<td>CEE 2870</td>
<td>Intro to Progr.</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>93</td>
<td>HW</td>
<td>a-2870-3</td>
<td>write a program for linear regression (Math and Eng)</td>
<td>6</td>
<td>10</td>
<td>84</td>
</tr>
<tr>
<td>CEE 3430</td>
<td>Hydrology</td>
<td>Tarboton</td>
<td>Sp 2014</td>
<td>44</td>
<td>exam</td>
<td>a-3430-6</td>
<td>calculation of aquifer properties (Math and Engineering)</td>
<td>16</td>
<td>32</td>
<td>52</td>
</tr>
<tr>
<td>CEE 3500</td>
<td>Fluids</td>
<td>Tullis</td>
<td>Sp 2014</td>
<td>13</td>
<td>final exam</td>
<td>a-3500-7</td>
<td>calculate fluid properties - vol change with temp (Eng.)</td>
<td>0</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>F 2013</td>
<td>17</td>
<td>HW</td>
<td>a-3510-8</td>
<td>fluid viscosity &amp; drag force (Engineering)</td>
<td>6</td>
<td>12</td>
<td>82</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>51</td>
<td>HW</td>
<td>a-3510-9</td>
<td>Solve viscous forces on moving plate (Math and Eng)</td>
<td>2</td>
<td>0</td>
<td>98</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2013</td>
<td>55</td>
<td>quiz</td>
<td>a-3610-10</td>
<td>mass balance with 2nd order kinetics (Engineering)</td>
<td>7</td>
<td>0</td>
<td>93</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>72</td>
<td>HW</td>
<td>a-3610-11</td>
<td>stoichiometry and limiting reactant: PM2.5 calc (Science)</td>
<td>15</td>
<td>19</td>
<td>65</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>HW</td>
<td>a-3640-12</td>
<td>population calculation (Math)</td>
<td>0</td>
<td>7</td>
<td>93</td>
</tr>
<tr>
<td>CEE 3670</td>
<td>Transport Phen.</td>
<td>Neilson</td>
<td>Sp 2013</td>
<td>5</td>
<td>HW</td>
<td>a-3670-13</td>
<td>heat conduction in leg (Engineering)</td>
<td>0</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>CEE 3670</td>
<td>Transport Phen.</td>
<td>Neilson</td>
<td>Sp 2014</td>
<td>5</td>
<td>HW</td>
<td>a-3670-14</td>
<td>heat conduction in leg (Engineering)</td>
<td>0</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2012</td>
<td>42</td>
<td>HW</td>
<td>a-3780-15</td>
<td>mass balance and waste composition (Engineering)</td>
<td>0</td>
<td>36</td>
<td>64</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2012</td>
<td>42</td>
<td>HW</td>
<td>a-3780-16</td>
<td>mass bal and waste comp - optional follow-up (Eng.)</td>
<td>0</td>
<td>14</td>
<td>86</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>pre/post test</td>
<td>a-3780-17</td>
<td>principles of integrated solid waste management (Eng.)</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>CEE 4930</td>
<td>Env. Microbio.</td>
<td>Sorensen</td>
<td>Sp 2014</td>
<td>5</td>
<td>final exam</td>
<td>a-4930-18</td>
<td>log growth of bacteria (Science and Math)</td>
<td>20</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>CEE 5860</td>
<td>Air Qual. Mgmt</td>
<td>Martin</td>
<td>F 2013</td>
<td>12</td>
<td>exam</td>
<td>a-5860-22</td>
<td>convert units: ppm to ug/m^3 (Math and Science)</td>
<td>8</td>
<td>17</td>
<td>75</td>
</tr>
<tr>
<td><strong>Outcome b</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 2240</td>
<td>Surveying</td>
<td>Caliendo</td>
<td>F 2013</td>
<td>93</td>
<td>lab exercise</td>
<td>b-2240-1</td>
<td>design exp: triangulation to calc distance between 2 points</td>
<td>8</td>
<td>5</td>
<td>87</td>
</tr>
<tr>
<td>CEE 3500</td>
<td>Fluids</td>
<td>Tullis</td>
<td>Sp 2014</td>
<td>13</td>
<td>lab exercise</td>
<td>b-3500-10</td>
<td>design an experiment (pipe wall roughness)</td>
<td>0</td>
<td>8</td>
<td>92</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>F 2013</td>
<td>17</td>
<td>HW</td>
<td>b-3510-2</td>
<td>pump curve development lab</td>
<td>6</td>
<td>18</td>
<td>76</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>51</td>
<td>lab report</td>
<td>b-3510-3</td>
<td>discharge on sharp-crested weir</td>
<td>8</td>
<td>0</td>
<td>92</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>HW</td>
<td>b-3780-4</td>
<td>interpret waste generation data</td>
<td>0</td>
<td>32</td>
<td>68</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>HW</td>
<td>b-3780-5</td>
<td>interpret waste generation data - follow-up</td>
<td>0</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>CEE 5610</td>
<td>Env. Quality</td>
<td>McLean</td>
<td>F 2013</td>
<td>5</td>
<td>lab report</td>
<td>b-5610-8</td>
<td>analyze data: dissolved O2 lab report</td>
<td>0</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>CEE 5610</td>
<td>Env. Quality</td>
<td>McLean</td>
<td>F 2013</td>
<td>5</td>
<td>lab report</td>
<td>b-5610-9</td>
<td>analyze data: hardness lab report</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Class</td>
<td>Name</td>
<td>Instructor</td>
<td>Term</td>
<td>Enrol.</td>
<td>Method</td>
<td>Ref #</td>
<td>Description</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------</td>
<td>------------</td>
<td>-------</td>
<td>-------</td>
<td>------------</td>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td><strong>Outcome c</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2013</td>
<td>16</td>
<td>mini-design</td>
<td>e-3640-3</td>
<td>design within env constraints: coag/floc/sed</td>
<td>0%</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2013</td>
<td>16</td>
<td>mini-design</td>
<td>e-3640-4</td>
<td>design within env constraints: filtration/sorp/IX</td>
<td>0%</td>
<td>13%</td>
<td>88%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>mini-design</td>
<td>e-3640-5</td>
<td>design within env constraints: coag/floc/sed</td>
<td>0%</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>mini-design</td>
<td>e-3640-6</td>
<td>design within env constraints: filtration/sorp/IX</td>
<td>0%</td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>design project</td>
<td>c-3780-7</td>
<td>design within env, cost, H&amp;S, reg. constraints: waste audit</td>
<td>3%</td>
<td>6%</td>
<td>91%</td>
</tr>
<tr>
<td>CEE 4880</td>
<td>CEE Design III</td>
<td>Peralta</td>
<td>Sp 2014</td>
<td>55</td>
<td>design project</td>
<td>c-4880-8</td>
<td>design within constraints</td>
<td>0%</td>
<td>11%</td>
<td>89%</td>
</tr>
<tr>
<td>CEE 5860</td>
<td>Air Qual. Mgmt</td>
<td>Martin</td>
<td>F 2012</td>
<td>16</td>
<td>design project</td>
<td>c-5860-9</td>
<td>design within env and reg. constraints: carbon abs. system</td>
<td>19%</td>
<td>25%</td>
<td>56%</td>
</tr>
<tr>
<td><strong>Outcome d</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2013</td>
<td>16</td>
<td>peer eval</td>
<td>d-3640-1</td>
<td>peer eval for group project (both projects)</td>
<td>0%</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>peer eval</td>
<td>d-3640-2</td>
<td>peer eval for group project</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2012</td>
<td>44</td>
<td>peer eval</td>
<td>d-3780-3</td>
<td>peer eval for group project</td>
<td>0%</td>
<td>2%</td>
<td>98%</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>37</td>
<td>peer eval</td>
<td>d-3780-4</td>
<td>peer eval for group project</td>
<td>3%</td>
<td>5%</td>
<td>92%</td>
</tr>
<tr>
<td>CEE 5860</td>
<td>Air Qual. Mgmt</td>
<td>Martin</td>
<td>Sp 2014</td>
<td>12</td>
<td>peer eval</td>
<td>d-5860-5</td>
<td>peer eval for group project</td>
<td>8%</td>
<td>0%</td>
<td>92%</td>
</tr>
<tr>
<td><strong>Outcome e</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 2870</td>
<td>Intro to Progr.</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>93</td>
<td>HW</td>
<td>e-2870-1</td>
<td>program to calc discharge and velocity in pipeline</td>
<td>9%</td>
<td>11%</td>
<td>81%</td>
</tr>
<tr>
<td>CEE 3500</td>
<td>Fluids</td>
<td>Tullis</td>
<td>Sp 2014</td>
<td>39</td>
<td>final exam</td>
<td>e-3500-5</td>
<td>fluid mechanics</td>
<td>0%</td>
<td>26%</td>
<td>74%</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>F 2013</td>
<td>17</td>
<td>HW</td>
<td>e-3510-6</td>
<td>open channel flow transition</td>
<td>12%</td>
<td>12%</td>
<td>76%</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>51</td>
<td>HW</td>
<td>e-3510-7</td>
<td>solve pipeline system including friction and minor losses</td>
<td>8%</td>
<td>16%</td>
<td>76%</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2012</td>
<td>55</td>
<td>quiz</td>
<td>e-3610-8</td>
<td>calculate area for MSW landfill</td>
<td>7%</td>
<td>20%</td>
<td>73%</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2013</td>
<td>72</td>
<td>HW</td>
<td>e-3610-9</td>
<td>risk calculation</td>
<td>6%</td>
<td>17%</td>
<td>78%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>HW</td>
<td>e-3640-10</td>
<td>disinfection calculation</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>mini-design</td>
<td>e-3640-12</td>
<td>filter headloss - follow-up</td>
<td>0%</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>CEE 3670</td>
<td>Transport Phen.</td>
<td>Neilson</td>
<td>Sp 2013</td>
<td>5</td>
<td>HW</td>
<td>e-3670-13</td>
<td>unsteady heat conduction in furnace</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3670</td>
<td>Transport Phen.</td>
<td>Neilson</td>
<td>Sp 2014</td>
<td>5</td>
<td>HW</td>
<td>e-3670-14</td>
<td>unsteady heat conduction in furnace</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>HW</td>
<td>e-3780-15</td>
<td>MSW transport</td>
<td>3%</td>
<td>35%</td>
<td>62%</td>
</tr>
<tr>
<td>Class</td>
<td>Name</td>
<td>Instructor</td>
<td>Term</td>
<td>Enrol.</td>
<td>Method</td>
<td>Ref #</td>
<td>Description</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------</td>
<td>---------------</td>
<td>------------</td>
<td>------</td>
<td>-------</td>
<td>------------</td>
<td>------------</td>
<td>--------------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Outcome f</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 1880</td>
<td>CEE Orientation</td>
<td>Rahmeyer</td>
<td>Sp 2014</td>
<td>36</td>
<td>team report</td>
<td>f-1880-1</td>
<td>summarize eng. failure and discuss ethics issues</td>
<td>3%</td>
<td>14%</td>
<td>83%</td>
</tr>
<tr>
<td>CEE 2890</td>
<td>Soph. Seminar</td>
<td>Stevens</td>
<td>Sp 2014</td>
<td>6</td>
<td>quiz</td>
<td>f-2890-2</td>
<td>quiz on professional registration requirements/ethics</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3880</td>
<td>CEE Design I</td>
<td>Peralta</td>
<td>Sp 2014</td>
<td>72</td>
<td>quiz</td>
<td>f-3880-3</td>
<td>quiz on ethics</td>
<td>13%</td>
<td>56%</td>
<td>32%</td>
</tr>
<tr>
<td>CEE 3880</td>
<td>CEE Design I</td>
<td>Peralta</td>
<td>Sp 2014</td>
<td>72</td>
<td>essay</td>
<td>f-3880-4</td>
<td>essay brief from guest speaker discussing ethics issues</td>
<td>3%</td>
<td>10%</td>
<td>88%</td>
</tr>
<tr>
<td><strong>Outcome g</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 1880</td>
<td>CEE Orientation</td>
<td>Rahmeyer</td>
<td>F 2013</td>
<td>36</td>
<td>group project</td>
<td>g-1880-1</td>
<td>written comm: report</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 1880</td>
<td>CEE Orientation</td>
<td>Rahmeyer</td>
<td>F 2013</td>
<td>36</td>
<td>group project</td>
<td>g-1880-2</td>
<td>oral comm: presentation (slides and speaking skills)</td>
<td>0%</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>CEE 2890</td>
<td>Soph. Seminar</td>
<td>Stevens</td>
<td>Sp 2013</td>
<td>2</td>
<td>oral pres.</td>
<td>g-2890-3</td>
<td>oral comm: presentation to grad seminar</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>CEE 2890</td>
<td>Soph. Seminar</td>
<td>Stevens</td>
<td>Sp 2014</td>
<td>6</td>
<td>oral pres.</td>
<td>g-2890-4</td>
<td>oral comm: presentation to grad seminar</td>
<td>0%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>CEE 2890</td>
<td>Soph. Seminar</td>
<td>Stevens</td>
<td>Sp 2014</td>
<td>6</td>
<td>poster</td>
<td>g-2890-5</td>
<td>oral comm: poster at Spring Runoff conference</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>F 2013</td>
<td>17</td>
<td>HW</td>
<td>g-3510-7</td>
<td>report: Sluice gate/hjump lab</td>
<td>12%</td>
<td>29%</td>
<td>59%</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>51</td>
<td>lab report</td>
<td>g-3510-8</td>
<td>report: hydrostatics test</td>
<td>2%</td>
<td>0%</td>
<td>98%</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2013</td>
<td>72</td>
<td>essay HW</td>
<td>g-3610-9</td>
<td>written communication: EIS essay</td>
<td>6%</td>
<td>0%</td>
<td>94%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2013</td>
<td>16</td>
<td>group project</td>
<td>g-3640-10</td>
<td>written comm: grammar/spelling/format/refs</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/WW Trt</td>
<td>McNeill</td>
<td>Sp 2014</td>
<td>14</td>
<td>group project</td>
<td>g-3640-11</td>
<td>written comm: grammar/spelling/format/refs</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>group project</td>
<td>g-3780-12</td>
<td>oral comm: presentation skills</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 5610</td>
<td>Env. Quality</td>
<td>McLean</td>
<td>F 2013</td>
<td>5</td>
<td>lab report</td>
<td>g-5610-15</td>
<td>written communication: dissolved O₂ lab report</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 5610</td>
<td>Env. Quality</td>
<td>McLean</td>
<td>F 2013</td>
<td>5</td>
<td>lab report</td>
<td>g-5610-16</td>
<td>written communication: hardness lab report</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 5860</td>
<td>Air. Qual. Mgmt</td>
<td>Martin</td>
<td>F 2013</td>
<td>12</td>
<td>group project</td>
<td>g-5860-18</td>
<td>oral comm: presentation (slides and speaking skills)</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Outcome h</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2012</td>
<td>55</td>
<td>quiz</td>
<td>h-3610-2</td>
<td>environmental context: EA/EIS process</td>
<td>13%</td>
<td>0%</td>
<td>87%</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2013</td>
<td>72</td>
<td>essay HW</td>
<td>h-3610-3</td>
<td>environmental context: EIS essay</td>
<td>6%</td>
<td>0%</td>
<td>94%</td>
</tr>
<tr>
<td>CEE 4200</td>
<td>Eng. Econ.</td>
<td>Stevens</td>
<td>F 2013</td>
<td>76</td>
<td>exam</td>
<td>h-4200-4</td>
<td>economic analysis of two designs</td>
<td>0%</td>
<td>29%</td>
<td>71%</td>
</tr>
<tr>
<td><strong>Outcome i</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 1880</td>
<td>CEE Orientation</td>
<td>Rahmeyer</td>
<td>Sp 2014</td>
<td>36</td>
<td>memo</td>
<td>i-1880-1</td>
<td>memo on importance of lifelong learning</td>
<td>19%</td>
<td>0%</td>
<td>81%</td>
</tr>
<tr>
<td>CEE 2890</td>
<td>Soph Seminar</td>
<td>Stevens</td>
<td>Sp 2014</td>
<td>6</td>
<td>quiz</td>
<td>i-2890-2</td>
<td>quiz on professional registration requirements</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>CEE 3880</td>
<td>CEE Design I</td>
<td>Peralta</td>
<td>Sp 2014</td>
<td>72</td>
<td>essay</td>
<td>i-3880-3</td>
<td>essay brief from guest speaker</td>
<td>4%</td>
<td>21%</td>
<td>75%</td>
</tr>
<tr>
<td>Class</td>
<td>Name</td>
<td>Instructor</td>
<td>Term</td>
<td>Enrol.</td>
<td>Method</td>
<td>Ref #</td>
<td>Description</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------</td>
<td>------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>---------</td>
<td>--------------------------------------------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Outcome j</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE</td>
<td>1880</td>
<td>CEE Orientation</td>
<td>Rahmeyer</td>
<td>Sp 2014</td>
<td>36</td>
<td>HW</td>
<td>j-1880-1</td>
<td>list contemporary issues in CEE</td>
<td>19%</td>
<td>14%</td>
</tr>
<tr>
<td>CEE</td>
<td>3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2012</td>
<td>55</td>
<td>quiz</td>
<td>j-3610-3</td>
<td>identify potential hazardous waste (quiz 29)</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>CEE</td>
<td>3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2012</td>
<td>55</td>
<td>quiz</td>
<td>j-3610-4</td>
<td>nuclear waste storage (quiz 30)</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>CEE</td>
<td>3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2013</td>
<td>72</td>
<td>essay HW</td>
<td>j-3610-5</td>
<td>Logan DW trip report - canal project</td>
<td>0%</td>
<td>39%</td>
</tr>
<tr>
<td>CEE</td>
<td>3610</td>
<td>Env. Mgmt</td>
<td>McNeill</td>
<td>F 2013</td>
<td>72</td>
<td>essay HW</td>
<td>j-3610-6</td>
<td>Logan DW trip report - turbine project</td>
<td>0%</td>
<td>11%</td>
</tr>
<tr>
<td>CEE</td>
<td>3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>essay HW</td>
<td>j-3780-7</td>
<td>landfill siting in Cache Valley</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>CEE</td>
<td>5860</td>
<td>Air Qual. Mgmt</td>
<td>Martin</td>
<td>F 2013</td>
<td>12</td>
<td>exam</td>
<td>j-5860-8</td>
<td>PM2.5 in Utah</td>
<td>0%</td>
<td>25%</td>
</tr>
<tr>
<td>Outcome k</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE</td>
<td>2240</td>
<td>Surveying</td>
<td>Caliendo</td>
<td>F 2013</td>
<td>93</td>
<td>Lab exercise</td>
<td>k-2240-1</td>
<td>survey Traverse w/ Total Station &amp; Software</td>
<td>3%</td>
<td>17%</td>
</tr>
<tr>
<td>CEE</td>
<td>2240</td>
<td>Surveying</td>
<td>Caliendo</td>
<td>F 2013</td>
<td>93</td>
<td>HW</td>
<td>k-2240-2</td>
<td>surveying software to balance closed traverse and calc area</td>
<td>45%</td>
<td>8%</td>
</tr>
<tr>
<td>CEE</td>
<td>2870</td>
<td>Intro to Progr.</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>93</td>
<td>HW</td>
<td>k-2870-3</td>
<td>program VBA + spreadsheet to calc flow in open channel</td>
<td>2%</td>
<td>8%</td>
</tr>
<tr>
<td>CEE</td>
<td>3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>F 2013</td>
<td>17</td>
<td>HW</td>
<td>k-3510-4</td>
<td>pipe network software problem</td>
<td>6%</td>
<td>24%</td>
</tr>
<tr>
<td>CEE</td>
<td>3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>Sp 2014</td>
<td>51</td>
<td>exam</td>
<td>k-3510-5</td>
<td>solve pipe network using EPANET</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>CEE</td>
<td>3670</td>
<td>Transport Phen.</td>
<td>Neilson</td>
<td>Sp 2013</td>
<td>5</td>
<td>HW</td>
<td>k-3670-6</td>
<td>unsteady heat transfer w/num methods</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>CEE</td>
<td>3670</td>
<td>Transport Phen.</td>
<td>Neilson</td>
<td>Sp 2014</td>
<td>5</td>
<td>HW</td>
<td>k-3670-7</td>
<td>unsteady heat transfer w/num methods</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>CEE</td>
<td>3780</td>
<td>Solid/Haz Waste</td>
<td>Dupont</td>
<td>F 2013</td>
<td>34</td>
<td>exam</td>
<td>k-3780-8</td>
<td>spreadsheet tool to eval landfill leachate, gas, en. recovery</td>
<td>3%</td>
<td>6%</td>
</tr>
</tbody>
</table>
The aggregated Student Outcome assessment results are summarized in Table 4-5 and Figure 4-1. Note the “sample size” refers to the number of individual examples of student work that were assessed for each outcome, not the number of students. The program is satisfactorily meeting Goal 1 of having at least 70% of students performing at a 2 level for all outcomes except for Outcome f, and is meeting Goal 2 with at least 80% of students performing at a level of 1 or 2 for all outcomes. Specific outcomes are discussed below.

Table 4-5: Aggregated Assessment Results for Required EnvE Classes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Sample size</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>Sum of 1&amp;2 ratings</th>
<th>Level of attainment</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>576</td>
<td>9%</td>
<td>13%</td>
<td>78%</td>
<td>91%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>b</td>
<td>252</td>
<td>5%</td>
<td>10%</td>
<td>85%</td>
<td>95%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>c</td>
<td>165</td>
<td>2%</td>
<td>11%</td>
<td>87%</td>
<td>98%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>d</td>
<td>123</td>
<td>2%</td>
<td>3%</td>
<td>95%</td>
<td>98%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>e</td>
<td>399</td>
<td>6%</td>
<td>17%</td>
<td>77%</td>
<td>94%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>f</td>
<td>186</td>
<td>6%</td>
<td>28%</td>
<td>66%</td>
<td>94%</td>
<td>Needs improvement</td>
</tr>
<tr>
<td>g</td>
<td>312</td>
<td>2%</td>
<td>9%</td>
<td>88%</td>
<td>98%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>h</td>
<td>203</td>
<td>5%</td>
<td>11%</td>
<td>84%</td>
<td>95%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>i</td>
<td>114</td>
<td>9%</td>
<td>13%</td>
<td>78%</td>
<td>91%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>j</td>
<td>336</td>
<td>5%</td>
<td>16%</td>
<td>79%</td>
<td>95%</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>k</td>
<td>391</td>
<td>13%</td>
<td>9%</td>
<td>78%</td>
<td>87%</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

Figure 4-1: Aggregated Assessment Results for Required EnvE Classes

Outcome a – an ability to apply knowledge of mathematics, science, and engineering

This outcome was assessed in 14 classes, ranging from a first-year class (CEE 2240) to upper-division classes, using a variety of assessment tools including homework, exams, quizzes, and a pre/post-test (Table 4-4). Student performance met both goals, with 78% of students rating a 2 and 91% rating a 1 or 2. We note that CEE 2240, which had the highest proportion of 0 ratings, is a first-year class; many of the 0 ratings were from students who did not submit the
assignment. This is often an indicator of students who will not persist in the engineering program. Nevertheless, the instructor will continue to focus on effective teaching techniques for as many students as possible.

Outcome b – an ability to design and conduct experiments, as well as to analyze and interpret data

This outcome is assessed in several lab- and lecture-based courses. Overall student performance is satisfactory and meets both Goal 1 and Goal 2. We note, however, that most of the current assessment focuses on students’ ability to conduct experiments and analyze/interpret data, but not on design of experiments. Accordingly, the Assessment Committee has recommended two actions. First, the design exercise successfully conducted in the Spring 2014 section of CEE 3500 – Fluid Dynamics will be replicated in the fall semester offering of the course, which has a larger enrollment (~85 students). Second, a new lab exercise will be implemented in CEE 5610 wherein students spend more time designing an experiment rather than just carrying out a proscribed activity.

Outcome c – an ability to design a system, component, or process to meet desired needs within realistic constraints

This outcome is assessed in several upper-level classes as well as through the capstone design experience (culminating in CEE 4880). In particular, students in the design class must specifically address the “health and safety” and “constructability” aspects of their project, as well as three of the six other constraint areas (economics, environmental, social, political, ethical, and sustainability). Student performance is satisfactory and meets both Goal 1 and Goal 2.

Outcome d – an ability to function on multidisciplinary teams

Nearly all of the upper-division courses require some sort of team project, as does the capstone design sequence. Outcome d is assessed via peer evaluations of student groups in three of these classes, wherein students rate the performance of their teammates in a variety of areas. We note that the first design class (CEE 3880) now includes a guest speaker from the USU Psychology Department who talks about effective teamwork, which was an intentional effort to provide instruction on how to function on a team, rather than just expecting the students to “figure it out.” Student performance is satisfactory and meets both Goal 1 and Goal 2.

Outcome e – an ability to identify, formulate, and solve engineering problems

Student performance is assessed using homework, quizzes, exams, and design problems in a broad range of classes. Student performance is satisfactory and meets both Goal 1 and Goal 2.

Outcome f – an understanding of professional and ethical responsibility

Student attainment was assessed in four classes through a group writing assignment on the ethics associated with an engineering failure, an essay about a guest speaker’s talk on ethics, and two quizzes. Overall, 94% of student assessments rated a 1 or 2, which met Goal 2. However, Goal 1 was not met, as only 66% of the students performed at a 2 level. This was mainly due to poorer performance on the ethics quiz in CEE 3880. To improve attainment of this outcome, the CEE 3880 instructor plans to cover additional information on professional ethics in class next year, as well as bring in a guest speaker from the Utah Division of Occupational and Professional Licensing. This outcome will be re-assessed in 2014-2015.
Outcome g – an ability to communicate effectively

Written and oral communication skills are emphasized throughout the curriculum, starting with the freshman orientation seminar (CEE 1880) and continuing into upper-division classes and the capstone design sequence. Several classes have made changes from year-to-year to improve communication skills as described in the individual course assessments (e.g., CEE 2890, CEE 3640). Student performance is satisfactory and meets both Goal 1 and Goal 2. We note that starting in Spring 2014, students in the EnvE program are taking a new college-specific course, ENGR 3080 – Technical Communication, which replaces the broader ENGL 3080 class (Table 5-1). We will begin assessing Outcome g in the ENGR 3080 course starting in the 2014-2015 academic year.

Outcome h – the broad education necessary to understand the impact of engineering solutions

Student performance on this outcome has been assessed three times in two different courses. Although student performance satisfactorily meets both Goal 1 and Goal 2, the number of assessments is relatively small. The Assessment Committee recommends that this outcome be assessed in additional classes, which will be chosen during the Fall 2014 faculty retreat.

Outcome i – a recognition of the need for, and an ability to engage in life-long learning

This outcome is assessed in the freshman orientation class, sophomore seminar, and the first class of the capstone design sequence. Student attainment is demonstrated through a memo on the importance of life-long learning, a quiz on professional registration requirements (including associated continuing education requirements), and an essay on a guest speaker’s discussion of this topic. Student performance is satisfactory and meets both Goal 1 and Goal 2. To additionally reinforce this idea in the capstone design sequence, starting in the 2014-2015 academic year, all guest speakers who are professional engineers will be requested to include the topic of life-long learning in their presentation.

Outcome j – a knowledge of contemporary issues

This outcome is assessed in multiple classes by having students demonstrate knowledge of contemporary issues through HW, writing assignment, or exam. Student performance is satisfactory and meets both Goal 1 and Goal 2.

Outcome k – an ability to use the techniques, skills, and modern engineering tools

Multiple classes across the curriculum assess students’ ability to use modern tools including surveying equipment and various software programs like excel and EPANET. Overall, student performance is satisfactory and meets both Goal 1 and Goal 2. However, as with Outcome a, we note that performance on one of the CEE 2240 – Surveying assignments was not as high as desired. That instructor will continue to implement effective instruction techniques in this class.

FE Exam

Table 4-6 summarizes the FE results for the past six years, including the percentage of students who had passed the FE exam by the time of graduation. The data do not account for the number of attempts required to pass. The USU EnvE pass rate has been either 100% or just below the national average. Realistically, these values are considered comparable to the national average, considering the small number of USU EnvE graduates. During the 2013-2014 academic
year, the faculty decided to require passing the FE exam as a graduation requirement. This will take effect in the 2014-2015 academic year.

The fact that nearly all of the EnvE students pass the FE exam is a strong, independent, external indicator for meeting Student Outcomes a, e, f, and k. It is also a strong indication of a good foundation for life-long (independent) learning skills. In general, students are responsible for reviewing the fundamental principles and applications necessary to pass the FE exam.

**Table 4-6: EnvE Graduates Passing FE Exam vs. National Annual Pass Rate**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>USU EnvE graduates</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>USU EnvE pass rate at gradn.</td>
<td>100%</td>
<td>80%</td>
<td>100%</td>
<td>80%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>National EnvE pass rate</td>
<td>83%</td>
<td>84%</td>
<td>85%</td>
<td>83%</td>
<td>88%</td>
<td>84%</td>
</tr>
</tbody>
</table>

**Senior Exit Interviews**

The response rate to the senior exit interview is high (90 – 100%, Table 4-7), and the students’ rating of their outcome attainment is generally at the ‘2’ level, with the goal of at least 80% rating a 1 or 2 being met (Figure 4-2). Acknowledging that this is a subjective self-evaluation and that student numbers are small, these exit interview results are taken as a general indication that students feel they are meeting the outcomes. Over the past five years, no student rated their attainment as a ‘0’ for any of the outcomes.

**Table 4-7: Response Rate for Senior Exit Interview Self-Evaluation of Outcome Attainment**

<table>
<thead>
<tr>
<th></th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
<th>2013-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>USU EnvE graduates</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Response rate</td>
<td>90%</td>
<td>100%</td>
<td>90%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
B. Continuous Improvement

Continuous improvement occurs at the program level and at the individual course level. Faculty are often changing and updating their courses, but previously the effect of those changes was not always documented. A goal of the Environmental Engineering program is to create a culture of assessment among the faculty. Starting in the 2012-2013 academic year, at least one Student Outcome was assessed and documented in all EnvE “core” classes (CEE 3610, 3640, 3670, 3870, 5610, 5860). Starting in the 2013-2014 academic year, at least one Student Outcome was assessed in all undergraduate classes. This assessment was summarized in Tables 4-4 and 4-5, and will be available for review during the visit.

To support Continuous Improvement in the Environmental Engineering program, the Assessment Committee coordinates the collection and review of assessment data specific to the Student Outcomes being evaluated each year (Table 4-1). If attainment of any Student Outcomes is identified as needing improvement, the problem is discussed with faculty members whose courses map directly to that outcome (Table 4-2), as well as with all faculty during the
Program Level Changes

The following are examples of recent, specific program changes intended to improve the academic program and Student Outcome attainment.

Capstone Design Sequence (CEE 3880, 4870, 4880) Improvement

The Civil and Environmental Engineering Capstone Design sequence is an integrated design experience taught within three semesters. The course sequence provides students project design experience and enhances their abilities to solve real-world problems. The course requires students to acknowledge a variety of constraints impacting an engineer’s ability to conserve resources, address hazards, and create sustainable civil structures. Students undergo a refining process, strengthening their abilities to work in teams, to communicate technically, and to use modern engineering tools.

Significant changes to the Design sequence began in Fall 2012 with the gradual transition to a new instructor over several semesters. Review of faculty and senior exit interview feedback about the CEE Design sequence identified needs for improved structure, content, and implementation, and caused many changes. The Design sequence continues to undergo re-evaluation and re-structuring. Recent discussions and course evaluations indicate the need for further changes in some areas, while other course aspects are serving students well. As we observe student growth and vigorously obtain student and mentor feedback, we enhance the Design sequence in exciting ways mentioned below. We are also preparing a departmental Standard Operating Procedure to internalize a continuous improvement process.

Professional Communication Training

Past – Historically, the CEE Design sequence required students to participate in technical writing or business communications training.

Current – Students must complete the prerequisite college-provided ENGR 3080 – Technical Communications course, before beginning CEE 3880, the first course of the design sequence. ENGR 3080 prepares students to complete individual writing assignments to prepare team project proposals in CEE 3880, and to write team reports in CEE 4870 and 4880. Videotapes of CEE 4870 and CEE 4880 presentations are available for viewing by students and possible future employers.

Future Changes – In CEE 4870, after one individual writing assignment, students will receive a technical writing review and a revised version of the technical writing guidance and grading rubric used in CEE 3880. There will be two more individual writing assignments. The writing rubric will partially guide grading of team writing assignments. Other employed grading rubrics concern the content and format of Meeting Minutes, Progress Reports, and Interim Report. We will increase the speed with which videotapes are available for student retrieval.

Technical Document Requirements

Past – In previous years, there were no required formats or contents for student-produced technical documents. Hence, evaluation and grading was not rigorous.

Current – Students must submit work that complies with writing standards outlined by ASCE. Several rubrics for assessing technical communication have been added to all three design
sequence courses. These rubrics impact the evaluation of individual student-written briefs (CEE 3880) and email (all courses), as well as team proposals (CEE 3880), meeting minutes (CEE 4870 and 4880), time-effort reports (CEE 4870 and 4880), progress and interim reports (CEE 4870 and 4880), visual and oral presentations (CEE 4870 and 4880), and final project reports (CEE 4880).

**Future Changes** – Rubrics and assignments will be revised for efficacy as needed.

**Skills Training and Exposure**

**Past** – Students in CEE 3880 participated in weekly seminars concerning concepts important for professional civil and environmental engineering design. Students viewed CEE 4880 team presentations.

**Current** – CEE 3880 students attend seminars and write formal one-page summaries. CEE 3880 students view and evaluate CEE 4880 presentations, using the same rubric they will be evaluated by in CEE 4870 and CEE 4880. CEE 3880 students are taught the Critical Path Method and preparation of Gantt Charts, which are required in team project proposal, presentations, and interim and final reports.

**Future Changes** – Seminars and workshops are scheduled for CEE 4870 in Fall 2014. Training will include a refresher on technical writing, Pugh Matrices for decision making, and guidelines for presenting technical presentations, documenting time, effort, and meetings, and writing project reports. Scheduled seminars from external experts will address: a) navigating challenges that arise in teamwork (Dr. Scott Bates, psychologist and USU Associate Vice President for Research and Graduate Studies), and b) professional responsibility and ethics (Allyson Pettley, Investigator, Utah Department of Occupational and Professional Licensing). In Spring 2015, there will be fewer seminars in CEE 3880 (some seminars will move to CEE 4870), allowing the course Instructor more time to coach students and help them identify projects and form teams.

**Team Role Balancing**

**Past** – Students were required to self-organize into teams to work on their Design Project.

**Current** – Some teams struggle to arrange equitably balanced workloads for team members. To some extent this results from the need to assign individuals to particular technical discipline responsibilities and to team roles.

**Future Changes** – The CEE 3880 team formation process will be enhanced. Students will complete assessments that help identify their best-fitting role within team structure. A process to identify teammates who may be struggling to fulfill their roles is currently considered, as well as ways to motivate struggling teammates. Beginning in Fall 2014, CEE 4870 students will benefit from extra instruction on team-building skills. In Spring 2015, the CEE 3880 Instructor will use more class-time coaching students and teaching them to identify projects, form teams, conduct meetings.

**Project Types**

**Past** – Students were encouraged to either identify actual projects for clients, or to create design projects without actual clients. Students could optionally participate on USU Concrete Canoe or Steel Bridge design teams. Team performance has been mixed, but even projects without clients have had excellent results.

**Current** – Students self-identify projects. Some students and teams are delighted with the freedom to identify personally satisfying and rewarding projects. The least satisfactory results
occur when teams have difficulty meeting with mentors or are not self-motivated. To help students envision the range of possible projects, in CEE 3880 a partial list of former team projects, clients, and external mentors is posted on GoogleDocs. Also, a GoogleDocs spreadsheet is posted for students and teams to report whether they need a project and the type of skill they would like to use on a project, or whether they have a project idea that they want others to participate with, and skills sought for their project.

Future Changes – Because some students struggle to identify appropriate projects, avenues to aid students in the selection process are currently being evaluated. The goal is for faculty to identify more actual clients and possible sources of funding, and to make that information available to students entering the design sequence.

Collaboration
Past – A unique feature of the CE Design sequence is collaboration between students, faculty, and external mentors on the Design Project.
Current – Collaboration continues as an important course feature.
Future Changes – New materials are being developed to standardize the operating procedure and streamline interactions within the three groups. Beginning Fall 2014, in CEE 4870, mentors and students will sign Memoranda of Agreements delineating responsibilities. Also beginning in Fall 2014, students will participate in round-table discussions with advisors and mentors. This will be the first instance that all three groups will meet together at the same time to discuss design projects.

Individual Student Growth
Past – Not all students in the design sequence gained the same level of experience and preparation for entering the profession. Not all students had the same understanding of the need for personal initiative. Some team members worked one-eighth as much as other team members, yet received the same team grade. Different teams had different faculty advisers. Although faculty approved all projects, students had flexibility in design, causing some design efforts to be less rigorous than others. Additionally, due to circumstances beyond control, some faculty had less availability than others, causing some teams to enjoy less interaction with advisors. Some external mentors did not maintain enthusiasm for working with teams.
Current – CEE 3880 students submit individual work initially, and a team proposal at the end of the semester. After that grades are primarily affected by team submissions. To help assure that all students are participating significantly, they must individually certify work hours in front of other team members. Gross disparities in individual efforts are no longer visible. Students know that they can receive different grades than the rest of their team. Individual student roles are identified at the beginning of each project report.
Future Changes – New processes to increase student benefit include:
• Use of class-time and other resources to help students understand the importance of personal development goals, and the glorious opportunity posed by the sequence in terms of freedom, responsibility, and adoption of professional thought and behavior patterns.
• Use of Memoranda of Agreement to:
  o Emphasize individual effort and accountability toward teammates.
  o Improve team relations with faculty advisers, external advisers, and clients.
• Increased Instructor communication with faculty, to identify and solve issues impacting faculty involvement.
• Departmental adoption of an Instructor-prepared standard operating procedure (SOP) for the
course sequence and evolution, to increase faculty support.

• Proactive contacting of potential project clients to obtain a better selection of projects for
student teams to address.

Expectations

Organizations and faculty will seek the opportunity to pay student teams to perform projects
for them. This will help assure considerable growth of all students. Meanwhile, we will allow
exceptional students to maximize their development by continuing to allow them to self-identify
projects. Systematic course changes being enacted will significantly benefit students. Students
will gain powerful communication, organizational, and decision-making skills to solve complex
problems. Team reports and videotaped presentations will highlight professionalism. Graduates,
especially those that identify and complete their own projects, will be eagerly sought by
prospective employers.

Senior Exit Interviews

Although senior exit interview data has been collected each year, it was not routinely
presented to the faculty as a whole. Starting in Fall 2014, a summary of this data will be
presented and discussed with all faculty at the Fall Retreat.

FE Exam

Attaining professional licensure is an important step in progressing toward a successful
career in the engineering profession. Passing the FE Exam represents a critical step toward
professional licensure. The FE exam also provides students with an opportunity to review and
reinforce the general body of knowledge and fundamental principles associated with the
Environmental Engineering program. Consequently, in an effort to promote these objectives and
improve the level of preparedness of our graduating students entering the workforce, starting in
the 2014-2015 academic year, passing the FE exam will be a graduation requirement for the
program.

Curriculum

Curriculum changes can be initiated and approved at the program, department, college, or
university level. The following is the list of changes made to the Environmental Engineering
curriculum since 2010:

1. Fall 2010: The credit hours for the Statics (ENGR 2010) and Strength of Materials (ENGR
2140) courses were increased from 2 to 3 to better meet the objectives of all engineering
programs in the College for whom those classes are required. Changes were approved
College-wide and were implemented Fall 2011.

2. Fall 2010: CEE 2870–Introduction to Programming was added to the curriculum to provide a
focused programming experience for students. Material was consolidated from various CEE
seminars students take throughout their undergraduate programs. This change was approved
by the CEE Faculty and implemented Fall 2010.

3. Fall 2010: Engineering Numerical Methods (ENGR 2450, 3 credits) was added to the
curriculum as a way to improve the problem solving and math skills of students. This change
was approved by the CEE faculty and implemented in Spring 2011. Note that starting in Fall
2014, this class is no longer required of EnvE students, in order to allow the addition of a new microbiology class into the curriculum.

4. Spring 2011: A 1-credit Physics Lab (PHYS 2215) was added to accompany PHYS 2210. This change was initiated by the Physics Department and was implemented university-wide. The new lab provides valuable hands-on laboratory data collection and analysis experience and technical communication through laboratory reports. Change was approved by the CEE Faculty and implemented in Fall 2011.

5. Spring 2011: Managing Organizations and People (MGT 3110, 3 credits) was added to the curriculum as a university studies Depth in Social Science course. The goal was to improve student learning in the ABET Student Outcomes d, f, and h through the study of business and public administration, leadership, and teamwork. This change was approved by the CEE faculty.

6. Fall 2011: Uncertainty in Engineering Analysis (CEE 3030, 3 credits) was removed from the curriculum and STAT 3000 Statistics for Scientists (3 credits) was required in its place to provide a broader discipline-based background in statistics to environmental engineering undergraduate students. This change was approved by the EnvE faculty.

7. Fall 2012: The number of technical electives in the curriculum was reduced from 9 to 7 credits to allow inclusion of other required courses. This change was approved by the EnvE faculty.

8. Fall 2012: CEE 2140–Strength of Materials (3 credits) was dropped from the curriculum and the second semester of Inorganic Chemistry and the accompanying lab (CHEM 1220/1225) were added to the curriculum to fulfill the USU Breadth Physical Science requirement and increase the depth of chemistry taken by EnvE undergraduate students. The GEOL 1110 requirement was dropped as a Breadth Physical Science requirement. These changes were approved by the EnvE faculty.

9. Fall 2012: The required combination of BIOL 1610–Biology (3 credits) and BIOL 3300–Microbiology (4 credits) for meeting the Breadth Life Science requirement was replaced with the General Education Life Science Breadth course BIOL 1010–Biology and the Citizen (3 credits). An Environmental Microbiology (3 credits) course was added to the curriculum in Spring 2014 to provide microbiology training to environmental engineering undergraduate students. This change was approved by the EnvE faculty.

10. Spring 2013. Technical Communications (ENGL 3080, 3 credits) was made a prerequisite to CEE 3880 (the first course in the design capstone series) to insure that students had the communications skills to be successful with their capstone design project report. This was change was made to strengthen a perceived weakness in technical writing. Rubrics were developed and given to students to clearly convey expectations. This change was approved by the CEE Faculty and implemented in Spring 2013.

11. Spring 2014: Technical Communication (ENGL 3080, 3 credits) was replaced with a College of Engineering technical writing class (ENGR 3080, 3 credits) for two reasons. Students were typically not able to get into the ENGL 3080 prior to starting their capstone course (senior design), and because it was a university-wide course, the content was not specific to engineering technical communication. The college hired a full-time lecturer to teach the course. The course content is more tailored to engineering needs and will hopefully improve the written communication skills of engineering students. ENGR 3080 is a prerequisite for CEE 3880. This change was approved by the College of Engineering and implemented Spring 2014.
*Examples of Individual Course Improvement*

Each instructor is encouraged to document course improvements, along with data assessing student performance before and after the change. These improvements are described in a standard form and archived in the course binder (available for review during the PEV visit). Several illustrative examples are given below.

**CEE 2240** – Surveying (Outcomes a, k; Fall 2013): Modern surveying equipment and techniques include GPS-based instrumentation. The CEE Department purchased two Trimble GPS systems and a surveying lab exercise was added devoted to data collection with the GPS units. A closed traverse is now surveyed with total stations and the GPS and the resulting area and bearing calculations compared. We use the City of Logan's base station, which allows both of our units to be used as "rovers" allowing more students to participate in the exercise at the same time.

**CEE 3500** – Fluid Mechanics (Outcomes a, i; Spring 2013): Completing textbook reading assignments prior to lecture typically improves students’ ability to understand lecture material (the lecture becomes the 2nd exposure to the material and affords students the opportunity to ask questions regarding details that were not clear from their reading). It was apparent from students’ inability to respond correctly to in-class questions that students were not reading the assigned textbook sections prior to class. To motivate students to better prepare for class (reading) and reinforce the importance of understanding the homework problem and solution, the instructor began giving a quiz at the beginning of most lectures that featured a question from the reading assignment or the homework assignment turned in that day. Students typically score very well on homework assignments but often struggle to solve similar problems on exams. The good homework scores are likely heavily influenced by the fact that most students have access to electronic copies of the solution manual (available online but not provided through the course). The instructor felt that students needed more timely opportunities to be held accountable for the fundamental principles and problem-solving skills reinforced in the homework problems. This course adjustment is difficult to measure with a single number or metric; however, the quality of in-class discussions and improved ability of students to participate in in-class example problems improved as a result of the quizzes. Students came to class more prepared.

**CEE 3510** – Hydraulics (Outcomes a, e, k; Fall 2012): Systems involving a few pipelines in series, parallel, or branching are typically required in the simultaneous solution of multiple non-linear algebraic equations (energy and continuity equations). While the solution of pipe networks had been implemented using publicly available software (EPANET), the solution of simpler systems had not been implemented in class. During Fall 2012, the instructor developed new course material and assignments to teach students how to utilize EPANET for solving simple series, parallel, and branching pipe problems.

**CEE 3610** – Environmental Management (Outcomes f, j; Fall 2013): Students attend a series of field trips, including a trip to the local drinking water system. During the Fall 2011 class, the guide for the field trip mentioned the recent collapse of an irrigation canal, which killed three people, and the resultant canal reconstruction project. This is a very relevant local contemporary issue with ethical and health/safety considerations, yet very few of the students had heard of the incident. Starting in Fall 2012, students were required to answer specific questions about the
canal collapse incident in their trip report. In the Fall 2013 class, all students discussed the incident in their trip reports (61% rated a 2 and 39% rated a 1). This is a great improvement in awareness compared to Fall 2011, although it would be better if more students were able to fully describe the incident and rate a 2. In the future, the tour guide will be requested to specifically mention the incident during future field trips, and increased time will be allotted during lecture for discussion after the trip.

**CEE 3640 – Water/Wastewater Treatment (Outcome d; Spring 2013):** Students are required to complete a two-part group project. The first part evaluates the drinking water system of a local community, while the second part looks at the wastewater system for the same community. All students complete a peer evaluation of their group members at the conclusion of each part of the project. When the instructors reviewed the peer evaluations after the drinking water project, it was clear that one group was not functioning smoothly, especially with respect to Student H. The instructors met with that student individually, as well as with the other group members, and also discussed strategies for effective group work with the whole class. All groups functioned more smoothly for the wastewater project in the second part of the class, and all peer evaluations increased (Figure 4-3).

![Average Group Participation Score for CEE 3640 Group Projects](image)

**Figure 4-3: Student Peer Evaluations for CEE 3640 Group Projects**

**CEE 3640 – Water/Wastewater Treatment (Outcome e; Spring 2014)** Students completed a homework assignment wherein they calculated the clean bed headloss in a rapid sand filter. Only 64% of the students correctly applied the fundamental principles to calculate headloss and rated a 2, while 36% of the students only rated a 1. Because this is a foundational idea in the area of water and wastewater treatment, this topic was revisited in lecture and reassessed using a mini-design assignment later in the semester. Student performance improved substantially, with 86% of students rating a 2 and 14% rating a 1.

**CEE 3870 – Solid and Hazardous Waste Management (Outcome a; Fall 2012):** A homework problem was assigned to assess outcome a (ability to apply knowledge of engineering). For this
problem, students needed to conduct a mass balance to assess solid waste composition. Twenty-seven of the 42 students (64%) correctly solved the problem and received a “2” rating, but 15 of the students made errors related to waste composition “as generated” versus “as collected” and thus only rated a “1.” Since this is such a critical concept to the class, the instructor revisited the topic in lecture, and assigned an optional follow-up problem. Of the 21 students who did the follow-up problem, 18 students (86%) correctly solved the problem and achieved a “2.” This change was considered a successful course improvement ultimately resulting in more than 70% of the students achieving a level 2 performance.

C. Additional Information
Copies of the assessment materials referenced in 4.A and 4.B will be available for review at the time of the visit.
CRITERION 5. CURRICULUM

A. Program Curriculum

Plan of Study

Table 5-1 describes the plan of study for students in the EnvE program as well as average section enrollments for all courses in the program over the past two years (2012-13 and 2013-14). The curriculum requires a minimum of 130 credit hours, with 39 credits of basic math and science, 67 credits of engineering, and 24 credits of general education. These meet the ABET requirements of at least 32 credits of basic math and science and 48 credits of engineering. The EnvE program uses a semester-based schedule, with classes offered during the Fall, Spring, and Summer semesters. The recommended schedule by year and term is also presented in Figure 5-1. Personnel from the College of Engineering Advising Office and CEE Department staff review student files and ensure that students meet all of the curriculum requirements, as described earlier in the Criterion 1 section.
<table>
<thead>
<tr>
<th>Course (Department, Number, Title)</th>
<th>Required (R), Elective (E), or Selected Elective (SE)</th>
<th>Subject Area (Credit Hours)</th>
<th>Last Two Terms the Course was Offered: Year and Semester</th>
<th>Max Section Enrollment for Last Two Terms Course was Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Math &amp; Basic Sciences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1, Fall semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1210 – Calculus I</td>
<td>R</td>
<td>4</td>
<td>F2013, SP2014</td>
<td>48/45</td>
</tr>
<tr>
<td>CHEM 1210 – Principles of Chemistry I</td>
<td>R</td>
<td>4</td>
<td>F2013, SP2014</td>
<td>227/296</td>
</tr>
<tr>
<td>CHEM 1215 – Principles of Chemistry Lab I</td>
<td>R</td>
<td>1</td>
<td>F2013, SP2014</td>
<td>4</td>
</tr>
<tr>
<td>CEE 1880 – Civil and Environmental Engineering Orientation</td>
<td>R</td>
<td>1</td>
<td>F2013, SP2013</td>
<td>48</td>
</tr>
<tr>
<td>CEE 2240 – Engr. Surveying</td>
<td>R</td>
<td>3</td>
<td>F2013, SU2013</td>
<td>93/25</td>
</tr>
<tr>
<td>BIOL 1010 – Biology and the Citizen (BLS)</td>
<td>R</td>
<td>3</td>
<td>F2013, SU2013</td>
<td>268</td>
</tr>
<tr>
<td>Year 1, Spring semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1220 – Calculus II</td>
<td>R</td>
<td>4</td>
<td>F2013, SU2014</td>
<td>40/42</td>
</tr>
<tr>
<td>CHEM 1220 – Principles of Chemistry II</td>
<td>R</td>
<td>4</td>
<td>F2013, SP2013</td>
<td>372/39</td>
</tr>
<tr>
<td>CHEM 1225 – Principles of Chemistry Lab II</td>
<td>R</td>
<td>1</td>
<td>F2013, SP2013</td>
<td>24</td>
</tr>
<tr>
<td>PHYS 2210 – General Physics – Science I</td>
<td>R</td>
<td>4</td>
<td>F2013, SP2014</td>
<td>267/241</td>
</tr>
<tr>
<td>PHYS 2215 – General Physics – Science I Lab</td>
<td>R</td>
<td>1</td>
<td>F2013, SP2014</td>
<td>16/17</td>
</tr>
<tr>
<td>Year 2, Fall semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 2870 – Introduction to Programming</td>
<td>R</td>
<td>2</td>
<td>F2013, F2012</td>
<td>95/90</td>
</tr>
<tr>
<td>ENGR 2270 – Computer Engineering Drafting</td>
<td>R</td>
<td>2</td>
<td>F2013, SP2014</td>
<td>34/69</td>
</tr>
<tr>
<td>MATH 2250 – Linear Algebra and Differential Equations</td>
<td>R</td>
<td>4</td>
<td>F2013, SP2014</td>
<td>143/170</td>
</tr>
<tr>
<td>Year 2, Spring semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 2890 – Environmental Engineering Sophomore Seminar</td>
<td>R</td>
<td>1</td>
<td>SP2013, SP2012</td>
<td>18</td>
</tr>
<tr>
<td>ENGR 2450 – Engineering Numerical Methods</td>
<td>R</td>
<td>3</td>
<td>SP2013, SP2012</td>
<td>90</td>
</tr>
<tr>
<td>BENG 2400 – Thermodynamics 1</td>
<td>R</td>
<td>3</td>
<td>SP2013, SP2014</td>
<td>33/41</td>
</tr>
<tr>
<td>Course</td>
<td>Required (R), Elective (E), or Selected Elective (SE)</td>
<td>Subject Area (Credit Hours)</td>
<td>Last Two Terms the Course was Offered: Year and Semester</td>
<td>Max Section Enrollment for Last Two Terms Course was Offered</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
<td>----------------------------</td>
<td>----------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Math &amp; Basic Sciences</td>
<td>Engineering Topics. Check (✓) = Significant Design</td>
<td>General Education</td>
<td>Other</td>
</tr>
<tr>
<td>Year 3, Fall semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 3000 – Statistics for Scientists</td>
<td>R</td>
<td>3</td>
<td>F2013, SP2014</td>
<td>141/136</td>
</tr>
<tr>
<td>CEE 3500 – CEE Engineering Fluid Mechanics</td>
<td>R</td>
<td>3</td>
<td>F2013, SP2014</td>
<td>85/13</td>
</tr>
<tr>
<td>CEE 3610 – Environmental Management</td>
<td>R</td>
<td>3</td>
<td>F2013, F2012</td>
<td>72/23</td>
</tr>
<tr>
<td>CEE 3780 – Solid and Hazardous Waste Management</td>
<td>R</td>
<td>3 ✓</td>
<td>F2013, F2012</td>
<td>46</td>
</tr>
<tr>
<td>CEE 4200 – Engineering Economics</td>
<td>R</td>
<td>2</td>
<td>F2013, F2012</td>
<td>76</td>
</tr>
<tr>
<td>PSC 3000 – Fundamentals of Soil Science</td>
<td>R</td>
<td>4</td>
<td>F2013, SP2013</td>
<td>70</td>
</tr>
<tr>
<td>Year 3, Spring semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 3430 – Engineering Hydrology</td>
<td>R</td>
<td>3</td>
<td>SP2013, SP2012</td>
<td>59</td>
</tr>
<tr>
<td>CEE 3510 – CEE Engineering Hydraulics</td>
<td>R</td>
<td>3</td>
<td>F2013, SP2013</td>
<td>35</td>
</tr>
<tr>
<td>CEE 3640 – Water and Wastewater Engineering</td>
<td>R</td>
<td>4 ✓</td>
<td>SP2013, SP2012</td>
<td>29</td>
</tr>
<tr>
<td>CEE 3670 – Transport Phenomenon in Bio-Env Systems</td>
<td>R</td>
<td>3</td>
<td>SP2013, SP2012</td>
<td>5</td>
</tr>
<tr>
<td>CEE 3880 - Civil Engineering Design I</td>
<td>R</td>
<td>1 ✓</td>
<td>SP2013, SP2012</td>
<td>46</td>
</tr>
<tr>
<td>Year 4, Fall semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUBH 3310 – Occupational Health and Safety</td>
<td>R</td>
<td>3</td>
<td>F2013, F2012</td>
<td>36</td>
</tr>
<tr>
<td>CEE 4870 – Civil Engineering Design II</td>
<td>R</td>
<td>2 ✓</td>
<td>F2013, F2012</td>
<td>56</td>
</tr>
<tr>
<td>CEE 5610 – Environmental Quality Analysis</td>
<td>R</td>
<td>3</td>
<td>F2013, F2012</td>
<td>56/20</td>
</tr>
<tr>
<td>CEE 5860 – Air Quality Management</td>
<td>R</td>
<td>3 ✓</td>
<td>F2013, F2012</td>
<td>16</td>
</tr>
<tr>
<td>Year 4, Spring semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 4880 – Civil Engineering Design III</td>
<td>R</td>
<td>2 ✓</td>
<td>SP2013, SP2012</td>
<td>54</td>
</tr>
<tr>
<td>Technical Electives (select 7 credits from the list below)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEE 5430 – Groundwater Engineering</td>
<td>SE</td>
<td>3</td>
<td>F2013, F2012</td>
<td>5</td>
</tr>
<tr>
<td>CEE 5620 – Aquatic Chemistry</td>
<td>SE</td>
<td>3</td>
<td>SP2013, SP2012</td>
<td>14</td>
</tr>
<tr>
<td>CEE 5670 – Hazardous Chemicals Handling and Safety</td>
<td>SE</td>
<td>2</td>
<td>SP2013, SP2012</td>
<td>9</td>
</tr>
<tr>
<td>CEE 5680 – Soil-Based Waste Management</td>
<td>SE</td>
<td>2</td>
<td>SP2013, SP2012</td>
<td>2</td>
</tr>
</tbody>
</table>
List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.

<table>
<thead>
<tr>
<th>Course</th>
<th>Required (R), Elective (E), or Selected Elective (SE)¹</th>
<th>Subject Area (Credit Hours)</th>
<th>Last Two Terms the Course was Offered: Year and Semester</th>
<th>Max Section Enrollment for Last Two Terms Course was Offered²</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 5750 – Air Quality Measurements</td>
<td>SE</td>
<td>Engineering Topics: 3</td>
<td>F2013, F2012</td>
<td>4</td>
</tr>
<tr>
<td>CEE 5830 – Mgmt of Biological Solids and WW</td>
<td>SE</td>
<td>General Education: 3</td>
<td>F2011, F2010</td>
<td>8</td>
</tr>
<tr>
<td>CEE 5880 – Remediation Engineering</td>
<td>SE</td>
<td>Other: 3</td>
<td>F2013, F2012</td>
<td>18</td>
</tr>
<tr>
<td>PUBH 4310 – Industrial Hygiene Recognition of Hazards</td>
<td>SE</td>
<td></td>
<td>F2013, F2012</td>
<td>22</td>
</tr>
<tr>
<td>PUBH 4320 – Industrial Hygiene Chemical Hazard Evaluation</td>
<td>SE</td>
<td></td>
<td>F2013, F2012</td>
<td>16</td>
</tr>
<tr>
<td>PUBH 4330 – Industrial Hygiene Physical Hazards</td>
<td>SE</td>
<td></td>
<td>F2013, F2012</td>
<td>11</td>
</tr>
<tr>
<td>PUBH 5330 – Industrial Hygiene Chemical Hazard Control</td>
<td>SE</td>
<td></td>
<td>F2013, F2012</td>
<td>14</td>
</tr>
<tr>
<td>WATS 4500 – Limnology: Ecology of Inland Waters</td>
<td>SE</td>
<td></td>
<td>F2013, F2012</td>
<td>22</td>
</tr>
<tr>
<td>WATS 4530 – Water Quality and Pollution</td>
<td>SE</td>
<td></td>
<td>F2013, F2012</td>
<td>14</td>
</tr>
<tr>
<td>General Education classes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGL 2010 – Intermediate Writing (Year 2, Fall)</td>
<td>R</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>ENGL 3080 – Intro to Tech. Communications (Year 2, Spring)</td>
<td>R</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>Breadth AI</td>
<td>SE</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>Breadth CA</td>
<td>SE</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>Breadth HU</td>
<td>SE</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>Breadth SS</td>
<td>SE</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>Depth HU</td>
<td>SE</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
<tr>
<td>MGT 3110 – Managing Organizations and People (Depth SS)</td>
<td>R</td>
<td></td>
<td>F2013, SU2013</td>
<td>N/A</td>
</tr>
</tbody>
</table>

TOTALS-ABET BASIC-LEVEL REQUIREMENTS

OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM

<table>
<thead>
<tr>
<th></th>
<th>130 hours</th>
<th>39 hours</th>
<th>67 hours</th>
<th>24 hours</th>
</tr>
</thead>
</table>

PERCENT OF TOTAL

<table>
<thead>
<tr>
<th></th>
<th>30%</th>
<th>51.5%</th>
<th>18.5%</th>
</tr>
</thead>
</table>

Total must satisfy either credit hours or percentage

<table>
<thead>
<tr>
<th>Minimum Semester Credit Hours</th>
<th>32 Hours</th>
<th>48 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Percentage</td>
<td>25%</td>
<td>37.5 %</td>
</tr>
</tbody>
</table>

44
1. **Required** (R) courses are required of all students in the program, **elective** (E) courses are optional for students, and **selected elective** (SE) courses are those for which students must take one or more courses from a specified group.

2. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the maximum enrollment in each element. For selected elective courses, indicate the maximum enrollment for each option.
Curriculum Alignment with Program Educational Objectives (PEOs)

The EnvE program educational objectives (PEOs) are given in the Criterion 2 section. At a high level, the PEOs for this program are for graduates to achieve success in their careers and engage in learning activities throughout their lives. The main indicators of PEO success are a graduate’s (1) application of the knowledge and skills in the workplace that were acquired in the program and (2) ability to acquire new knowledge and skills. The keys to achieving these objectives are: (1) a good understanding of fundamental principles (math, science, and engineering), (2) the ability to apply critical thinking and appropriate tools to engineering problem solving, and (3) the ability to work ethically, think globally, and function well as a team member. The curriculum is designed to produce these abilities in our graduates so that they can attain the PEOs.

The core and elective courses are offered in an environment rich in laboratory experience, using modern tools. The fundamental courses provide students with the foundation necessary for broad understanding and for more advanced study. Other courses provide students with skills and experience with engineering tools that make them valuable employees immediately upon graduation. Students are thus prepared for a successful professional career with some “staying power” (successful career – PEO 1). Experiences in upper-level courses, building upon the foundation of fundamentals principles, provide students with some applied engineering skills that can be utilized in the workplace (PEO 1). A good understanding of fundamental engineering principles also prepares students for further study (life-long learning – PEO 3). The ethics training in Engineering Design and other courses develops their ethical sensitivities (sound ethical judgment – PEO 2).

Curriculum Support for the Attainment of Student Outcomes

Each math, science, and engineering course in the curriculum is mapped to one or more specific student outcomes as shown in Table 5-2. Note that not all of these classes are specifically evaluated as part of Criterion 4.

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1210</td>
<td>Calculus I</td>
</tr>
<tr>
<td>MATH 1220</td>
<td>Calculus II</td>
</tr>
<tr>
<td>MATH 2250</td>
<td>Linear Algebra/Differential Eqn</td>
</tr>
<tr>
<td>STAT 3000</td>
<td>Statistics</td>
</tr>
<tr>
<td>CHEM 1210</td>
<td>Principles of Chemistry I</td>
</tr>
<tr>
<td>CHEM 1215</td>
<td>Principles of Chemistry Lab I</td>
</tr>
<tr>
<td>CHEM 1220</td>
<td>Principles of Chemistry II</td>
</tr>
</tbody>
</table>

Table 5-2: Course Mapping to Student Outcomes (elective classes are shaded)
<table>
<thead>
<tr>
<th>Course</th>
<th>Student Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1225</td>
<td>Principles of Chemistry Lab II</td>
</tr>
<tr>
<td>CHEM 2300</td>
<td>Principles of Organic Chemistry</td>
</tr>
<tr>
<td>PHYS 2210</td>
<td>General Physics I</td>
</tr>
<tr>
<td>PHYS 2215</td>
<td>General Physics Lab I</td>
</tr>
<tr>
<td>BIOL 1010</td>
<td>Biology and the Citizen</td>
</tr>
<tr>
<td>ENGL 2010</td>
<td>Intermediate Writing</td>
</tr>
<tr>
<td>ENGL 3080</td>
<td>Technical Communication</td>
</tr>
<tr>
<td>ENGR 2010</td>
<td>Statics</td>
</tr>
<tr>
<td>ENGR 2030</td>
<td>Dynamics</td>
</tr>
<tr>
<td>ENGR 2270</td>
<td>Computer Drafting</td>
</tr>
<tr>
<td>ENGR 2450</td>
<td>Numerical Methods</td>
</tr>
<tr>
<td>BENG 2400</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>PSC 3000</td>
<td>Soil Science</td>
</tr>
<tr>
<td>PUBH 3310</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>CEE 1880</td>
<td>CEE Orientation</td>
</tr>
<tr>
<td>CEE 2240</td>
<td>Engineering Surveying</td>
</tr>
<tr>
<td>CEE 2870</td>
<td>Intro to Programming</td>
</tr>
<tr>
<td>CEE 2890</td>
<td>Sophomore Seminar</td>
</tr>
<tr>
<td>CEE 3430</td>
<td>Engr. Hydrology</td>
</tr>
<tr>
<td>CEE 3500</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
</tr>
<tr>
<td>CEE 3610</td>
<td>Environ. Mgmt.</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water/Wastewater Engr.</td>
</tr>
<tr>
<td>CEE 3670</td>
<td>Transport Phenomena</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid/Haz. Waste Mgmt.</td>
</tr>
<tr>
<td>CEE 3880</td>
<td>Civil Engr. Design I</td>
</tr>
<tr>
<td>CEE 4200</td>
<td>Engr. Economics</td>
</tr>
<tr>
<td>CEE 4870</td>
<td>Civil Engr. Design II</td>
</tr>
<tr>
<td>CEE 4880</td>
<td>Civil Engr. Design III</td>
</tr>
<tr>
<td>CEE 5250</td>
<td>Env. Co-op</td>
</tr>
<tr>
<td>CEE 5430</td>
<td>Groundwater Engineering</td>
</tr>
</tbody>
</table>

47
<table>
<thead>
<tr>
<th>Course</th>
<th>Student Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 5610 Environ. Quality Analysis</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5620 Aquatic Chemistry</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5670 Haz. Chem. Safety</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5680 Soil-Based Waste Mgmt.</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>CEE 5730 Environ. Org Contaminants</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5750 Air Quality Measurements</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>CEE 5830 Mgmt. Biosolid/Wastewater</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5860 Air Quality Mgmt.</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 5930 Env. Eng. In Develop Countries</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
</tbody>
</table>

**Prerequisite Structure of the EnvE Program’s Required Courses**

The prerequisites for the required courses are shown in the Degree Progression Flow Diagram in Figure 5-1.
Math and Basic Sciences, Engineering Topics, and General Education

Our curriculum is designed to prepare students both in fundamental math, science, and engineering principles – establishing an enduring foundation of technical fundamentals to build on throughout an extended career – as well as prepare them to be immediately productive as engineers “right out of the box.” The pre-professional program curriculum (the first two years) includes 36 credit hours of math and science (calculus, linear algebra, differential equations, numerical methods, physics, computer programming, chemistry, and biology), as well as 18 credit hours of engineering fundamentals (statics, dynamics, surveying, computer drafting, thermodynamics). Students who complete the pre-professional curriculum with a sufficiently high grade point average are admitted to the professional program. In the professional program, students take additional core engineering fundamentals courses in civil and environmental engineering along with engineering economics, applied sciences, and technical writing courses. Following the completion of the core courses, students take three additional technical elective courses (typically 5000-level courses) from the areas of solids, water, air, and occupational safety and health.

A total of 27 credits are also required to meet USU’s general education requirements for breadth (B) and depth (D) in the following six categories: American Institutions (AI), Creative Arts (CA), Humanities (HU), Life Sciences (LS), Physical Sciences (PS), and Social Sciences (SS). Several required classes in the EnvE curriculum meet these general education requirements, including BIOL 1010 (BLS), MGT 3110 (DSS), and CHEM 1220 (BPS). Students choose from a list of approved classes to meet the other breadth and depth requirements (Supplement 9).

Capstone Design Experience

The EnvE capstone design experience is carried out over a three-semester course sequence. EnvE students work jointly with Civil Engineering students on multi-disciplinary design projects during the final three semesters of the BS degree program. In CEE 3880, third-year students identify design projects, form teams, and prepare a design project proposal. Students begin working with mentors (faculty advisers, external clients, and external professional engineers). Students attend weekly seminars featuring guest lecturers from outside the Department and/or University that provide knowledge on skills needed for the design sequence and post-collegiate settings. Topics include: team building, winning and keeping clients, Critical Path Method and Gantt Charts for project planning, proposal writing, contracts and specifications, professional and ethical responsibility, design constraints, continuing professional education, and engineering within private and public sectors. Student exercises include: writing technical briefs on guest-lecture presentations, writing a technical proposal for their design project, and evaluating the oral presentations of projects completed by CEE 4880 teams.

During CEE 4870 (first semester of senior year), student teams work on projects proposed in CEE 3880. Students and mentors (faculty advisers, clients, and external professional advisors) sign Memoranda of Agreement delineating roles and responsibilities for team projects. Students meet weekly to work, report progress, and receive guidance on projects. Additionally, students receive training on enhancing team productivity, strengthening team-mentor relationships, decision-making, managing projects, reporting oral and written project progress, fulfilling professional responsibility and continuing professional education. Teams use germane design standards, perform necessary research and calculations, conduct and report formal meetings,
adhere to schedules, deliver an oral presentation, and submit progress reports and an end-of-semester report. Mentors and peers evaluate the oral presentation, and mentors evaluate the reports.

Within CEE 4880 (second semester of senior year), student teams complete their design project and deliver results in formal oral presentation and written report. To accomplish this, teams perform research, address design constraints (health, safety, social, economic, political, environmental, sustainability, and others), make calculations, plan and conduct meetings, report progress, and fulfill professional responsibility. Students attend team meetings and selected classes. Mentors and peers evaluate the oral presentation. Mentors evaluate written reports.

**Cooperative Education**

Students in the EnvE program can use a cooperative education experience to obtain up to 3 credits that count as a technical elective. The student must first discuss their proposed co-op experience with the EnvE Co-op advisor (Dr. Ryan Dupont). For 3 credits, the student must work at least 320 hours (40 hours/week for at least 8 weeks or 20 hours/week for 16 weeks). The learning objectives for the co-op must be documented on the Co-op Internship Agreement (see Supplement 10) and the student must be supervised by a licensed engineer. Once approved by the advisor, the student registers for CEE 5250 – EnvE Co-operative Practice for the appropriate number of credit hours. Upon completion of the co-op, the student must complete a written evaluation of their work performance and progress on learning objectives, and give an oral presentation to EnvE students and faculty. The supervisor also submits an evaluation of the student’s performance during the co-op (Supplement 10).

**Materials Available During the Visit**

Each course has a binder that contains the course syllabi (both the ABET format shown in Appendix A and the regular syllabus), representative high/medium/low samples of student work, course change documentation, and assessment results. Textbooks will also be available for review during the visit. A binder summarizing all assessment materials and evaluations will also be available.

**B. Course Syllabi**

A syllabus for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5 is included in Appendix A.
CRITERION 6. FACULTY

A. Faculty Qualifications

The Environmental Engineering Division within the CEE Department has nine full-time faculty members (Table 6-1); seven are tenured (four full professors and three associate professors) and two are non-tenure track (research professors). Eight of the nine faculty have a terminal degree (PhD), and the faculty obtained their highest degree from six different universities, with specialties in civil and environmental engineering, agricultural engineering, environmental health engineering, soil chemistry, and water chemistry. The EnvE program is also supported by courses taught by Civil Engineering faculty in the CEE Department (Table 6-1). Presently, seven of the EnvE faculty are eligible (because of their degrees) for Professional Engineering registration, and three of the eligible faculty are registered as Professional Engineers. Two faculty members are also Board Certified Environmental Engineers. However, all of the non-registered faculty have extensive professional and consulting experience, and therefore all of the faculty teaching undergraduate courses are either registered or have equivalent professional experience. Faculty resumes are included in Appendix B.

The expertise of the EnvE faculty can be divided into the following areas:

- Water and Wastewater Management: Ryan Dupont, Joan McLean, Laurie McNeill, Michael McFarland
- Air Quality Management: Randy Martin, Ryan Dupont, Michael McFarland
- Solid and Hazardous Waste Management: Ryan Dupont, William Doucette, Michael McFarland, Joan McLean
- Environmental Chemistry: William Doucette, Joan McLean
- Water Quality Modeling: Bethany Neilson, David Stevens
- Environmental Process Dynamics: William Doucette, Ryan Dupont, David Stevens, Bethany Neilson
- Environmental Statistics: David Stevens

The size of the faculty for our teaching needs is adequate in the steady state. Given the modest enrollment of the program, many of the technical electives are only taught every other year. When a faculty member is on sabbatical leave, the resulting teaching shortfalls are covered by existing faculty with help from capable graduate students and/or adjuncts. However, it is our aim to have faculty cover the classes as much as possible. Even though most faculty members have a high level of research activity, undergraduate and graduate teaching is an EnvE program priority and a priority for each faculty member. Much of the research is applied, with engineering firms and government agencies as sponsors of the research, which allows faculty to bring that research experience into the classroom as a source of real-world problems and contemporary issues.
## Table 6-1: Faculty Qualifications

<table>
<thead>
<tr>
<th>Faculty Name</th>
<th>Highest Degree Earned - Field and Year</th>
<th>Rank</th>
<th>Type of Academic Appointment</th>
<th>Years of Experience</th>
<th>Professional Registration/Certification</th>
<th>Level of Activity</th>
<th>Professional Organizations</th>
<th>Professional Development</th>
<th>Consulting/summer work in industry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Engineering Faculty</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doucette, William</td>
<td>PhD – Water Chemistry, 1985</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>1</td>
<td>27</td>
<td>28</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>Dupont, Ryan</td>
<td>PhD – Env. Health Eng., 1982</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>2</td>
<td>33</td>
<td>31</td>
<td>None</td>
<td>M</td>
</tr>
<tr>
<td>Martin, Randal</td>
<td>PhD – CE, 1992</td>
<td>RASC</td>
<td>NTT</td>
<td>FT</td>
<td>5</td>
<td>21</td>
<td>13</td>
<td>EIT</td>
<td>M</td>
</tr>
<tr>
<td>McLean, Joan</td>
<td>MS – Soil Chem, 1978</td>
<td>RASC</td>
<td>NTT</td>
<td>FT</td>
<td>5</td>
<td>31</td>
<td>31</td>
<td>None</td>
<td>L</td>
</tr>
<tr>
<td>McNeill, Laurie</td>
<td>PhD – CE, 2000</td>
<td>ASC</td>
<td>T</td>
<td>FT</td>
<td>0</td>
<td>14</td>
<td>13</td>
<td>EIT</td>
<td>M</td>
</tr>
<tr>
<td>Neilson, Bethany</td>
<td>PhD – CEE, 2006</td>
<td>ASC</td>
<td>T</td>
<td>FT</td>
<td>0</td>
<td>7</td>
<td>7</td>
<td>EIT</td>
<td>H</td>
</tr>
<tr>
<td>Stevens, David</td>
<td>PhD – CEE, 1983</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>6</td>
<td>27</td>
<td>27</td>
<td>PE: OH</td>
<td>M</td>
</tr>
<tr>
<td><strong>Civil Engineering Faculty (who contribute to the EnvE program)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caliendo, Joseph</td>
<td>PhD – CE, 1986</td>
<td>ASC</td>
<td>T</td>
<td>FT</td>
<td>7</td>
<td>21</td>
<td>21</td>
<td>PE: FL, VA</td>
<td>H</td>
</tr>
<tr>
<td>Peralta, Richard</td>
<td>PhD – Ag. (Water) Eng., 1979</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>5</td>
<td>30</td>
<td>25</td>
<td>PE: UT, AR</td>
<td>M</td>
</tr>
<tr>
<td>Tarboton, David</td>
<td>ScD – CE, 1990</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>0</td>
<td>23</td>
<td>23</td>
<td>PE: UT</td>
<td>M</td>
</tr>
<tr>
<td>Tullis, Blake</td>
<td>PhD – CEE, 1996</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>1.5</td>
<td>16</td>
<td>12</td>
<td>EIT</td>
<td>H</td>
</tr>
<tr>
<td>Urroz, Gilberto</td>
<td>PhD – CEE, 1988</td>
<td>ASC</td>
<td>T</td>
<td>FT</td>
<td>1.5</td>
<td>30</td>
<td>25</td>
<td>PE: UT</td>
<td>M</td>
</tr>
</tbody>
</table>

53
1. Code: P = Professor  ASC = Associate Professor  AST = Assistant Professor  I = Instructor  A = Adjunct  
   RASC = Research Associate Professor  RAST = Research Assistant Professor  O = Other
2. Code: T = Tenured  TT = Tenure Track  NTT = Non Tenure Track
3. Code: FT = Full-time  PT = Part-time  Appointment at the institution.
4. The level of activity (high, medium or low) should reflect an average over the year prior to the visit plus the two previous years.
B. Faculty Workload

Utah State University has adopted role statements to clarify expectations and associated workloads for faculty. A role statement is a document that broadly describes the multiple responsibilities of a faculty member at USU and outlines the performance expectations that the University has of faculty members. Faculty role assignments are divided into the three broad categories of Teaching, Research, and Service. The typical faculty workload is shown in Table 6-2. The Program Activity Distribution corresponds closely to the USU role statement categories. Although the faculty role statement percentages (teaching/research/service) formally represent weightings applied to faculty evaluations, a close correspondence with workload is also expected. Faculty must demonstrate “excellence” in their major role, which is research for most faculty within the College of Engineering, and must demonstrate “effectiveness” in the remaining areas of teaching and service. Typical annual expectations are that faculty publish two or more journal articles in respected, peer-review journals, present research results at one or more conferences, and acquire sufficient external funding to support their research enterprise. Of course, these represent only general expectations, and vary somewhat with respect to individual faculty members. Most faculty teach two to four courses per year, with adjustments based on course size, service commitment, and other factors. For their service role, faculty serve on department, college, and university committees as well as have various roles advising students (see next section). The USU faculty also has a strong presence in local, regional, and national service to the community and the discipline. As can be seen in faculty resumes in Appendix B, these positions include leadership positions in the local society chapters, membership on several State of Utah boards and commissions (e.g. the Solid and Hazardous Waste Board, Drinking Water Board, State of Utah wastewater operators and drinking water operators certification commissions). At the national level, EnvE faculty serve or have served on the editorial boards of several journals, on EPA Science Advisory Boards, various National Science Foundation review panels, and society specialty committees, and as organizers of regional and national scientific meetings.
<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>PT or FT</th>
<th>Classes Taught (Course # - Credit Hrs.)</th>
<th>Term and Year</th>
<th>Program Activity Distribution</th>
<th>% of Time Devoted to the Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Classes Taught (Course # - Credit Hrs.)</td>
<td></td>
<td>Teaching and service</td>
<td>Research or Scholarship</td>
</tr>
<tr>
<td>Environmental Engineering Faculty</td>
<td></td>
<td></td>
<td></td>
<td>% of Time</td>
<td></td>
</tr>
<tr>
<td>Adams, Craig</td>
<td>FT</td>
<td>CEE 4930/6930 – 3, F13, Sp14 CEE 6900 – 3, Sp14 CEE 6970/7970 – 3, F13, Sp14</td>
<td></td>
<td>10%</td>
<td>30%</td>
</tr>
<tr>
<td>Doucette, William</td>
<td>FT</td>
<td>CEE 5620 – 3, Sp14 CEE 5670 – 2, Sp14 CEE 5730/6730 – 3, F13</td>
<td></td>
<td>30%</td>
<td>60%</td>
</tr>
<tr>
<td>Dupont, Ryan</td>
<td>FT</td>
<td>CEE 3640 – 4, Sp14 CEE 3780 – 3, F13 CEE 5250 – 2, F13, Sp14</td>
<td></td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>Martin, Randal</td>
<td>FT</td>
<td>CEE 5750 – 3, Sp14 CEE 5860 – 3, F13 CEE 6930 – 3, Sp14</td>
<td></td>
<td>30%</td>
<td>50%</td>
</tr>
<tr>
<td>McFarland, Michael</td>
<td>FT</td>
<td>CEE 5830/6830 – 3, F13 CEE 6650 – 3, Sp14</td>
<td></td>
<td>25%</td>
<td>65%</td>
</tr>
<tr>
<td>McLean, Joan</td>
<td>FT</td>
<td>CEE 5610/6610 – 3, F13</td>
<td></td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Faculty Member</td>
<td>PT or FT</td>
<td>Classes Taught (Course # - Credit Hrs.)</td>
<td>Term and Year</td>
<td>Program Activity Distribution</td>
<td>% of Time Devoted to the Program</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------</td>
<td>----------------------------------------</td>
<td>---------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Teaching and service</td>
<td>Research or Scholarship</td>
</tr>
<tr>
<td>McNeill, Laurie</td>
<td>FT</td>
<td>CEE/PUBH 3610 – 3, F13</td>
<td></td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 3640 – 4, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6640 – 3, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6670 – 2, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neilson, Bethany</td>
<td>FT</td>
<td>CEE 3670 – 3, Sp14</td>
<td></td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6740 – 3, F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevens, David</td>
<td>FT</td>
<td>CEE 2890 – 1, Sp14</td>
<td></td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6630 – 3, F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6660 – 3, F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6800 – 1, F13, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil Engineering Faculty (who contribute to the EnvE program)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caliendo, Joseph</td>
<td>FT</td>
<td>CEE 2240 – 3, F13</td>
<td></td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 4300 – 3, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 5350/6350 – 3, F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 5900 – 3, F13, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 6320 – 3, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peralta, Richard</td>
<td>FT</td>
<td>CEE 3880 – 1, Sp14</td>
<td></td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 4870 – 2, F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 4880 – 1, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 5450/6450 – 3, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 7000 – 4 F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rahmeyer, William</td>
<td>FT</td>
<td>ENGR 2010 – 3, Sp14</td>
<td></td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 3500 – 3, F13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEE 5470/6470 – 3, Sp14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty Member</td>
<td>PT or FT</td>
<td>Classes Taught (Course # - Credit Hrs.) Term and Year</td>
<td>Program Activity Distribution</td>
<td>% of Time Devoted to the Program</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----------</td>
<td>------------------------------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Teaching and service</td>
<td>Research or Scholarship</td>
<td>Other</td>
</tr>
<tr>
<td>Tarboton, David</td>
<td>FT</td>
<td>CEE 3430 – 3, Sp13 CEE 6440 – 3, F13</td>
<td>30%</td>
<td>70%</td>
<td>0%</td>
</tr>
<tr>
<td>Tullis, Blake</td>
<td>FT</td>
<td>CEE 3500 – 3, Sp14 CEE 5540/6540 – 3, F13 CEE 5550/6550 – 3, Sp14</td>
<td>33%</td>
<td>67%</td>
<td>0%</td>
</tr>
<tr>
<td>Urroz, Gilberto</td>
<td>FT</td>
<td>ENGR 2450 – 3, Sp14 CEE 2870 – 2, F13 CEE 3510 – 3, F13, Sp14</td>
<td>85%</td>
<td>15%</td>
<td>0%</td>
</tr>
</tbody>
</table>

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For the academic year for which the self-study is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution. The balance of the time is devoted to the Civil Engineering program.
C. Faculty Size

As mentioned above in Section 6.B, the size of the EnvE faculty is adequate to cover the teaching load of the program. The faculty to student ratio is very favorable, allowing close interaction (often one-on-one) with the students. EnvE faculty actively participate in the advising of both undergraduate and graduate students, and also serve as mentors and advisors for Senior Design projects. Nearly all undergraduate EnvE students are involved in undergraduate research with the faculty, typically through research activities at the Utah Water Research Lab. In addition, some EnvE faculty are heavily involved in student organizations at USU including Engineers without Borders, Society of Environmental Engineering Students, and the American Society of Civil Engineers.

The EnvE faculty interact with industrial and professional practitioners primarily through industry-funding research activities, conference attendance, CEE Department Advisory Board meetings, and senior design projects. Faculty also keep up-to-date with industry trends through participation in both professional conferences and professional service activities.

D. Professional Development

Faculty are encouraged to attend conferences and workshops to keep current with technologies and advancements in their fields of expertise. These activities are typically supported through new faculty startup packages, research grants, and the department E&G budget.

University and College Professional Development

To foster instructional excellence and to launch the careers of new, untenured assistant professors on a positive and productive trajectory, USU has created a one-semester teaching experience (the New Faculty Teaching Academy) to support the transition of new faculty into the multiple roles that they will assume at a modern, comprehensive, research intensive, student-centered land-grant university. The Teaching Academy is a structured, group experience for new faculty that explores the fundamental principles of high-quality college teaching and lays the foundation for success in the classroom. The New Faculty Teaching Academy is sponsored by the Office of the Executive Vice President and Provost. The Provost’s Office and the Engineering Dean’s Office also sponsor a number of professional development programs for all faculty. For instance, the Office of the Executive Vice President and Provost sponsors a series on Instructional Excellence to stimulate and advance the academic environment of Utah State University. Experts from USU and beyond are invited to deliver lectures, lead workshops, and facilitate discussions on topics and issues important for the pursuit of excellence in teaching and learning. Presentations offered over the 2013-14 academic year included:

- Michael Torrens: Getting the Most from the IDEA Student Ratings of Instruction - October 1, 2013
- John Louviere: Advancing Teaching Excellent - CIDI and Canvas Learning Management System - October 22, 2013
- Sylvia Read: Peer Evaluation of Teaching - November 12, 2013
- Economics and Finance: Department Teaching Excellence - February 25, 2014
Faculty members in the College of Engineering are encouraged to participate in these programs. Whenever possible, Provost series lectures are captured and archived for delayed viewing. Archives can be found on the Provost’s webpage.

The Dean’s Office in the College of Engineering sponsors a number of professional development sessions for faculty throughout the academic year, beginning with the fall retreat. The Dean usually invites one expert from outside of USU to the retreat. For example, at the Fall 2013 retreat, Amy Moll, Dean of Boise State University’s College of Engineering, was invited to present “ABET: Help or Hindrance?” which she presented earlier at the 2013 ABET Symposium. The Dean and Associate Deans hold a series of professional development programs for the untenured faculty on topics related primarily to career development and the tenure and promotion process (usually three programs a year for the first-year faculty and one program a year for the remaining untenured faculty). The Dean also provides travel funds to faculty who are successful in their research role but are struggling in their teaching role to attend a teaching workshop, e.g. the National Effective Teaching Institute.

**Sponsored Programs Office**

The Sponsored Programs Office (SPO) is a unit within the Vice President for Research Office created to serve the faculty, staff, and students by assisting and facilitating the pursuit of external funding for scholarly, research, public service, and instructional activities. This office sponsors a number of educational and training workshops throughout the year.

**USU Center for Innovative Instruction and Design (CIDI)**

The USU Center for Innovative Instruction and Design (CIDI) is committed to supporting the university community and empowering faculty to improve the quality of instruction across the USU system through technology, production assistance, training, consultation and support. The mission of CIDI is to assist the USU community with classroom material preparation, instructional design and development, and Canvas support.

**EnvE Faculty Professional Development**

A summary of the recent professional development activities for each EnvE faculty member is provided on each faculty CV in Appendix B.

**E. Authority and Responsibility of Faculty**

The initiation of new courses is the responsibility of the EnvE faculty who have significant latitude in creation, modification, and deletion of courses to support the evolving needs of the program. Typically, a potential new course is suggested by a faculty member, who provides a description of the course, a syllabus, and a textbook title. The course is temporarily assigned as a section of CEE 4930 – Special Topics. The course approval process then requires approval by a number of people and/or committees, with a final approval by the university Educational Policies Committee (EPC). Approval signatures are required from:

1. CEE Department Head
2. Dean of Engineering
3. College Representative on EPC
4. University Council on Teacher Education Chair (as needed)
5. General Education Chair (as needed)
6. Honors Program Director (as needed)
7. EPC Chair

Upon receiving EPC approval, the course is assigned a permanent CEE course number and placed in the University Catalog. Changing course content or prerequisites requires a similar process. After the EnvE Faculty have approved the change, the Semester Course Approval Form is prepared and sent to the EPC via the same approval routing as shown above.

As indicated, the role of the Dean in the course creation process rests primarily in the approval process. The role of the Provost in the process is only indirect, as the Provost is responsible for appointing various personnel involved in the approval process. The department head is ultimately responsible for the development and implementation of processes for assessment, evaluation, and continuous improvement. However, the Assessment Committee and Undergraduate Curriculum Committee represent the primary mechanism by which the department initiates the revision of Program Educational Objectives and Student Outcomes, and evaluates the attainment of these outcomes. The Assessment and Undergraduate Curriculum Committees each receive input and make recommendations to the department head. These recommendations are presented to the full faculty at department faculty meetings, where discussion and voting on actions take place. Faculty meetings also provide an opportunity to instruct faculty on their responsibilities and involvement in assessment processes in the department. The department head also becomes involved in the course evaluation process through a review of course evaluations which are completed by students near the end of each course.

Individual faculty also take a role in defining and ensuring attainment of specific program educational objectives and student outcomes through assessment in the courses that they teach. A more detailed description of the faculty’s involvement in the ensuring the attainment of student outcomes is provided in under Criterion 3 (Student Outcomes) and 4 (Continuous Improvement). In addition, faculty involvement in the determination of program educational objectives is described more fully under Criteria 2 (Program Educational Objectives).
CRITERION 7. FACILITIES

A. Offices, Classrooms and Laboratories

The College of Engineering occupies six separate buildings with a combined floor space of more than 450,000 ft². The newest building is the 38,000 ft² David G. Sant Engineering Innovation Building that was dedicated in June 2008.

Offices

The CEE departmental office space is split between the 2nd floor of the Engineering Lab (ENLAB) building and the 2nd floor of the Engineering (ENGR) building. Space in the ENLAB building consists of a suite for the main CEE office (ENLAB 211) with a reception area, offices for the CEE Department staff (business manager, office assistant, staff assistant, advisor, and computer technician), conference room, copy room, and supply room. Seven faculty offices, each approximately 150 ft², are located in the ENLAB hallway near the main CEE office suite. Twelve additional faculty offices are located in the ENGR building. Four of these offices are each shared by two faculty who have their main office at the Water Lab. Graduate student office space is located in the 2nd floor of the ENGR building and the ENLAB building basement; many EnvE students have their office down at the Water Lab. Office spaces typically have computers, printers, wired and wireless internet connections, and VOIP phones.

The CEE student lounge (ENLAB 229) was remodeled in Fall 2013 with new lockers, tables, and a computer and flat panel screen. This space is used as a student study and meeting room, and as a practice area for group presentations.

Classrooms and Associated Equipment

The College of Engineering provides excellent teaching classrooms in the Engineering (ENGR) building and the Engineering Laboratory (ENLAB) building. The combined classroom space in both buildings totals 71,594 ft². There are 16 classrooms available, with each seating between 32 and 219 students. All classrooms provide extensive multi-media support, including computers, overhead projectors, and high speed wireless internet connections. Scheduling of classrooms in these buildings is the responsibility of USU, with requests being initiated at the department level. Table 7-1 is a list of classroom space used by the CEE Department.

<table>
<thead>
<tr>
<th>Building and Room Number</th>
<th>Maximum Seating</th>
<th>Building and Room Number</th>
<th>Maximum Seating</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 101</td>
<td>158</td>
<td>ENGR 201</td>
<td>78</td>
</tr>
<tr>
<td>ENGR 103</td>
<td>219</td>
<td>ENGR 202</td>
<td>32</td>
</tr>
<tr>
<td>ENGR 104</td>
<td>65</td>
<td>ENGR 203</td>
<td>78</td>
</tr>
<tr>
<td>ENGR 106</td>
<td>68</td>
<td>ENGR 204</td>
<td>34</td>
</tr>
<tr>
<td>ENGR 108</td>
<td>122</td>
<td>ENGR 205</td>
<td>60</td>
</tr>
<tr>
<td>ENGR 302</td>
<td>102</td>
<td>ENGR 206</td>
<td>30</td>
</tr>
<tr>
<td>ENGR 304</td>
<td>40</td>
<td>ENGR 238</td>
<td>46</td>
</tr>
<tr>
<td>ENGR 401</td>
<td>38</td>
<td>ENLAB 250</td>
<td>49</td>
</tr>
</tbody>
</table>
In addition to the university-operated classroom facilities, the CEE Department also teaches classes in ENLAB 221 and 235B. The primary difference between these and the other classrooms is that the CEE Department is responsible for scheduling their use, which provides some flexibility for unexpected demands in classroom space. Each room seats 35 students and also contains computer and overhead projection equipment.

The College’s primary undergraduate computing facility is housed on the third floor of the ENGR building and contains over 150 computers, each with high speed internet access. This area also includes moveable walls which may be closed to provide isolated classroom space for individual student access to computer workstations. The facility is described in more detail in Section 7.B below.

The ENGR and ENLAB buildings also house major undergraduate teaching laboratories, student project rooms, and a display area for engineering projects. A Student Learning and Advising center is also located on the third floor.

Laboratory facilities

The CEE Department has ten laboratories used by both undergraduate and graduate students, four of which are actively used in the Environmental Engineering program. The Environmental Teaching Laboratory and the Hydraulics Laboratory are small and sparsely equipped compared to laboratories at the CEE Departments of peer institutions. However, the laboratories are supplemented by the Environmental and Hydraulics facilities located at the Utah Water Research Laboratory (UWRL). The UWRL is primarily used for faculty and graduate student research, although undergraduate classes sometimes have tours or lab exercises at the UWRL, and many undergraduate students participate in research at the UWRL.

The Environmental Teaching Laboratory is located on the second floor of the Engineering Laboratory building (ENLAB 223) and occupies about 1600 square feet of floor space. The lab is used for courses in Environmental Quality Analysis, Environmental Microbiology, Air Quality Measurements, and Hazardous Chemical Safety, as well as graduate courses. The last major remodel of the lab was in 1991, and a common (accurate) comment from the senior exit interviews is that this lab is in need of an upgrade. This year (2014), the CEE Department allocated approximately $45,000 in funds for a partial remodel (upgraded lighting, lab furniture (cabinets and shelves), and new paint/carpet/flooring) and new equipment (jar test apparatus, DO meters, etc).

The Hydraulics Laboratory is located in ENLAB 130 and occupies about 1600 square feet of floor space. The laboratory is used by several courses and is shared with other departments. The laboratory includes a basement area used for vertical pumps and recirculation water sumps. Laboratory equipment includes two Armfield re-circulating hydraulics bench and a one-foot-wide, 24-ft-long, tilting flume. The flume has been renovated and uses a new state-of-the-art magnetic flowmeter. The hydraulics lab also has a soil liquefaction tank that is used to demonstrate the principles of soil liquefaction and seismic interaction. Along with the expansion of the material testing lab, additional floor space has been provided to the laboratory.

The CEE Geomatics Lab is a high-end computer laboratory that is for general CEE student use and specifically for the course CEE 5190 - Geographic Information Systems for Civil Engineers. The lab has 19 DELL NT stations and 10 Sun Workstations with all of the appropriate software for the GIS and Geometric Design class activities. The lab is also equipped
with a wide bed color plotter, digitizer, scanner, and color and black and white printers. The lab is regularly scheduled for the GIS and Geometric Highway Design classes. It is also available for special use by other classes. The lab is under the direct control of the Department of Civil and Environmental Engineering and meets all of the needs of CEE 5190. As with all computer labs, continual maintenance and upgrading of the lab is required.

The Surveying Laboratory is located in ENLAB 132 and occupies about 500 square feet of floor space. The laboratory is used primarily to store and distribute surveying equipment for the undergraduate surveying course (CEE 2240). The laboratory has all of the conventional surveying equipment including levels, theodolites, total stations, etc. needed for a first course in surveying. Two Trimble GPS units have been purchased within the last few years. These are typically used as rover units while the City of Logan provides a base station. There is not enough equipment to conveniently accommodate the number of students that are now enrolled in the program making it necessary to have a number of laboratory sections. Surveying classes are taught only during the summer and fall semesters because the classes require students to operate equipment outside of the classrooms. Although crowded, the Surveying Laboratory is adequate for the undergraduate surveying course.

A small CEE Department fabrication and machining shop is located adjacent to the Concrete and Hydraulics labs on the first floor of the ENLAB building and occupies about 200 square feet of floor space. The shop is used to fabricate research and instructional equipment. It is also used to fabricate projects for Senior design projects and the Engineers Without Borders program. The College of Engineering maintains an undergraduate fabrication laboratory in the Technology Building which is available for student use as well. It has a variety of machining tools including lathes, milling machines, breaks, drill presses, gas and electric welders, presses, shears, and band saws. The college supports a technician who oversees the operation of the college fabrication lab.

Appendix C contains a list of the major pieces of equipment used by the EnvE program in support of instruction.

B. Computing Resources

Open Access Computer Labs

The Department of Information Technology supports 11 Open Access Computer Labs that provide USU students with state-of-the-art computer services and software; qualified consultants trained to answer any software, general, or university questions; and employment opportunities with real-world application and hands-on experiences. Two of the Open Access Labs focus their support on students in the College of Engineering: the Engineering Open Access Lab and the Engineering Education Open Access Lab.

The Engineering Open Access Lab includes 157 HP Z220 workstations, each with an Intel® Core™ i7 3.4 GHz process, 16 GB RAM, DVD+RW drive and 2 TB hard drive. Students have access to a Canon CanoScan LiDE 210 scanner and printers (Epson Stylus® Photo R2000, HP Laserjet 4015, and HP Color LaserJet CP4025 all accessed through the campus print system). They can also access an HP Designjet Z3200ps Photo large format plotter.
Software available to all students includes document tools, development tools, audio visual tools, network and utility tools, engineering tools and mathematics tools. Specific engineering tools include AutoCAD, Fieldview, STARR CCM, and SolidEdge. Specific mathematical tools include FEMAP, Maple, Mathcad, and MATLAB. A complete list of current software available to all lab users is in Supplement 11.

The Engineering Education Open Access Lab includes 40 PCs with Intel Core i5 2500 3.3GHz Quad Core, 8 GB DDR3 RAM for student use. The computers have Microsoft Office Suite, MATLAB, AutoDesk AutoCAD Suite, Microsoft Project, Microsoft Viso, OpenOffice, ASA Prepware, and Visual Basic Express. There is also a HP DesignJet Plotter that can print 36 inch wide documents and a Laser Printer that can print on paper up to 11”x17”. Students also have access to a Fortus 250mc rapid prototyping machine which uses ABS plastic. The Fortus 250mc features a 10 x 10 x 12 inch build envelope and three layer thicknesses: 0.007, 0.010 and 0.013 inches and is powered by Insight™ job processing and management software which offers students the flexibility to edit standard parameters that control the look, strength and precision of parts, as well as the time, throughput and efficiency of the build process.

The Open Access Labs are supported by student fees, by grants, and by university, college and departmental budgets. Each student is charged a computing fee per credit hour. Information Technology has a budget line item for supporting these labs. USU policy is that Open Access Labs are upgraded every three years. The Engineering Education Open Access Lab was upgraded over the summer of 2011 and the Engineering Open Access Lab was upgraded over the summer of 2012.

The Engineering Open Access Lab operating hours are Monday - Friday 7:00 AM – 12:00 PM, Saturday and Sunday 10:00 AM – 10:00 PM, and the Engineering Education Open Access Lab operating hours are Monday - Thursday 8:00 AM – 10:00 PM, Friday 8:00 AM – 5:00 PM, Saturday 10:00 AM – 2:00 PM, and closed on Sunday.

C. Guidance

Guidance for EnvE program laboratories is primarily the responsibility of the faculty member associated with each individual course. The faculty member directly supervises the laboratory exercise or assigns TAs to supervise. In the case of a lab supervised by a TA, the faculty member provides adequate safety training to the TA prior to the initial lab to insure the safety of all involved. Ken Jewkes, who manages the CEE departmental shop and laboratories, is responsible for setting up the test facilities and instrumentation for many of the lab exercises to insure safety, proper function of equipment and instrumentation. Over the past six years, no student injuries associated with student laboratory exercises have been reported.

Each EnvE laboratory class syllabus includes standard information on lab safety (use of PPE, location of emergency exits and first aid and spill response kits, chemical and broken glass disposal, etc.) This information is reviewed with all students during the first class period of each semester. Based on advice from the USU Environmental Health and Safety group, starting in Fall 2014, each student will be required to sign an acknowledgement form that they have read the safety information and agree to abide by laboratory rules. Individual lab exercises also have training and safety information relevant to the specific exercise, which is discussed prior to that lab activity.
D. Maintenance and Upgrading of Facilities

The CEE Department student laboratories are managed and maintained by Ken Jewkes, the Department’s laboratory and shop supervisor. Mr. Jewkes has a significant role in maintaining our laboratories and in the manufacturing of new equipment. He has a great relationship with both the faculty and the students and he is clearly an asset for our programs. The Department also has a computer technician, Paul Rew. Mr. Rew’s responsibilities are to maintain and upgrade the computers and software used by the Department staff and faculty. The College computer laboratories are maintained and upgraded by Les Seeley and his staff from the College of Engineering.

Laboratory equipment planning for specific courses is coordinated by the CEE Department Head and the faculty members who are responsible for the lab courses. In particular, each fall, faculty members place requests with the Department Head concerning equipment needs for their specific courses. The Department Head and faculty members work in unison to decide funding priorities. All lab courses charge an additional course fee of $10 to $50 per student, and those funds are used to partially offset the cost of consumables and equipment for the various labs. A portion of the funding necessary to meet the equipment needs is also provided by State-appropriated Engineering Undergraduate Initiative (EUI) funds, which typically amount to $60K per year for the EnvE and CE programs combined.

E. Library Services

The Utah State University Libraries are a central resource for the university community. The libraries’ overarching goal is to support the university’s mission, core themes, programs, and services, wherever offered and however delivered. The University Libraries’ primary physical collection is maintained in the Merrill-Cazier Library located in Logan, with two branch libraries in Price and Blanding, Utah. The Merrill-Cazier Library opened in 2005 and is a state-of-the-art library featuring an inviting, spacious, and comfortable learning environment. With roughly a million visitors annually, the library provides a variety of study spaces, including 35 group-study rooms, an Information Commons with 150 workstations, and a café. The library features an automated storage and retrieval system (known to users as the BARN), which uses robotics to house and access over 600,000 volumes with a capacity for 900,000 more. The Merrill-Cazier Library collections contain over 1,714,945 total print volumes, which include over 700,000 books and over 400,000 print journal volumes. The collection also contains maps (approximately 35,000), print and electronic serial subscriptions, and access to over 225 bibliographic, text, and informational databases. The Library is a regional depository of U.S. government publications, and, thus, has extensive holdings of U.S. agency documents, maps, and periodicals (over 560,000 items in print and electronic formats).

The Libraries have been aggressively moving the collections from print to digital formats in order to accommodate student and faculty preferences. By 2012 the Libraries provided access to over 70,000 electronic journals (representing 57,000 unique titles) through journal package deals, individual subscriptions, and full-text aggregators; about 1,100 titles are still maintained in print. The Library has also been purchasing electronic journal backfiles to complement current subscriptions. With regard to monographs, the USU Libraries add approximately 10,000 volumes annually. In 2013, the Libraries purchased more electronic books (over 5,800) than print books (approximately 4,200) for the first time. USU Libraries is also a member of the HathiTrust and provides access to over 3 million downloadable titles through that website.
The Libraries have several online collections that are of particular interest to the EnvE program. The Libraries subscribe to Web Of Science and Scopus, both of which contain extensive records in engineering and technology. The Libraries also maintain a subscription to IEEE Xplore Digital Library, containing journals, proceedings and standards from the Institute of Electrical and Electronics Engineers. In addition, USU Libraries carry ENGNetBase which is an engineering collection of CRC Press handbooks. The Libraries also purchase over 2,500 full-text journals and 11,000 books, primarily in science and engineering, through ScienceDirect.

The Libraries maintain ties with university faculty through subject librarians, who have specific subject expertise. These librarians are responsible for guiding all collection development for their assigned subjects. Their responsibilities include selecting new books, keeping track of current journal subscriptions, and seeking out other information resources that might be valuable to the academic department. They collaborate with faculty to create lessons that introduce students to librarians, collections, and develop research and information literacy skills.

The Libraries belong to several consortia, including the Utah Academic Library Consortium (UALC), comprised of 14 academic libraries throughout Utah; the Greater Western Library Alliance (GWLA), a group of 33 major research libraries; and the Center for Research Libraries (CRL), an international consortium of more than 260 research libraries headquartered in Chicago. Interlibrary Services (recently renamed to Resource Sharing and Document Delivery [RSDD]) provides materials for academic, curricular, and research needs to the faculty, staff, and students in an efficient and cost-effective manner. Consortial agreements (UALC and GWLA) provide article and book delivery with service benchmarks of 24 hours for journal articles and four days for book delivery.

USU scholarly output is captured, preserved, and promoted in the institutional repository, DigitalCommons@USU. This repository provides open access to scholarly works, theses and dissertations, research, reports, publications, and conferences produced by Utah State University faculty, staff, students, and others. Since its inception in the fall of 2008 more than 36,000 USU records have been added to DigitalCommons.

**Overall Comments on Facilities**

Overall, the facilities are adequate for their teaching purpose and are safe for student use. In addition to regular faculty oversight of lab facilities, the USU Environmental Health and Safety (EH&S) group inspects all teaching and research labs. Annual inspection is provided for lab safety infrastructure (proper airflow rates in fume hoods, adequate water pressure in safety showers and eye wash stations), while additional inspections are conducted as needed. EH&S also provides pick-up and disposal of any hazardous waste generated from lab exercises. The USU Fire Marshall inspects all fire extinguishers annually.

**Improvements to the EnvE Student Safety Policies and Procedures**

Based on the zero-accident record over the last six years, it can be concluded that the EnvE program teaching labs are safe for student activity. Despite the good safety record, however, the student safety policies and procedure are currently being improved. The following is a list of student lab safety policy and procedural changes that will be implemented during the 2014-15 academic year.
1. Faculty members with the primary responsibility for student laboratory classes will produce a list of lab safety training and instructions for student safety. The lab safety procedures and instruction will serve as a safety review for the faculty member each time the course is taught, will be used to train TAs as needed, and will document what safety instructions should be shared with students, as well as safe measures to be implemented to keep students away from unsafe situations. A copy of the lab safety training and procedures will be submitted to the CEE Department Head.

2. A standardized accident report form will be developed. In the event of an accident or student injury in a lab, Ken Jewkes will be responsible for seeing that the accident form is filled out by the injured student, witnesses, and lab supervisor. Ken Jewkes would also inform the Environmental Health and Safety Office in the event of a serious accident or injury as well as emergency medical services (if needed). The accident report forms will be stored by Ken Jewkes and submitted to the CEE Department Head for review and follow up with the responsible faculty member. If an accident or injury occurs, the Department Head and responsible faculty member will review the report, identify the need for improvements to the lab safety policies and procedures (as appropriate), and make adjustments as needed to the lab safety training, equipment, etc.
CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

The Environmental Engineering (EnvE) program resides within the Department of Civil and Environmental Engineering (CEE). The leadership of the EnvE program is a shared responsibility that includes the CEE Department Head (Dr. Craig Adams), the Associate Department Head for Undergraduate Affairs (Dr. Paul Barr), and the EnvE Division Head (Dr. David Stevens).

The Department Head is the chief administrator of all resources provided to both the Environmental Engineering and Civil Engineering programs in the CEE Department. The role of a department head has two primary dimensions. First, department heads have the responsibility to oversee and manage the wide range of operations in their academic unit. Second, department heads participate in the executive management of their college and, as such, have a responsibility to contribute to the overall success of their college. Department heads serve at the pleasure of their Dean. Periodically, input on performance will be solicited from faculty and staff; however, it is the Dean who will make the final decision about continued service in this role.

The Department Head’s five primary areas of responsibility are:

1. **Leadership for Academic Quality:** ensure that the department provides high quality instructional, research, and outreach programs that contribute to the success of the college and the university.

2. **Leadership for Administrative Operations:** manage the administrative operations of the academic unit to optimize flexibility, adaptability, efficiency and effectiveness. The department head must direct the affairs of the unit consistent with University policies and regulations.

3. **Leadership in Building the Reputation of the Department:** promote the internal and external recognition of the instructional, research, and outreach activities of the department.

4. **Leadership in Fostering the Success of the College and the University:** foster the success of their college and the overall university and ensure that their department is contributing positively to the goals and strategic plans of the college and the university.

5. **Continue Faculty Responsibilities:** contribute as a tenured member of the faculty.

The primary responsibilities of the Associate Department Head for Undergraduate Affairs are to chair the undergraduate curriculum, serve on the Assessment Committee, and work with the Department Head, Division Heads, faculty, and Dean’s office in guiding the future direction of both the Environmental Engineering and Civil Engineering undergraduate programs in the department. The EnvE Division Head serves on the curriculum committee and organizes EnvE faculty meetings.

B. Program Budget and Financial Support

Budget Process and Funding

The Utah Board of Regents establishes the governance and financial framework for all public institutions of higher education within the State of Utah. Consistent with University policy, the CEE Department relies on state appropriations, tuition and fees, course fees, private gifts, and sponsored research grants/contracts to meet its cost of operations and to provide for the
acquisition of capital equipment and renovations. Education and General (E&G) funds are appropriated to Utah State University by the legislature and supported, in part, by dedicated credits from tuition and fee revenues.

The CEE Department receives an E&G budget from the university administration through the College of Engineering every year in the form of salary (for staff and faculty salaries), wages (for student support such as teaching assistantships) and operating expenses (such as telephone, travel, and some lab support). These funds are then allocated to support the EnvE and CE programs. These funds are considered permanent, available yearly from legislative on-going funding and tuition, although the level of funding changes year to year. Unfilled faculty positions are usually placed in a college open position pool controlled by the Dean of Engineering.

The CEE department receives additional funding from the following sources.

1) Student lab/course fees. Student lab/course fees are assessed from students for most classes in the department. Money for this is spent on lab hardware, lab software, consumables, maintenance, and teaching assistants. The Lab Fee Account is also permanent money, tied specifically to engineering classes in the department.

2) Undergraduate Initiative from the College of Engineering. The Engineering Initiative money is provided by the Utah State Legislature, to be spent on undergraduate laboratory hardware and software. The Engineering Initiative is temporary funding, provided at the discretion of the legislature.

3) Research overhead. USU assesses a 38% F&A rate on all research contracts. A portion of these funds is returned to the PI’s college and department. The CEE Department typically receives between 3 - 10% of the overhead return, depending on the contract.

Teaching Support from Graders, Teaching Assistants, Workshops, etc.

The CEE department employs both graders and teaching assistants (TAs). The graders are typically undergraduate students who work with a professor to grade homework in a class they have already completed. TAs are graduate students who take a more senior role in the administration of a class, typically laboratory sections. Graders and TAs can work up to 20 hours per week. In the past, this was covered by E&G funds. Starting in Fall 2014, graders and TAs will be partly covered by increased course fees. The College of Engineering Dean’s Office also provides funding for additional student support for large, required undergraduate classes. The EnvE program also utilizes five to six Undergraduate Teaching Fellows (UTFs) per year (for CEE 3610, 3640, 3670, and 3870). These students are paid $750 per semester to work 100 hours in support of a class. Funding comes from the USU Provost’s Office.

All TAs must complete a USU training workshop. The workshop addresses course preparation, facilitating classroom discussions, lecture effectiveness, testing and grading, and active and problem-based learning. There is also a required, two-hour classroom session that addresses FERPA, sexual harassment prevention policies, and how to accommodate students with disabilities. UTFs also attend a two-hour training session that is an abbreviated version of the TA training described above.

The Office of the Executive Vice President and Provost sponsors a New Faculty Teaching Academy. The Academy is designed for all new faculty members to support their transition into the multiple roles that faculty members assume at a modern, comprehensive, research intensive, student-centered land-grant university. The academy offers the background, knowledge and
skills to be a successful university instructor. It provides feedback, coaching and mentoring on teaching performance in a formative context that is supportive, encouraging and focused on skills development. This program is intended to provide a foundation for success in this important domain of responsibilities as a member of the university faculty.

Additional Resources
In September 2003, USU complete construction on a 100,000 square foot engineering building that was funded by the State and private donators. Every classroom is equipped with state-of-the-art multimedia equipment to support classroom instruction (see Section 7A for more detail).

Adequacy of Resources
The resources available to the EnvE program are sufficient to support student attainment of the student outcomes. Environmental Engineering is a very applied field, which makes the availability and effective utilization of teaching labs very important. The EnvE program has four teaching laboratories (see Criterion 7 for lab descriptions), where students are exposed to science and engineering fundamentals (Outcome a), conducting experiments (Outcome b), teamwork activities (Outcome d), solving engineering problems (Outcome e), communication exercises (Outcome g), and modern engineering tools (Outcome k). The classroom and technology resources, including computer access for students, are very good. The size of the faculty and staff are adequate for carrying out the academic and research responsibilities of the program.

C. Staffing
CEE Staff
Four full-time office staff members, two full-time technicians, and one part-time student assistant provide support to the faculty, as discussed below. These positions are funded by the State of UT as authorized by the State legislature. This combination of personnel support is adequate for the current size of the CEE Department.

- Ms. Sheila Jessie is the Office Manager and Business Manager. She is responsible for the organization and maintenance of our accounting procedures and provides monthly financial reports for the Department accounts. She is also the HR liaison and is responsible for handling new hires.
- Ms. Marlo Bailey is the Undergraduate and Graduate Student Advisor. Her undergraduate student responsibilities include graduation checklists and processing, grade changes, and general advising. Her graduate student responsibilities include admission processing, tuition awards, graduation paperwork, required forms, registration, and grade changes.
- Ms. Michelle Lerwill is the Receptionist. She also handles course scheduling and evaluations, office and key assignments, and coordinates with the University Facilities group. She is also has the following ABET-related responsibilities: collecting and organizing course assessment data from faculty, organizing course binders, and summarizing senior exit interview results.
- Ms. Rebeca Olsen is the Accounting Assistant. She is responsible for travel authorizations, purchasing requests, and student payroll.
• Mr. Ken Jewkes is the Research Technologist. He maintains and manages the CEE shop and labs.
• Mr. Paul Rew is the Computer Technician. He maintains computers for CEE faculty and staff as well as CEE classroom computers, and maintains the display monitors in the hallway. He is also responsible for the CEE webpage.
• Office Assistant – during the school year, the CEE Department has a part-time student office assistant to help with various tasks.

Training for staff needs is available in a variety of ways:
• The university uses the Banner information system. Banner training is available for all staff, targeted toward specific staff responsibilities. The department business manager also attends monthly Banner meetings in which new developments in Banner are presented.
• Staff are eligible to audit courses on campus, if desired.
• Focused training is available for many campus operations. All staff have received training in the following areas, as appropriate for their responsibilities.
  o EZbuy --- the online purchasing system
  o Pcard --- the university credit card system
  o DocuSign – Online signature system (graduate course of study, graduate committees, lab fees, proposals, etc.)
  o CERT – emergency response training
  o DegreeWorks --- course requirement tracking
  o OISS --- Office of International Students

College of Engineering Advising Center

The College of Engineering employs four professional advisors for student academic counseling. Ms. Kathy Bayn is the advisor who works directly with EnvE students. Further information on the Advising Center was presented in Criterion 1.D.

USU Department of Information Technology

USU’s Department of Information Technology (IT) operates and maintains the campus-wide computer networking system. Its services for faculty, staff and students include:
1. Unified email system for faculty and staff with shared calendaring, tasks, and more.
2. Partnership with Google for a student email system.
3. Campus-wide wireless coverage.
4. Web content management system.
5. Secure data backup using offsite equipment.
6. Maintenance of all computer and multimedia technology in classrooms.

The IT Department completed a major reorganization in early 2007. Its new organization consists of response teams with multiple skill sets. It also hired a number of full-time professionals and reduced its reliance on part-time student help. This change has proven to be very effective for CEE faculty, staff, and students.
USU Division of Student Services

The Division of Student Services partners with USU faculty in supporting the university's mission to be one of the nation's premier student-centered land-and space-grant universities. Through the exceptional credentials and commitment of the division staff, they are able to enhance students' academic success, provide them opportunities to cultivate diversity of thought and culture, and promote their learning, discovery, and engagement within and outside of the campus environment. Nearly 170 employees work within the Division of Student Services, including three administrators, four executive directors, 14 department directors, and numerous exempt and non-exempt employees.

Other University Support

The CEE Department is supported by standard university infrastructure including HR, EEO/AA, parking services, facilities, etc. The Department is satisfied with the support provided.

D. Faculty Hiring and Retention

Process for hiring new faculty

The initial process for hiring new faculty begins with an analysis of current faculty needs. In particular, the faculty, in conjunction with the Department Head, determine the need for, and general parameters of, a new faculty appointment. The Department Head then obtains authorization from the provost, through the College of Engineering Dean, to establish or fill the appointment. The Department Head subsequently appoints a search committee of at least five members. A majority must be appointed from among the faculty of the CEE Department.

In consultation with the Department Head and the faculty, the search committee prepares a job description and advertises in accord with university regulations. The committee then screens applicants according to the job description and identifies a suitable pool of candidates to be further considered by the faculty and Department Head. Where feasible, at least three candidates are identified. Candidates are then invited to an on-campus interview at department expense to be interviewed by the faculty and Department Head. The interview process includes two lectures – one research-oriented, and one teaching-oriented.

When the investigation of candidates has been completed, the search committee solicits recommendations from faculty. Utilizing these recommendations and their own knowledge of the candidates, the search committee presents its list of acceptable candidates and all supporting information to the Department Head, ranked in order of preference. The Department Head forwards a recommendation from the list of acceptable candidates recommended by the search committee, including all supporting information, to the Dean of the College of Engineering. The Dean then forwards to the Provost the department’s recommendation together with all pertinent and supportive data from the faculty and the Department Head. If the Provost is in agreement, then the Provost, as the President's designee, approves the appointment of the candidate. Tentative offers can be made to a prospective appointee only with the approval of the Provost. To help ensure that proper procedures are followed throughout the hiring process, the Office of the Provost has developed a detailed web site with extensive information that provides greater details regarding the hiring process.
Strategies for Retaining Current Qualified Faculty

Faculty retention is a serious issue; when faculty leave, the department suffers a disruption in both its teaching and research missions. Since the last ABET review (2008), only one EnvE program faculty member has left and not been replaced, so retention is not considered a concern for this program.

At USU, the Office of the Executive Vice President and Provost has become proactive in efforts to retain highly research-productive faculty. In particular, over the past eight years merit raises have been limited to a small number of highly productive faculty within individual departments in an effort to leverage the low level of funds made available from the State for faculty pay raises. This consolidation of raise pool funds has resulted in select faculty receiving significant merit raises which has helped with retention.

The unofficial College of Engineering policy is that if a faculty member receives an offer from another institution, an attempt is usually made to match the offer. The CEE department has also used money from unfilled positions for broader salary increases to help retain faculty.

One USU program in need of improvement is the spousal accommodation program, which has been only sparingly successful. This program is particularly important in Cache Valley UT, where opportunities for employment beyond the university are considerably less than those available at many of our peer institutions.

E. Support of Faculty Professional Development

Faculty members benefit from a variety of professional development opportunities. Criterion 6.D describes numerous faculty development opportunities sponsored by the Provost’s Office and College of Engineering Dean’s Office. These opportunities support faculty development in the teaching and research domains of individual role statements. Individual requests by faculty and staff to attend professional development conferences/workshops have been supported via departmental, College, or VP Research Office funds.

The CEE Department attempts to limit the teaching load of new faculty to one course in the first year in order to encourage the writing of proposals and papers and to establish a research program. This load is generally increased to two to three courses per year until tenure is achieved. Tenured faculty members generally teach three to four courses per year.

State supported funds for travel to present papers at professional meetings and conferences are not included in the budget allocation. Travel is supported from E&G funds and research overhead funds. The Department is committed to providing travel funds to faculty members for at least one professional event per year should they not be able to fund their travel through research grants. Sabbatical leaves are encouraged because experience has shown their positive benefits for individual professional development as well as for departmental development. Approved 12-month or two-semester sabbatical leaves are eligible for 80% monthly base salary; a one-semester sabbatical is eligible for 100% base salary.
9. PROGRAM CRITERIA

A. Curriculum

The 2014-2015 program criteria for Environmental Engineering are listed below, along with the ways in which the EnvE program meets those criteria. The entire EnvE curriculum is listed in Table 5-1 and described further in section 5.A. See Appendix B – Syllabi for content of individual classes.

1. The curriculum must prepare students to apply knowledge of mathematics through differential equations, probability and statistics, calculus-based physics, chemistry (including stoichiometry, equilibrium, and kinetics), an earth science, a biological science, and fluid mechanics

Table 9-1 maps specific required classes to the requirements for this criterion.

<table>
<thead>
<tr>
<th>Criterion Subject Area</th>
<th>EnvE Courses</th>
</tr>
</thead>
</table>
| Math through differential equations | MATH 1210 – Calculus I  
MATH 1220 – Calculus II  
MATH 2250 – Linear Algebra and Differential Equations |
| Probability and statistics | STAT 3000 – Statistics for Scientists |
| Calculus-based physics | PHYS 2210 – General Physics – Science I  
PHYS 2215 – General Physics – Science I Lab |
| Chemistry* | CHEM 1210 – Principles of Chemistry I  
CHEM 1215 – Principles of Chemistry Lab I  
CHEM 1220 – Principles of Chemistry II  
CHEM 1225 – Principles of Chemistry Lab II  
CHEM 2300 – Principles of Organic Chemistry |
| Earth science | PSC 3000 – Fundamentals of Soil Science |
| Biological science | BIOL 1010 – Biology and the Citizen  
CEE 2620 – Environmental Engineering Microbiology‡ |
| Fluid mechanics | CEE 3500 – CEE Engineering Fluid Mechanics |

* CHEM 1210 covers stoichiometry, while CHEM 1220 covers equilibrium and kinetics  
‡ Required starting 2013-14 academic year. Taught as CEE 4930 in Spring 2014; taught as CEE 2620 starting Spring 2015

2. The curriculum must prepare students to formulate material and energy balances, and analyze the fate and transport of substances in and between air, water, and soil phases

3. The curriculum must prepare students to conduct laboratory experiments, and analyze and interpret the resulting data in more than one major environmental engineering focus area, e.g., air, water, land, environmental health.

Table 9-2 shows the laboratory classes in the EnvE curriculum related to the environmental engineering focus areas. Note that CEE 2240 – Surveying and PHYS 2215 – Physics Lab 1 also require students to conduct experiments and analyze data, although topics are not directly related to the environmental engineering focus areas.

<table>
<thead>
<tr>
<th>EnvE Laboratory Courses</th>
<th>EnvE Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1215 – Principles of Chemistry Lab I</td>
<td>air, water</td>
</tr>
<tr>
<td>CHEM 1225 – Principles of Chemistry Lab II</td>
<td>water</td>
</tr>
<tr>
<td>CEE 2620 – Environmental Engineering Microbiology</td>
<td>water, environmental health</td>
</tr>
<tr>
<td>CEE 3510 – CEE Engineering Hydraulics</td>
<td>water</td>
</tr>
<tr>
<td>CEE 5610 – Environmental Quality Analysis</td>
<td>air, water, land, env. health</td>
</tr>
<tr>
<td>PSC 3000 – Fundamentals of Soil Science</td>
<td>land</td>
</tr>
</tbody>
</table>

† Required starting 2013-2014 academic year. Taught as CEE 4930 in Spring 2014; taught as CEE 2620 starting Spring 2015.

4. The curriculum must prepare students to design environmental engineering systems that include considerations of risk, uncertainty, sustainability, life-cycle principles, and environmental impacts and apply advanced principles and practice relevant to the program objectives.

The principal demonstration of this criteria is through the capstone design sequence (CEE 3880, 4880, 4890). These topics are also covered in CEE 3610 – Environmental Management, CEE 3640 – Water/Wastewater Treatment, CEE 3870 – Solid/Hazardous Waste, and CEE 5860 – Air Quality Management.

5. The curriculum must prepare students to understand concepts of professional practice, project management, and the roles and responsibilities of public institutions and private organizations pertaining to environmental policy and regulations.

All of these topics are covered in the capstone design sequence (CEE 3880, 4870, 4880). Project Management is also discussed in CEE 2890 – Sophomore Seminar and MGMT 3110 – Managing Organizations and People. The roles and responsibilities of public institutions and private organizations are also covered in CEE 3610 – Environmental Management.
B. Faculty

The 2014-2015 program criteria for Environmental Engineering state that “the program must demonstrate that a majority of those faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, board certification in environmental engineering, or by education and equivalent design experience.”

Faculty qualifications are listed in Table 6-1, and teaching assignments for 2013-2014 are listed in Table 6-2. The capstone design sequence (CEE 3880, 4870, 4880) is taught by Dr. Richard Peralta, who is licensed Professional Engineer. The other classes with significant design content (CEE 3640, 3780, and 5860) are taught by faculty who are not professional engineers, but who do have significant relevant research/consulting experience and training for the course content.
Appendix A – Course Syllabi

Required Courses
MATH 1210 – Calculus I

Credits and Contact Hours: 4 credits, 3 contact hours per week

Course Instructor: Michael Snyder


Catalog Description: Analytic geometry, differential and integral calculus, transcendental functions, and applications. Graphing calculator required.

Prerequisites/Co-requisites: Prerequisite/Restriction: One of the following within the last year or three consecutive semesters (including summer); ACT Math score of at least 27; SAT Math score of at least 620; AP Calculus AB score of at least 3; Grade of C- or better in MATH 1050 and MATH 1060; or satisfactory score on the Math Placement Exam. Semester(s) Traditionally Offered: Fall, Spring, Summer

Course Goals: Math 1210 is an introduction to analytic geometry, differential and integral calculus, transcendental functions, and applications in scientific disciplines.

Criterion 3 outcomes: a

Topics Covered:
- Limits and Continuity
- Differentiation
- Applications of Derivatives
- Integration
- Applications of Definite Integrals

Last Updated: September, 2013
CHEM 1210 – Principles of Chemistry I

Credits and Contact Hours: 4 credits, 3.3 contact hours per week.

Course Coordinator: Alvan Hengge, Department Head, Chemistry


Catalog Description: First of a two-semester sequence, covering fundamentals of chemistry. Designed for science and engineering students. 4 credits, Traditionally offered: Fall, Spring

Prerequisite/Restriction: Math ACT score of at least 25, or MATH 1050 or higher; or co-requisite of MATH 1050. High school chemistry recommended.

Criterion 3 outcomes: a

Course Goals:
Students will gain a fundamental understanding of the principles of fundamental chemistry. Specifically, students will be able to:

- Describe units of measurement for mass, length, velocity, time
- Use the metric system of units and perform conversions mathematically
- Perform calculations utilizing correct significant figures
- Identify and describe the different particles inside an atom and describe the structure of an atom
- Describe the Periodic Table as it relates to atomic number, atomic mass, valence electron count
- Be able to name simple atoms and general ionic and molecular compounds
- Balance chemical equations
- Differentiate between a chemical formula and an empirical formula
- Define units of solution concentration
- Define an acid, a base, a salt, and electrolyte
- Calculate formula weights and perform stoichiometric calculations
- Determine theoretical yields and experimental yields
- Utilize the First Law of thermodynamics and the Law of Hess; predict enthalpies for chemical processes
- Describe the nature of electromagnetic radiation
- Describe the origin of line spectra and how it relates to the development of quantum numbers
- Describe the forces that favor the formation of the H₂ molecule over two isolated H atoms
- Describe Bohr orbitals and the structure of a many-electron atom
- Describe and draw the shapes of the Hydrogenic Orbitals (s, p, d, f)
• Utilize the Periodic Table to predict atomic trends in size, ionization energies, electron attachment
• Draw Lewis diagrams for atoms and polyatomic species
• Describe the Octet Rule and draw resonance structures
• Predict molecular shapes using the Valence Shell Electron Repulsion Model
• Predict molecular polarity
• Differentiate single, double, and triple bonds and estimate bond relative bond energies
• Describe the notion of hybrid orbitals and when this approximation works
• Describe the properties of gases and utilize the gas laws of Boyle, Charles, and Avogadro
• Perform calculations using the Ideal Gas Law and understand the associated pitfalls
• Describe and differentiate between the solid, liquid, and gas phases
• Draw and use a phase diagram to describe temperature and pressure relationships
• Define the term colligative property
• Show how vapor pressure of a solvent is affected by solute concentration

Last Updated: July, 2013
CHEM 1215 – Chemical Principles Laboratory I

Credits and Contact Hours: 1 credits, 3 contact hours per week.

Course Coordinator: Alvan Hengge, Department Head, Chemistry


Catalog Description: Laboratory course designed to be taken concurrently with CHEM 1210. The laboratory class offers hands-on experience related to the topics taught in the lecture sequence. 1 credit, Traditionally Offered: Fall, Spring

Prerequisite: CHEM 1210 (may be taken concurrently).

Criterion 3 outcomes: a

Course Goals:
Students will engage in laboratory experiences that are designed to complement the CHEM 1210 lecture course. Specifically, students will be able to:

- apply basic chemistry laboratory techniques
- assess data
- synthesize compounds
- determine chemical composition and characteristics
- conduct chemical separations
- characterize reactions

Topics Covered:
- Basic lab techniques
- Separation of the components of a mixture
- Chemical reactions – a “greener” approach
- Chemical formulas
- Chemical reactions of Cu and % yield
- Gravimetric analysis of a chloride salt
- Paper chromatography
- Heats of neutralization
- Atomic spectra
- Behavior of gases

Last Updated: July, 2013
Credits and contact hours: 1 credits, 3 contact hours per week (1 hours lecture + 2 hours lab)

Instructor: William Rahmeyer

Textbook: Course material and handout are online

Specific course information:
- Catalog description: Orients students to programs of the Department of Civil and Environmental Engineering, professional and academic advising, student services, professional societies, and engineering careers. Laboratory activities emphasize problem solving using computer applications, such as spreadsheets and the HP48 Scientific Calculator. (Fall, Spring)
- Prerequisites: none
- Co-requisites: none
- Required

Specific goals for the course:
- Specific goals of instruction: Present an overview of the Civil and Environmental Engineering Department and curriculum. To introduce faculty and programs in the six CEE divisions of Environmental, Water Engineering, Structures, Transportation, Geotechnical, and Irrigation Engineering. Present an overview of the skills needed to prepare the student for the more advanced course in engineering and in the required science courses.
- Criterion 3 outcomes: a, d, e, f, g, h, i, j

Brief list of topics covered:
- Examine and discuss the profession of Civil and Environmental Engineering; the career, the opportunities, and the expectations.
- Develop skills and techniques in engineering problem solving. Problem solving will be covered by example in the computer and calculator assignments for this course.
- The computer assignments will also develop basic skills with computer spreadsheets, Mathcad, Maple, and the HP scientific calculator

Updated: August, 2013
CEE 2240 – Engineering Surveying

Credits and contact hours: 3 credits, 4 contact hours per week (2 hours lecture + 2 hours lab)

Instructor: Joseph A. Caliendo


Specific course information:
• Catalog description: Experience with a wide variety of common surveying equipment, including use and operation of levels, theodolites, total station equipment, and GPS. Prior to graduation, computer applications and field exercises prepare students for civil engineering employment early in their careers.

• Prerequisites: ACT Math score of 27 or higher or credit for MATH 1050 and MATH 1060

• Co-requisites: None

• Required

Specific goals for the course:
Specific outcomes of instruction:
• This is meant to be a very practical and applied course. It is probably one of the few “stand alone” courses available to engineering students providing directly marketable job skills for summer/part-time employment during undergraduate/graduate studies. Students will be familiar with commonly used surveying equipment including levels, total stations, and GPS equipment.

• Criterion 3 outcomes: a, b, e, g, k

Brief list of topics covered:
• Distance measurements and corrections (steel tapes)
• Differential and trigonometric leveling
• Measuring vertical and horizontal angles
• Closed Traverse w/ total stations
• Calculation of areas by DMD and coordinates
• Computer applications
• Topographic surveying
• Vertical and horizontal curves
• Property surveys

Updated: August, 2013
BIOL 1010 – Biology and the Citizen

Credits and Contact Hours: 3 credits, 2.5 contact hours per week

Course Coordinator: Vicki Rosen


Catalog Description: Principles and methods of biology and how they impact the daily life and environment of the individual. 3 credits. Traditionally Offered: Fall, Spring, Summer

Prerequisite/Restriction: None.

Course Goals:
- Students gain an understanding on how science works and the role science plays in today’s society
- Students develop awareness and appreciation for the natural world and its processes
- Students gain an understanding of biological concepts

Criterion 3 outcomes: a

Topics Covered:
- Basic chemistry; water and life
- Organic compounds
- Cells – parts and functions
- Photosynthesis
- Making gametes – meiosis
- Genetics
- DNA, RNA and protein synthesis
- Gene expression and cloning
- DNA technology
- Microevolution
- Viruses, Bacteria and Fungi
- Ecosystems, cycles, food webs, services
- Ecological threats

Last Updated: September, 2013
MATH 1220 – Calculus II

Credits and Contact Hours: 4 credits, 3 contact hours per week

Course Instructor: Ju Yi

Textbook: “University Calculus”, by Hass, Weir, & Thomas

Catalog Description: Integration, infinite series, introduction to vectors, and applications. Graphing calculator required.

Prerequisites/Co-requisites: C- or better in MATH 1210, or AP score of at least 4 on Calculus AB exam or at least 3 on Calculus BC exam. Semester(s) Traditionally Offered: Fall, Spring, Summer

Criterion 3 outcomes: a

Course Goals: Integration, infinite series, introduction to vectors, and applications, covering section 6.4 through chapter 11 of the text. Emphasis will be placed upon gaining an understanding of the core concepts of calculus, becoming fluent in the language of mathematics, acquiring computational skill, and acquiring the ability to use calculus for solving problems. Your homework and exams will reflect all of these objectives.

Topics Covered:

- Applications of Definite Integrals
- Techniques of Integration
- Infinite Sequences and Series
- Polar Coordinates and Conics
- Vectors and the Geometry of Space
- Vector-Valued Functions and Motion in Space

Last Updated: July, 2013
CHEM 1220 – Principles of Chemistry II

Credits and Contact Hours: 4 credits, 3.3 contact hours per week.

Course Coordinator: Alvan Hengge, Department Head, Chemistry


Catalog Description: Continuation of CHEM 1210; the second half of a two-semester sequence, covering the fundamentals of chemistry. Designed for science and engineering students.  4 credits, Traditionally Offered: Fall, Spring, Summer

Prerequisite/Restriction: CHEM 1210

Criterion 3 outcomes: a

Course Goals: Students will:
- Describe reaction rates in terms of zero, 1st, 2nd, 3rd order processes
- Describe reaction rates as a function of temperature
- Predict reaction half-lives given initial conditions
- Differentiate between the plots of 1st order and 2nd order reactions
- Describe the action of catalysis on a chemical reaction
- Describe reactions in terms of elementary steps and rate-determining steps
- Write equilibrium constant expressions
- Perform calculations of concentrations, pressures using Keq information
- Predict the direction of a reaction using the reaction quotient
- Explain Le Chatelier’s Principle
- Cite essential definitions of acids and bases
- Utilize the autoionization of water to define pH and pOH, Kw, pKw
- Employ Ka, Kb values to calculate pH, pOH of solutions of weak acids, weak bases, and salts
- Describe chemical factors that contribute to the strength of acids and bases
- Apply concepts of the Common Ion effect to design and construct acid/base buffer systems
- Calculate acid/base titration curves and predict end-point conditions
- Describe and apply Ksp values to determine solubility of inorganic solids
- Describe the precipitation and separation of ions utilizing Ksp information
- Describe and apply concepts of chemical spontaneity and the 2nd Law of Thermodynamics
- Describe and apply the concepts of entropy to chemical reactions
- Use Gibb’s Free Energy to predict chemical equilibrium
- Balance chemical reactions that involve changes in oxidation states
- Express oxidation/reduction in terms of half reactions
- Describe voltaic cells and calculate potentials using standard reduction potentials
• Predict the spontaneity of oxidation/reduction reactions
• Employ the Nernst Equation to calculate cell potentials and chemical concentrations
• Describe the essential reactions related to common battery systems and fuel cells
• Describe the chemical reactions of corrosion
• Describe and differentiate between fundamental types of radioactivity and radioactive processes
• Predict nuclear stability based on proton/neutron ratios
• Apply 1st order kinetics for radioactive decay
• Compare the energetic and mass aspects of nuclear fission and nuclear fusion
• Describe the fundamental aspects of the reactivity of non-metal elements
• Identify the major chemical processes for purifying iron, steel, aluminum, copper, and sodium
• Describe the structure and bonding in simple coordination complexes of transition metals like Fe, Cu
• Predict simple electronic configurations for transition metal ions using the periodic table
• Predict magnetism using simple models of Crystal Field Theory
• Discuss how the color of transition metal complexes is related to d-orbital splitting
• Identify and draw the structure of hydrocarbon alkanes, alkenes, alkynes, and aromatics
• Identify and draw the organic functional groups ethers, aldehydes, ketones, acids, esters, and amides
• Identify the chemical structure of amino acids and polypeptides
• Identify the chemical structure of carbohydrate sugars and fats
• Identify the chemical structure of nucleic acids and DNA, RNA

Last Updated: August, 2013
CHEM 1225 – Chemical Principles Laboratory II

Credits and Contact Hours: 1 credits, 3 contact hours per week.

Course Coordinator: Alvan Hengge, Department Head, Chemistry


Catalog Description: Continuation of CHEM 1215. Normally taken concurrently with CHEM 1220. The laboratory class offers hands-on experience related to topics taught in the lecture sequence. 1 credit, Traditionally Offered: Fall, Spring

Prerequisite: CHEM 1215

Criterion 3 outcomes: a

Course Goals:
Students will engage in laboratory experiences that are designed to complement the CHEM 1210 lecture course. Specifically, students will be able to:

• apply basic chemistry laboratory techniques
• assess data
• determine chemical compositions and characteristics
• characterize reactions
• test acid/bases and their salts
• develop an understand electrochemistry

Topics Covered:
• Basic lab techniques
• Colligative properties
• Base hydrolysis of ethyl acetate
• Qualitative analysis
• Titration of acids and bases
• Determination of the $K_a$ of a weak acid
• Determine of the $K_{sp}$ for calcium hydroxide
• Electrolysis and calculating Faraday’s constant and Avogadro’s number
• Colorimetric determination of Fe

Last Updated: July, 2013
PHYS 2210 – Physics for Scientists and Engineers I

Credits and Contact Hours: 4 credits, 3.3 contact hours per week

Course Coordinator: Jan Sojka, Department Head, Physics


Catalog Description: The study of motion and thermal physics including vectors, kinematics, forces, Newton’s three laws of motion, circular motion and rotations, harmonic motion, momentum, energy and work, gravity, fluids, and thermodynamics. Lecture and required recitation.

Prerequisite: MATH 1210.

Criterion 3 outcomes: a

Course Goals:
This is a basic physics course that covers fundamental concepts in motion, forces, energy, momentum, rotational motion, oscillations, fluids and thermal physics. Students will understand the following concepts:

- Units and Solving Physics Problems
- 1D Motion
- 2D and 3D Motion
- Newton’s Laws
- Forces and Motion
- Work and Energy
- Energy Conservation
- Gravity
- Systems of Particles
- Rotation
- Angular Momentum
- Statics and Equilibrium
- Oscillations
- Waves
- Fluids
- Temperature
- Thermal Behavior
- First Law of Thermodynamics
- Second Law of Thermodynamics

Last Updated: August, 2013
PHYS 2215 – Physics for Scientists and Engineers - Lab 1

Credits and Contact Hours: 1 credit, 3 contact hours per week.

Course Coordinator: Jan Sojka, Department Head, Physics


Catalog Description: Computer assisted laboratory investigations of mechanics and thermal physics principles taught in PHYS 2210.

Prerequisite/Restriction: PHYS 2210 (may be taken concurrently)

Criterion 3 outcomes: a

Course Goals: Students will be able to:

- make physical measurements using instrumentation
- develop basic skills in error analysis
- prepare laboratory reports

Topics Covered:

- Basic lab techniques
- Error analysis
- Motion in one dimension
- Inertia
- Newton’s Second Law
- Terminal velocity
- Ballistic pendulum
- Moments of inertia
- Harmonic oscillators
- Thermal equilibrium

Last Updated: August, 2013
CEE 2870 - Introduction to Computer Programming for Civil and Environmental Engineers

Credits and contact hours: 2 credits, 2 contact hours per week (2 hours lecture + 0 hours lab)

Instructor: Gilberto E. Urroz, Ph.D., P.E.

Textbooks:

Specific course information:
- Catalog description: An introductory class for teaching the principles of computer programming to civil and environmental engineering students at the undergraduate level. The programming language will be Visual Basic for Applications (VBA) with Microsoft’s Excel spreadsheet.
- Prerequisites: MATH 1050 College Algebra or MATH 1060 Trigonometry or MATH 1210 Calculus I
- Co-requisites: none
- Required

Specific goals for the course:
- Specific outcomes of instruction: To introduce undergraduate Civil and Environmental Engineering students to the principles and practice of computer programming for engineering applications using Visual Basic for Applications (VBA) in Excel workbooks as well as Windows-Form-based and Console-based Visual Basic 2012.
- Criterion 3 outcomes:
  (a) an ability to apply knowledge of mathematics, science, and engineering
  (e) an ability to identify, formulate, and solve engineering problems
  (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Brief list of topics covered:
- Introduction to computers - computer operation - computer languages
- Programming structures: sequence, branching, loop
- Programming using Visual Basic for Applications in Excel - interface design
- Programming using arrays (vectors, matrices)
- Use of storage files
- Introduction to object-oriented programming
- Introduction to event-based programming
- Programming using Visual Basic 2012 in Windows

Updated: August, 2013
CHEM 2300 – Principles of Organic Chemistry

Credits and Contact Hours: 3 credits, 2.5 contact hours per week.

Course Coordinator: Alvan Hengge, Department Head, Chemistry


Catalog Description: Shape, bonding, nomenclature, stereochemistry, physical properties, and reactivity of organic molecules is covered for a range of molecules, beginning with simple alkanes and finishing with some of the more complex abiotic and biotic organic molecules known today. 3 credits, Traditionally Offered: Fall

Prerequisite: CHEM 1210.

Criterion 3 outcomes: a

Course Goals:
Students will gain a fundamental understanding of the principles of organic chemistry. Specifically, students will be able to:

- Apply electronegativity and VESPR to draw the Lewis structures and to predict the chemical properties for various functional groups
- Use electronegativity, the octet rule, and electron movements to write the resonance structures and to evaluate their relative stabilities
- Apply the concepts of acids/bases and nucleophiles/electrophiles to predict chemical reactions
- Recognize and differentiate constitutional isomers, configurational isomers, conformational isomers, and stereoisomers, with respect to their chemical and physical properties
- Write correct electron-pushing mechanisms for the assigned reactions in each chapter
- Apply concepts of resonance and inductive effects to predict the chemical and physical properties for different functional groups and the molecules to which these functional groups are attached
- Explain the reaction mechanisms using the concepts of steric hindrance, carbocation stability, and leaving group capability
- Use pKa values to explain or define the roles of a molecule bearing a lone-pair of electrons (:Z) as base, nucleophile, or leaving group in a chemical reaction
- Explain aromaticity and recognize aromatic compounds

Last Updated: August, 2013
ENGR 2010 –Engineering Mechanics Statics

Credits and contact hours: 3 credits, 12 contact hours per week (3 hours lecture + 6 hours lab)

Instructor: William Rahmeyer


Specific course information:
- Force and position vectors; equilibrium of particles; rigid bodies; equivalent system of forces; equilibrium; free body diagrams; static analysis of trusses, frames, and machines; centroids and centers of gravity; friction; and moments of inertia.
- Prerequisites: MATH 1210, 1220
- Co-requisites: none
- Required

Specific goals for the course:
- The purpose of this course is to teach you to apply your background in physics and math in solving engineering problems (ABET a,e) and to properly communicate those solutions (ABET g). This course is your introduction to engineering problem solving and you will be taught problem solving skills. You will become proficient in the basic mechanics areas of statics and will develop the ability to solve fundamental engineering problems and learn how to communicate that solution to other engineers.
- Criterion 3 outcomes: a, e, g

Brief list of topics covered:
- Vectors
- Equilibrium
- Free Body Diagrams
- Truss Analysis
- Frames and Machines
- Shear and Moment
- Center of Cavity
- Composite bodies
- Static Friction
- Hydrostatics
- Moment of Inertia
- Area Moment of Inertia

Updated: August, 2013
ENGR 2270 - Computer Engineering Drafting

Credits and Contact Hours: 2 credits, 3.5 contact hours per week.

Instructor: Kurt Becker


Specific course information:
- Catalog description: Provides engineering students with introduction to computer-aided drafting environment. Explores AutoCAD and gives background in drafting theory and applications through use of hand CAD techniques. Students gain ability to contribute in the workplace using creative thinking skills and team environments.
- Prerequisites: none
- Co-requisites: none
- Required Course

Specific goals for the course:
- Acquire and abilitye to produce accurate computer-aided drawing
- Become familiar with AutoCAD software produced by AutoDesk
- Develop an understanding of sketching, alternate methods of multi-vdiew projection (section view, removed views, and auxiliary views)
- Understand advanced dimensioning techniques and working drawings
- Understand descriptive geometry
- Criterion 3 outcomes: a, k

Brief list of topics covered:
- Sketching, scale, and line types
- Geometry and AutoCAD basics
- Multiview drawings
- Auxiliary and sectional views
- Dimensioning
- Descriptive geometry
- Pictorial drawings
- 3-D modeling

Updated July 2013
MATH 2250 – Linear Algebra and Differential Equations

Credits and Contact Hours: 4 credits, 4 contact hours per week

Course Instructor: Claire Watson


Catalog Description: Linear systems, abstract vector spaces, matrices through eigenvalues and eigenvectors, solution of ode’s, Laplace transforms, first order systems. Semester(s) Traditionally Offered: Fall, Spring, Summer.

Prerequisites/Co-requisites: C- or better in Math 1220; or AP Calculus score of 5 on BC exam and C- or better in MATH 2210.

Criterion 3 outcomes: a

Topics Covered:
- First order equations
- Mathematical Modeling
- Numerical Methods
- Linear Systems and matrices
- Vector Spaces
- Eigenvectors and Eigenvalues
- Linear Algebra Concepts
- Solution of Linear Ordinary Differential Equations
- Laplace Transforms and First Order Symptoms

Updated: August, 2013
CEE 2890 – Environmental Engineering Sophomore Seminar

Credits and contact hours: 1 credit, 1 contact hour/week (1 hour seminar)

Instructor: David K Stevens

Textbook: None

Specific course information:

• Catalog description: Introduces students to the field of environmental engineering, emphasizing design, ethics, and leadership in the environmental engineering profession. Emphasizes creative thinking, organizational skills, teamwork, professional ethics, and social responsibility.
• Prerequisites: None
• Co-requisites: none
• Required course

Specific goals for the course:

• Specific outcomes of instruction: Students will understand the scope of Environmental Engineering, some details of professional practice and ethics, how to develop and present a simple Environmental Engineering project, and be introduced to Environmental Engineering faculty members.
• Criterion 3 outcomes: c, d, f, g, i

Brief list of topics covered:

• Introduction to Design Project,
• Design Teams and Critical Path Method,
• Project Development and Conceptual Design, Project Management,
• Cost Estimating,
• CEE/DEE Professional Program,
• Construction Scheduling,
• Professional Ethics, ABET and Portfolios,
• Entrepreneurship,
• Green Engineering and Sustainable Development,
• Engineers Without Borders

Updated: November 2013
ENGR 2030 – Dynamics

Credits and contact hours: 3 credits. The class meets three times each week: Monday, Wednesday, and Friday. Each lecture is 50 minutes.

Instructor: Dr. Ning Fang


Specific course information:

- The course covers Newtonian mechanics, including equations of motion, kinetics of particles, kinetics of rigid bodies, work and energy, impulse and momentum, three-dimensional kinematics, and vibrations.
- Prerequisite: ENGR 2010 Statics
- The course is a required course in three engineering programs: mechanical and aerospace engineering, civil and environmental engineering, and biological engineering.

Specific goals for the course:

The goals of the course are to help students learn fundamental principles, generalizations, and theories, and apply course materials to improve thinking and problem solving. In particular, students will develop abilities to solve kinematics and dynamics problems for a particle (point mass) and for a planar rigid body by using:

- Newton’s Second Law
- Principle of Work and Energy
- Conservation of Energy
- Principle of Linear Impulse and Momentum
- Conservation of Linear Momentum
- Principle of Angular Impulse and Momentum
- Conservation of Angular Momentum

This sophomore year, foundational course primarily addresses the following student outcome listed in ABET Criterion 3:

a. an ability to apply knowledge of mathematics, science and engineering

Brief list of topics to be covered:

1) Chapter 12 Kinematics of a Particle: Rectilinear Kinematics: Continuous Motion and Erratic Motion; Curvilinear Motion: Rectangular Components, Normal and Tangential Components, and Cylindrical Components; Motion of a
Projectile; Absolute Dependent Motion Analysis of Two Particles; Relative-Motion of Two Particles Using Translating Axes

2) Chapter 13 Kinetics of a Particle: Force and Acceleration: Newton’s Second Law of Motion; The Equation of Motion; Equation of Motion for a System of Particles; Equations of Motion: Rectangular Coordinates, Normal and Tangential Coordinates, Cylindrical Coordinates


4) Chapter 15 Kinetics of a Particle: Impulse and Momentum: Principle of Linear Impulse and Momentum; Principle of Linear Impulse and Momentum for a System of Particles; Conservation of Linear Momentum for a System of Particles; Impact; Angular Momentum; Relation Between Moment of a Force and Angular Momentum; Principle of Angular Impulse and Momentum

5) Chapter 16 Planar Kinematics of a Rigid Body: Planar Rigid-Body Motion; Translation; Rotation about a Fixed Axis; Absolute Motion Analysis; Relative-Motion Analysis: Velocity; Instantaneous Center of Zero Velocity; Relative-Motion Analysis: Acceleration

6) Chapter 17 Planar Kinetics of a Rigid Body: Force and Acceleration: Moment of Inertia; Planar Kinetic Equations of Motion; Equations of Motion: Translation, Rotation about a Fixed Axis, General Plane Motion


8) Chapter 19 Planar Kinetics of a Rigid Body: Impulse and Momentum: Linear and Angular Momentum; Principle of Impulse and Momentum; Conservation of Momentum; Eccentric Impact

9) Chapter 22 Vibration: Undamped Free Vibration; Undamped Forced Vibration

Updated: October 2013
ENGR 2450 – Engineering Numerical Methods

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture + 0 hours lab)

Instructor: Gilberto E. Urroz, Ph.D., P.E.


Specific course information:
- **Catalog description:** Numerical analyses applied to engineering problems, including simultaneous solutions of linear and nonlinear equations, linear algebra applications, curve fitting, numerical differentiation and integration, and numerical solutions of differential equations.
- **Prerequisites:** A structured programming experience in MATLAB, C, FORTRAN, EXCEL-VBA, or similar language; MATH 1220 Calculus II and MATH 2250 Linear Algebra and Differential Equations
- **Co-requisites:** MATH 2250 Linear Algebra and Differential Equations can be taken concurrently
- **Required**

Specific goals for the course:
- **Specific outcomes of instruction:**
  - Understand the concept of numerical error in numerical calculations
  - Learn methods for solving problems involving numerical calculations: solution to equations, data fitting, numerical differentiation and integration, linear algebra applications, solutions of ordinary and partial differential equations
  - Be able to program the computer for solving numerical methods problems using specific computer languages
- **Criterion 3 outcomes:** a, e, k

Brief list of topics covered:
- Modeling, computers, and error analysis
- Numerical methods for finding roots of equations
- Numerical solution of linear algebraic equations
- Numerical methods for curve fitting
- Numerical differentiation and integration
- Numerical solution of ordinary differential equations
- Numerical solution of partial differential equations

Updated: January, 2013
BENG 2400 - Biological & Environmental Thermodynamics

Credits: Three (3)
Contact hours: MWF 4:00 - 4:50
Instructor: Dr. Timothy Taylor (ENGR 402L, 797-2241, tim.taylor@usu.edu)

Specific Course Information:
- **Course description:** Introductory thermodynamics for biological and environmental engineering. First and second laws of thermodynamics. Entropy, thermodynamics of processes, and equations of state. Phase equilibria, Gibbs free energy, and Raoult’s law.
- **Prerequisites or co-requisites:** Math 1220
- **Required course:**

Specific goals for the course:
Students gain an understanding of thermodynamics and how it can relate to biological systems.

Specific outcomes of instruction:
The students will be asked to demonstrate their knowledge of the material covered in Thermodynamics through their mastery of the following course objectives. Through the study of Thermodynamics the student will be able to:

- Determine properties of real substances, such as steam and refrigerant 134-a, and ideal gases from either tabular data or equations of state.
- Analyze processes involving ideal gases and real substances as working fluids in both closed systems and open systems or control volumes to determine process diagrams, apply the first law of thermodynamics to perform energy balances, and determine heat and work transfers.
- Analyze systems and control volumes through the application of the second law.
- Analyze the basic Carnot and Rankine cycles

Criterion 3 outcomes: a, e

List of Topics:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Definitions, Units, Systems</td>
<td>1.1-1.3</td>
</tr>
<tr>
<td>Properties, State, Processes, Cycles</td>
<td>1.4-1.7</td>
</tr>
<tr>
<td>State postulate, Temperature</td>
<td>1.8-1.9</td>
</tr>
<tr>
<td>Pressure, Problem-Solving, Energy</td>
<td>1.10-1.13, 2.1</td>
</tr>
<tr>
<td>Heat Transfer, Work</td>
<td>2.2-2.4</td>
</tr>
<tr>
<td>The First Law of Thermodynamics</td>
<td>2.5</td>
</tr>
<tr>
<td>Energy Conversion Efficiencies</td>
<td>2.6</td>
</tr>
<tr>
<td>Pure Substance, Phase-Change</td>
<td>3.1-3.3</td>
</tr>
<tr>
<td>Property Diagrams</td>
<td>3.4</td>
</tr>
</tbody>
</table>
Updated November 2013
STAT 3000 – Statistics for Scientists

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture + 0 hours lab)

Instructor: Chris Corcoran

Textbook: Probability & Statistics for Engineers and Scientists (Fourth Edition), AJ Hayter

Specific course information:
- Catalog description: Introduction to statistical concepts, graphical techniques, discrete and continuous distributions, parameter estimation, hypothesis testing, and chi-square tests.
- Prerequisites: MATH 1100 or MATH 1210
- Co-requisites: none
- Required

Specific goals for the course:
- The purpose of this class is to introduce you to a variety of methods that statisticians and researchers use to collect and analyze data. The core principle underlying all statistical methodology is the identification of the sources of uncertainty or variation in the observations/measurements we analyze. You will not become an expert in statistical analysis based solely on your experience in this course. However, provided that you participate meaningfully, you will become more familiar with the vocabulary of statistics and with the scientific method (which is at the core of statistical thinking), and you will hopefully be better equipped to think critically as a scientist and citizen.

- Criterion 3 outcomes: a

Brief list of topics covered:

- Introduction to probability
- Random variables
- Normal distribution
- Exploring data
- Descriptive statistics
- Inference for population means
- Association between continuous variables
- Categorical variables

Updated: January, 2014
CEE 3500 – Elementary Fluid Mechanics

Credits and contact hours: 3 credits, 9 contact hours per week (3 hours lecture + 0 hours lab)

Instructor: William Rahmeyer


Specific course information:
- Catalog description: Explores fluid properties, hydrostatics, fluid dynamics similitude, energy and momentum principles, closed conduit flow, open channel flow, and flow measurement.
- Prerequisites: Math 1220; Math 2210 or 2250; ENGR 2010, 2030.
- Co-requisites: none
- Required

Specific goals for the course:
- To learn and apply the principle or engineering fundamental of fluid properties.
- To learn and apply the principle or engineering fundamental of hydrostatics.
- To learn and apply the principle or engineering fundamental of fixed body diagrams and fluid control volumes.
- To learn and apply the principle or engineering fundamental of similitude.
- To learn and apply the principle or engineering fundamental of dimensional homogeneity.
- To learn and apply the principle or engineering fundamental of conservation of mass and continuity.
- To learn and apply the principle or engineering fundamental of energy.
- To learn and apply the principle or engineering fundamental of momentum.
- To learn solution of pipe systems and open channel systems
- Emphasis will be placed on problem solving, and analyzing both data and variables to generate numerical as well as theoretical solutions.

- Criterion 3 outcomes: a, b, e

Brief list of topics covered:
- Fluid distinctions and properties
- Viscosity, surface tension, vapor pressure
- Static fluid pressure, gage and absolute, Manometer principle
- Hydrostatic forces and Pressure forces
- Flow rates
- Energy correction factor and other topics dealing with energy
- Momentum applications, and momentum correction factor
- Similitude
- Scale ratios
- Modeling
- Dimensional analysis
• Friction losses
• Open Channel flow
• GVF profiles
• Flow measurements

Updated: August, 2013
CEE 3610 – Environmental Management

Credits and contact hours: 3 credits, 6 contact hours per week (3 hours lecture + 3 hours lab)

Instructor: Laurie McNeill


Specific course information:
• Catalog description: Introduction to environmental health, emphasizing relationships among environmental quality, public health, environmental and occupational health regulations, human health risk assessment, institutions, and engineered systems in environmental health management.
• Prerequisites: CHEM 1210 (Principles of Chemistry I), BIOL 1010 (Biology and the Citizen), MATH 1210 (Calculus I)
• Co-requisites: none
• Required course

Specific goals for the course:
• Specific outcomes of instruction: Students will understand and solve introductory problems in environmental engineering and science related to: sociological frameworks; fundamental physical, chemical, and biological processes; engineering technology; current environmental issues; and legislation.
• Criterion 3 outcomes: a, e, g, h, j

Brief list of topics covered:
• History of Environmental Protection
• Reactors and Mass Balances
• Energy Fundamentals
• National Environmental Policy Act
• Population Growth
• Risk Analysis
• Water Pollution
• Water Quality
• Air Pollution
• Global Atmospheric Change
• Solid Waste

Updated: August 2013
CEE 3780 – Solid and Hazardous Waste Management

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)

Instructor: R. Ryan Dupont


Specific course information:
- Catalog description: Introduction to integrated management of municipal and industrial solid waste; household, commercial, and industrial hazardous waste; and resource recovery, recycling, and sustainability principles. Three lectures augmented by computer modeling and field trip experiences related to modern solid and hazardous waste management principles.
- Prerequisites: Acceptance into professional program in engineering.
- Co-requisites: None.
- Required course for environmental engineering program; selected elective for civil engineering program

Specific goals for the course:
- Specific outcomes of instruction: Students will develop a working knowledge of civil engineering practice in the area of solid and hazardous waste, and will demonstrate an understanding of the fundamental physical, chemical, and biological processes that are used in integrated solid waste management systems; resource recovery; industrial and hazardous waste management; pollution prevention/waste minimization; and land disposal of solid and hazardous waste. An emphasis is placed on applying the students’ understanding of relevant engineering concepts to waste minimization and source reduction through a group project, and on the quantitative performance of a municipal landfill through an energy and greenhouse gas emission evaluation and landfill leachate and gas generation problem that comprises the final exam.
- Criterion 3 outcomes: a, b, c, d, e, g, j, k

Brief list of topics covered:
- Introduction to SWM/Historical Perspective
- Integrated Solid Waste Management
- Sources & Classification of Solid & Hazardous Waste
- Engineering Code of Ethics & Sustainability
- Solid & Hazardous Waste Legislation
- Municipal Solid Waste Mgmt. Systems
- Waste Generation Rates
- Source Reduction/Pollution Prevention
- Management of Waste at Source
- Solid Waste Collection
- Transfer & Transport
- Separation & Resource Recovery
• Material Recovery Facilities
• Waste Conversion Technologies/Biological & Thermal Transformations
• Landfill as a Reactor
• Liners/Landfill Footprint
• Production, Movement & Control of Landfill Gas
• Landfill Gas Composition & Volume
• Gas Generation Rates & Energy Content
• Landfill Gas & Air Toxics
• Landfill Solids Balance & Leachate Production
• Landfill Leachate Computations

Updated: September, 2013
CEE 4200 – Engineering Economics

Credits and contact hours: 2 credits, 2 contact hours per week (2 hours lecture)

Instructors: A. B. Bishop and D. Stevens


Specific course information:
- Catalog description: Applications of the mathematics of finance to engineering decision making.
- Prerequisites: Junior year of engineering or instructor’s consent
- Co-requisites: None
- Required course

Specific goals for the course:
- Specific outcomes of instruction: Student will develop proficiency in engineering economic analysis applied to various types of engineering decisions using appropriate tools and technology, consider the impact of engineering economic decisions in a global social and environmental, professional and ethical context.
- Criterion 3 outcomes: e, h

Brief list of topics covered:
- Time value of money and compound interest factors
- Cash flow calculations and equivalence
- Comparing alternatives using PW, AW, and ROR
- Breakeven, replacement, and effects of inflation
- Cost estimation and depreciation
- Before and after tax cash flow analysis
- Multi-criteria decisions, risk and uncertainty
- Economic externalities and sustainable projects

Updated: September, 2013
PSC 3000 – Fundamentals of Soil Science

Credits and contact hours: 4 credits, 5 contact hours per week (3 hours lecture + 2 hours lab)

Instructor: Paul Grossl

Textbook: Electronic lecture notes provided by instructor

Specific course information:
- Catalog description: Fundamentals of soil science, emphasizing physical, chemical, mineralogical, and biological properties of soils, and how these properties relate to plant growth and environmental quality.
- Prerequisites: CHEM 1110 or higher and MATH 1050 or higher
- Co-requisites: None
- Required course

Specific goals for the course:
Specific outcomes of instruction: An introduction to soil as a natural resource. Chemical, physical, and biological properties and processes related to soil formation and management will be presented.
- Criterion 3 outcomes: a

Brief list of topics covered:
- Soil profiles.
- Parent Materials and soil formation.
- Soil texture, structure, and profiles.
- Soil Minerals and color
- Soil Classification, Soil Survey
- Soil physical properties
- Soil water, water retention curves
- Water flow
- Soil salinity and sodicity
- Soil testing and fertility

Updated: January, 2014
CEE 3430 – Engineering Hydrology

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture + 0 hours lab)

Instructor: David G Tarboton


Specific course information:
• Catalog description: Provides a basic understanding of engineering hydrology through the hydrologic cycle, watershed characteristics, atmospheric water, rainfall-runoff processes, infiltration and evaporation, stream flow analysis, groundwater flow, and related designs
• Prerequisites: CEE 3500 Fluid Mechanics
• Co-requisites: None
• Required

Specific goals for the course:
• Specific outcomes of instruction: Upon successful completion of the course students should be able to apply the principles of hydrology to solve engineering hydrology design problems involving hydrologic modeling and analysis.
• Criterion 3 outcomes: a, c, e, j, k

Brief list of topics covered:
• Identify and describe the processes and quantities involved in the hydrologic cycle. (Mays Ch 1)
• Quantify the components of the water balance of a watershed. (Mays Ch 1)
• Quantify the hydrologic properties of groundwater (Mays Ch 2)
• Quantify the flow of groundwater and evaluate the impacts of well pumping on groundwater flow and properties. (Mays Ch 3, 4)
• Quantify the variability of precipitation, calculate area average precipitation and determine design storm amounts (Mays Ch 7)
• Calculate hydrologic losses due to evaporation and infiltration. (Mays Ch 7)
• Calculate hydrographs based on streamflow and precipitation measurements, watershed attributes and unit hydrograph theory. (Mays Ch 8)
• Formulate problems and prepare inputs to use hydrologic engineering software (computer models) for analysis and design. Summarize and synthesize outputs from these computer models. (Mays Ch 8, HEC HMS documentation)
• Use reservoir and river routing methods to determine the hydrograph output from a reservoir or river reach given the hydrograph input (Mays Ch 9)
• Quantify the probability associated with extreme hydrologic events and the magnitude of hydrologic events of specified recurrence interval and frequency. (Mays Ch 10)
• Design hydrologic solutions to drainage, culvert, flooding and water supply problems. (Mays Ch 11)

Updated: September, 2013
CEE 3510 – Civil and Environmental Engineering Hydraulics

Credits and contact hours: 3 credits, 4 contact hours per week (3 lecture + 1 lab)

Instructor: Gilberto E. Urroz, Ph.D., P.E.

Textbooks:

Specific course information:
- Catalog description: Steady flow in open channel and closed pipe circuits, nonuniform flow in open channels, combined energy losses in pipelines, and distribution in pipe networks. Includes laboratory and computer exercises in data collection, pipe networks, and unsteady and nonuniform flow.
- Prerequisites: CEE 3500 Hydraulics
- Co-requisites: none
- Required course

Specific goals for the course:
The objectives of this course are to learn and apply the principles or engineering fundamentals of

- Complex pipeline systems
- Gradually varied flow in open channels
- Hydraulic machinery

As well as to review the basic concepts of continuity, energy, and momentum applications in pipes, pumps, and open channels.

- Criterion 3 outcomes: a, b, e, g, k

Brief list of topics covered:
- Analysis of complex pipeline systems: Pipes in series - Pipes in parallel - Branching pipelines - Pipe networks - Solutions using EPANET
- Analysis of hydraulic machinery: Pumps - Types of pumps - Pump efficiency - Similarity laws - Discharge characteristics - Operating point - Specific speed - Cavitation in pumps - Selection of pumps - Pumps in series - Pumps in parallel - Pump installation

Updated: August, 2013
CEE 3640 – Water and Wastewater Engineering

Credits and contact hours: 4 credits, 4 contact hours per week (4 hours lecture)

Instructor: Laurie McNeill (water engineering) and Ryan Dupont (wastewater engineering)


Specific course information:
- Catalog description: Engineering analysis and design of processes for treatment of water and wastewater. Major topics include water quality evaluation; physical, chemical, and biological treatment systems; design of facilities for production of drinking water and for treatment and reclamation of municipal and industrial wastewater; and management of residuals from water and wastewater treatment facilities.
- Prerequisites: CEE 3610 (Environmental Management)
- Co-requisites: none
- Required course for environmental engineering program; selected elective for civil engineering program

Specific goals for the course:
- Specific outcomes of instruction: Students will develop a working knowledge of civil engineering practice in the area of potable water treatment and wastewater treatment; demonstrate an understanding of the fundamental physical, chemical, and biological processes that are used in potable water treatment and wastewater treatment; and understand legislation pertinent to potable water treatment and wastewater treatment.
- Criterion 3 outcomes: a, c, d, e, g

Brief list of topics covered:
Drinking Water portion
- Basic chemistry
- Reaction kinetics and reactor design
- Water/wastewater demand/production
- Population forecasting
- Disinfection
- Coagulation
- Sedimentation/flotation
- Filtration and membranes
- Lime softening
- Iron and manganese removal
- Adsorption and ion exchange
- Gas transfer
- Residuals management
- Energy usage at water utilities
**Wastewater portion**

- Biological principles applied to wastewater treatment
- Water quality standards and regulations
- Analytical measurements of wastewater quality
- Oxygen transfer
- Wastewater collection
- Preliminary treatment
- Primary treatment
- Secondary treatment
- Lagoons and wetlands
- Treatment plant modeling
- Disinfection
- Sludge treatment and disposal

Updated: August 2013
CEE 3670– Transport Phenomena in Bio-Environmental Systems

Credits and contact hours: 3 credits, 3 contact hours per week

Instructor: Bethany Neilson


Specific course information:
• Catalog description: Core course in both biological and environmental engineering. Students develop a detailed understanding of the principles, concepts, modes, and methods of calculating heat and mass transfer. Emphasis given to contaminant and nutrient flux, along with their state transformations, in order for the biological or environmental engineer to evaluate options for production, clean-up, and control of bio-environmental systems.

• Prerequisites: BENG 2400 Biological and Environmental Thermodynamics or MAE 2300 Thermodynamics 1; CEE 3500 Civil and Environmental Engineering Fluid Mechanics or MAE 3420 Fluid Mechanics

• Required

Specific goals for the course:
• Specific outcomes of instruction: Students will understand and solve introductory problems related to heat and mass transfer processes (including conduction, convection, radiation, diffusion, etc.).
• Criterion 3 outcomes: a, e, k

Brief list of topics covered:
• Conduction, convection, and radiation energy transfer; diffusion and convection mass transfer.

Updated: September, 2013
CEE 3880 – Civil and Environmental Engineering Design I

Credits and contact hours: 1 credit, 1 contact hours per week (1 hour lecture)

Instructor: Richard C. Peralta

Textbook: None

Specific course information:
- Catalog description: Introduction to senior engineering students’ integrated design experience. Design project is identified and proposal for its completion during the senior year is produced. Emphasizes project scheduling, and completion of design proposal.
- Prerequisites: ENGR 3080 - Introduction to Technical Communication
- Co-requisites: None
- Required

Specific goals for the course:
- Specific outcomes of instruction: Students will work with others on a team to identify an interdisciplinary engineering design problem and prepare a proposal describing its importance and how to systematically address it. Students will also write summaries of presentations given by guest speakers on topics listed below.
- Criterion 3 outcomes: e, f, g, i

Brief list of topics covered:
- Introduction, Syllabus and Schedule, Senior Project Proposal
- Gantt Charts and Pert Diagrams
- Organizing and Working in Teams
- Turning a Good Idea into a Winning Proposal
- Contracts and Specifications
- Civil Engineering within Private Consulting Firm
- Engineering in a Municipality & Contracts
- Ethics and Responsibility
- Marketing Engineering Services
- Civil Engineering in the Public Sector
- Distinguished Alumni Lecture
- Senior Design Proposal Presentations

Updated: October, 2013
PUBH 3310 – Occupational Health and Safety

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)

Instructor: David Wallace and Carl Farley

Textbook: None

Specific course information:
- Catalog description: Covers the principles of occupational health and safety, including regulatory standards. Emphasizes on-the-job health and safety problems from the occupational health and safety professional and management view.
- Prerequisites: None
- Co-requisites: None
- Required

Specific goals for the course:
- Specific outcomes of instruction: This course is intended to provide an overview of the safety and industrial hygiene professions, with more detail on relevant topics. After completing this course, students should:
  - Understand the historic context of occupational safety and health and the circumstances that prompted legislation.
  - Know essentials of the Occupational Safety and Health Administration, OSHA, and the Mine Safety and Health Administration, MSHA, their mission and their approach.
  - Be able to recognize workplace safety and health hazards, including chemical, biological, and physical agents and conditions that could lead to accidents and injuries.
  - Know the basics of hazard control, including the factors that determine risk and how to set priorities.
  - Appreciate the role of professionals and professionalism in occupational safety and health.
  - Recognize occupational safety and health issues in current events
- Criterion 3 outcomes: a, h

Brief list of topics covered:
- History of Occupational Safety and Health
- The Occupational Safety and Health Act
- Mine Safety and Health, History and Legislation
- Workers Compensation
- Introduction to OSH Management
- Occupational Health Hazards
- Occupational Infectious Diseases
- Principles of Toxicology
- Introduction to Epidemiology
- Workplace Exposure Limits
- Hazard Communication and the MSDS
• Evaluating Chemical Hazards
• Chemical Hazard, Source Controls (non vent.)
• Chemical Hazard, Ventilation Source Controls
• Personal Protect. Equip. (PPE)
• Physical Health Hazards
• Job Stress, Shiftwork
• Confined Space Entry
• Risk Assessment
• Ergo. Hazards and Repetitive Motion Diseases
• Behavior and Accident Causation and JHA
• Fire Safety and Protection
• Material Handling and Storage, Forklifts
• Emergency Response, Hazmat
• Construction Safety. Excavations. Scaffolds
• Electrical Hazards
• Walking/Working Surfaces and Fall Protection
• Machine Safeguarding, Lock-out / Tag-out
• Cranes and Hoists
• Accident Investigation and Cost Analysis
• Workplace Violence
• Teenage Workers

Updated: August, 2013
CEE 4870 – Civil and Environmental Engineering Design II

Credits and contact hours: 2 credits, 0.25 contact hour per week (2 hours lecture)

Instructor: Richard C. Peralta

Textbook: None

Specific course information:
- Catalog description: Provides senior engineering students with integrated design experience in two-semester sequence. Design projects proposed in Junior Design Proposal placed on team work, scheduling, design calculations, and completion of design report.
- Prerequisites: CEE 3880 - CEE Design I
- Co-requisites: None
- Required

Specific goals for the course:
- Specific outcomes of instruction:
- Criterion 3 outcomes: c, d, i, k

Brief list of topics covered:
- Critical Path Method and Gantt Charts
- Project Reporting and Evaluation
- Integrity in Work Reporting
- Project Presentation and Evaluation

Updated: September, 2013
CEE 5610 - Environmental Quality Analysis

Credits: Three (3)
Contact hours: Tuesday/Thursday 1:30 – 2:45 p.m., Engineering Laboratory 221
Thursday 2:30 – 5:20 p.m., Engineering Laboratory 223
Instructor: Joan E. McLean
Textbook: Sawyer, C.N. and P.L. McCarty and G. F. Parkin, Chemistry for Environmental Engineering and Science (textbook recommended, not required)

Specific Course Information

Course description: Familiarizes students with various methods used for analysis of chemical parameters in environmental samples (water, soil, and air). Provides students with skills enabling them to make proper selection/evaluation of analytical procedure and evaluate data generated.

Prerequisite: CHEM 1210 and Admission to the Professional Engineering Program

Specific Goals for the Course:

- Develop a working knowledge of environmental chemistry and analysis;
- Develop an understanding of data quality and interpretation of data within the limitations of data quality;
- Develop the skills to present processed data in tabular and graphic formats and communicate results and environmental significance of results in written reports.

Specific Criterion 3 ABET Student Outcomes addressed by the course:

b - An ability to design and conduct experiments, as well as to analyze and interpret data
g - An ability to communicate effectively

Course Topics

- Organization - Introduction to Environmental Quality Analysis
- Quality control
- Acid-base concepts, pH (potentiometric technique), alkalinity, acidity (potentiometric titration)
- Dissolved Oxygen (Polarographic technique)
- Misc Water Quality Parameters (Solids (gravimetric), Turbidity (light scatter), Specific conductivity (conductometric), Color)
- Phosphorus (Spectrophotometric technique-visible)
- Misc. Nutrient (colorimetric and potentiometric techniques)
- Hardness (Titration)
• Metals (Atomic absorption and atomic emission spectrometry and mass spectrometry, ion selective electrodes, biosensors)
• Anion analysis (Ion chromatography)

Updated October 2013
CEE 5860 – Air Quality Management

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)

Instructor: Randal Martin


Specific course information:
- Catalog description: Introduction to air quality management. Explores the legislation, sources, behaviors and effects of regulated and non-regulated air pollution, control techniques, and air dispersion modeling.
- Prerequisites: CEE 3610, CEE 3500, BENG 2400
- Co-requisites: none
- Required course for environmental engineering program; selected elective for civil engineering program

Specific goals for the course:
- Specific outcomes of instruction: Students will develop a working knowledge of engineering practice in the area of air quality and air pollution control; demonstrate an understanding of the fundamental physical, electrical, and chemical processes that are used in typical air pollution control scenarios; and understand the motivation of air pollutant legislation.
- Criterion 3 outcomes: a, c, d, e, g, j, k

Brief list of topics covered:
- Air Quality History & Regulation
- Typical Air Quality Units and Nomenclature
- Air Pollution Photochemistry
- Air Pollution Meteorology
- Dispersion Modeling
- Ducted Pollutant Transport
- Particulate Control Technologies
  - inertial separation (cyclones)
  - electrostatic precipitation (ESPs)
  - fabric filtration (bag houses)
  - wet scrubbing
- Gaseous Control Technologies
  - condensation
  - thermal/catalytic oxidation (incineration)
  - adsorption
  - absorption

Updated: August 2013
CEE 4880 – Civil and Environmental Engineering Design III

Credits and contact hours: 2 credits, 1 contact hours per week (1 hour lecture + 1 hour lab)

Instructor: Richard C. Peralta

Textbook: None

Specific course information:
- Catalog description: Provides senior engineering students with integrated design experience in two-semester sequence. Design projects started in CEE 4870 will be completed with presentation, report, and defense of design project.
- Prerequisites: CEE 4870 - CEE Design II
- Co-requisites: None
- Required

Specific goals for the course:
- Specific outcomes of instruction:
  - Criterion 3 outcomes: a, b, c, d, e, g, i, k

Brief list of topics covered:
- Critical Path Method and Gantt Charts
- Project Reporting and Evaluation
- Integrity in Work Reporting
- Project Presentation and Evaluation

Updated: September, 2013
Elective and General Education Classes
CEE 5430 – Ground Water Engineering

Credits and contact hours: 3, 3 contact hours per week (3 hours lecture)

Instructor: Jagath Kaluarachchi

Textbook: Instructor provided Powerpoint notes in PDF format.

Specific course information:
- Catalog description: Explores fundamentals of groundwater hydrology by focusing on theory related to aquifer systems and flow analysis, regional groundwater balance, well hydraulics, aquifer testing, capture zone analysis, unsaturated flow, saltwater intrusion, and basics of flow modeling.
- Prerequisites: CEE 3430 - Engineering Hydrology
- Co-requisites: none
- Elective

Specific goals for the course:
- Specific outcomes of instruction:
  - Gaining factual knowledge (terminology, classifications, methods, trends)
  - Learning fundamental principles, generalizations, or theories
  - Learning to apply course materials (to improve rational thinking, problem solving and decisions)

- Criterion 3 outcomes: a, e, i, k

Brief list of topics covered:
Unsaturated flow
Basics of ground water flow
Well hydraulics
Aquifer testing
Salt water intrusion
Flow and mass transport

Updated: September 2013
CEE 5620 – Aquatic Chemistry

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)

Instructor: William Doucette


Specific course information:
- Catalog description: Provides students with an understanding of aquatic chemistry principles, emphasizing chemical equilibria, acid-base reactions, complex formation, oxidation-reduction reactions, complex formation, and dissolution chemistry.
- Prerequisites: CHEM 1210 or equivalent
- Co-requisites: none
- Elective

Specific goals for the course:
- Specific outcomes of instruction: Students will understand and solve problems related to: chemical equilibria, acid-base reactions, complex formation, oxidation-reduction reactions, complex formation, and dissolution chemistry.
- Criterion 3 outcomes: a, e

Brief list of topics covered:
- Conservation Principles, Chemical Equilibrium & Kinetics
- Acid-Base Chemistry (carbonate system)
- MINEQL Equilibrium Model
- Solid Dissolution and Precipitation
- Complexation
- Oxidation-reduction
- Reactions on solid surface
- Selected topics/special projects

Updated: August 2013
CEE 5670 – Hazardous Chemicals Handling and Safety

Credits and contact hours: 2 credits, 2 contact hours per week (2 hours lecture or lab)

Instructor: William Doucette

Textbook: None.

Specific course information:
• Catalog description: Provides students with necessary skills and knowledge for working safely in areas associated with hazardous chemicals. Topics covered include: regulations, exposure routes, toxicology, chemical and physical hazards, personal protective equipment, sampling, monitoring, decontamination, and emergency response procedures.
• Prerequisites: CHEM 1210 or equivalent.
• Co-requisites: none
• Elective

Specific goals for the course:
• Specific outcomes of instruction: Students will understand issues, solve problems and conduct hands on exercise related to hazardous chemical: regulations, exposure routes, toxicology, chemical and physical hazards, personal protective equipment, sampling, monitoring, decontamination, and emergency response procedures.
• Criterion 3 outcomes: a, d, g, i

Brief list of topics covered:
• Hazard Recognition
• Regulatory overview
• Properties of Hazardous Materials
• Toxicology and Chemical Exposure
• Medical monitoring
• Respiratory Protection
• Air Sampling and Monitoring
• Personal Protective Clothing/Equipment
• Emergency response procedures
• Health and Safety Programs and Plans
• Special Operations
• Lab Exercises

Updated: August 2013
CEE 5680 – Soil-Based Waste Management

Credits and contact hours: 2 credits, 2 contact hours per week (2 hours lecture)
Instructor: Judith L Sims

Specific Course Information:
- Course description: Engineering management of wastes present in the vadose zone, including extraction, containment, and biological, chemical, and physical destruction technologies for sustainable agriculture and environmental quality. Aspects include engineering characterization, problem definition, treatment, and monitoring. Analysis and design emphasized through problems, examinations, and report writing.
- Prerequisites or co-requisites: Admission to Professional Engineering Program.
- Elective

Specific goals for the course:
- Learn to design land-based treatment and reuse systems.
- Become aware of the benefits as well as the challenges associated with the use of these systems

Specific outcomes of instruction:
- In this course, students continue to develop their skills in application of mathematics and basic sciences to develop engineering designs of land treatment systems. The course assignments provide the opportunity for the students to practice engineering science related to the treatment of wastes in soil-based systems.

Criterion 3 ABET Student Outcomes: c, h, i

List of Topics:

1. Overview: Methodology for design of land treatment systems
2. Soil properties critical for land-based treatment
3. Waste properties critical for land-based treatment
4. Design of land treatment systems: rapid infiltration, overland flow, slow rate irrigation, constructed wetlands
5. Overview: wastewater reclamation, reuse, and recycling
6. Benefits and role of wastewater reclamation, reuse, and recycling in sustainability of environmental systems; Public health & environmental issues
7. Water reclamation criteria: U.S. and other countries (WHO recommendations)
8. Overview of pretreatment processes and corresponding potential uses for reclaimed water
9. Potential uses for reclaimed water: 1) irrigation water, 2) landscape irrigation, 3) industrial water reuse (cooling, industrial processes), 4) groundwater recharge, 5) recreational and environmental uses, 6) non-potable urban uses, 7) potable reuse
10. On-site wastewater management for small wastewater flows: conventional septic tank/drain field systems and alternative (advanced or complex) systems

Updated September 2013
CEE 5730 – Environmental Chemistry of Organic Contaminants

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)

Instructor: William Doucette

Textbook: None.

Specific course information:
• Catalog description: Provides students with understanding of methods used in analysis of environmental samples for organic contaminants. Examines various properties and processes determining the fate of organic contaminants in the environment.
• Prerequisites: CHEM 1210 and CHEM 1215
• Co-requisites: none
• Elective course

Specific goals for the course:
• Specific outcomes of instruction: Students will understand concepts and solve problems in environmental organic chemistry related to the fate and analysis of organic contaminants in the environment.
• Criterion 3 outcomes: a, h, i, j

Brief list of topics covered:
• Introduction to Organic Chemicals in the Environment
• Introduction to Environmental Fate Processes
• Thermodynamics/Kinetics
• Vapor Pressure, Solubility, Henry’s Law Constants
• Octanol/water partition coefficients, Bioconcentration, Acidity Constants, Sorption
• Chemical Transformation Reactions (Hydrolysis, Redox, Photolysis)
• Biological Transformation Reactions
• Estimation of Environmental fate properties
• Environmental Fate Modeling (fugacity models)
• Analysis of Organic Contaminants in Environmental Samples (Sampling, extraction/concentration techniques, instrumental analysis)

Updated: August 2013
CEE 5750 – Air Pollutant Measurement and Analysis

Credits and contact hours: 2 credits, 4 contact hours per week (1 lecture hr, 3 laboratory hrs)

Instructor: Randal Martin


Specific course information:
- Catalog description: Laboratory-based course designed to familiarize participants with federally-approved reference measurement techniques for ambient and source pollutants. Also provides understanding of temporal and spatial pollutant behavior.
- Prerequisites: none, junior or senior-level
- Co-requisites: none
- Elective course for environmental and civil engineering program

Specific goals for the course:
- Specific outcomes of instruction: students will develop an understanding of the sources, behaviors, and fates of ambient and stack criteria pollutants; demonstrate comprehension of the theory and operating procedures behind the required EPA reference and/or equivalent air pollutant measurement methods; show the ability to work within the framework of a team toward the completion of laboratory and field investigations; and demonstrate the ability to communicate the results of field and lab experiments to peer audiences, in a clear and logical manner.
- Criterion 3 outcomes: a, b, g, j, k

Brief list of topics typically covered:
- Air Quality Regulations and Impacts (health & welfare)
- Typical Air Quality Units and Measurement Nomenclature
- Air Pollution Meteorology and its Measurement
- Ambient Measurement and Analysis of Criteria Air Pollutants
  - PM$_{10}$/PM$_{2.5}$
  - Carbon Monoxide
  - Ozone
  - Oxides of Nitrogen
- Other Air Quality Measurements (not necessarily covered every year)
  - Indoor vs Outdoor Air Quality
  - Automobile Emissions
  - Unique Special Topics (e.g. O$_3$ deodorizers, cigarette smoke, etc.)
- Site visit to State and/or Federal Air Quality Measurement Stations

Updated: September 2013
CEE/BENG 5810 - Biochemical Engineering

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)
Instructor: Dr. Yue Cui

Specific Course Information:

Course description: Fundamentals of bioreactor design and bioengineering to produce biological commodities. Emphasizes mathematical models of microbial and enzymatic processes in environmental and industrial biotechnology.

Prerequisites or co-requisites: BENG 3200 and BENG 3670/CEE 3670; or BENG 3670/CEE 3670, CEE 3610/PUBH 3610, and CEE 3640; and Admission to the Professional Engineering Program

Elective

Specific goals for the course:
1) Proficiency in core biochemical engineering principles.
2) Analyze/solve open ended problems in biochemical engineering.
3) Analyze and interpret data in order to solve engineering problems.
4) Assimilate information relevant to a problem.
5) Assess your own ability/knowledge to solve a problem, and determine when to seek help.

Criterion 3 outcomes: a, e

List of Topics to be Covered:

- Introduction to biochemical engineering
- Enzyme kinetics (biochemical engineering catalysis)
- Stoichiometry of biochemical reactors
- How biological cells grow and the chemostat
- Biochemical engineering reactors: design and operation
- Scale-up of bioreactors
- Recovery and purification of products

Updated: September 2013
CEE/BENG 5830 – Management and Utilization of Biological Solids and Wastewater

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture)
Instructor: Dr. Michael J. McFarland, PE, BCEE

Specific Course Information:

- **Course description:** Focuses on production, management, and disposal of biosolids and wastewater generated in food processing and wastewater treatment. Emphasizes beneficial use of biosolids and wastewater for agricultural production, forest enhancement, and land reclamation.
- **Prerequisites or co-requisites:** BENG 3200, BENG 3670/CEE 3670, CEE 3610/PUBH 3610, CEE 3640; and Admission to the Professional Engineering Program
- **Selected Elective**

Criterion 3 outcomes: a, b, c, d, e, f

Specific goals for the course:

- This course has been designed to introduce the student to the production and management of municipal wastewater sludges (now known as biosolids). With the passage of the recent amendments to the Clean Water Act (40 CFR Part 503), both the US Environmental Protection Agency and the State of Utah Department of Environmental Quality (UDEQ) are promoting the beneficial use of biosolids rather than their disposal in landfills or through incineration. With the new emphasis on biosolids use, approaches to controlling both biosolids production rates and quality must be developed.

This course will place emphasis on understanding the processes that result in the generation of biosolids as well as the impacts of industrial operations and pretreatment programs on biosolids quality. The students will be introduced to the various methods for estimating biosolids production rates together with the available technical (and legal) options for controlling biosolids quality. The beneficial use options that will be discussed in this course include biosolids use in; 1) agricultural crop and forest production, 2) disturbed and marginal land reclamation and 3) enhancement of public access sites (e.g., parks, golf courses, etc.).
Specific outcomes of instruction:

- This course has been developed to provide the student with an environmental engineering and science design experience. The course will examine approaches to optimizing the beneficial use of biosolids by emphasizing the application of pollution prevention and waste minimization techniques for key industries whose wastewater discharge may affect biosolids quality.

List of Topics:

1. Regulatory Control of Biosolids
2. Biosolids Beneficial Use Guidelines
3. Biosolids Quality and Production Rates
4. Control of Biosolids Quality
5. Production of Primary Solids
6. Production of Secondary Solids
7. Biosolids Processing
8. Beneficial Use System Design

Updated December 2013
CEE 5930 – ENVIRONMENTAL ENGINEERING IN DEVELOPING COUNTRIES

Credits and contact hours: 3 credits, 2.5 contact hours per week

Instructor: Craig Adams


Specific course information:
- Catalog description: Not in catalog yet. Description will read: “This course is designed for engineers and non-engineers and covers appropriate safe water, sanitation, air pollution technologies, and public health principles, for developing nations. Social and educational approaches, and project management principles required for successful project implementation, are stressed. A wide variety of processes and systems relevant to developing nations will be covered such as: Design and construction of reinforced slabs, elevated slabs, block walls, and structures; design of water collection and distribution systems; water treatment systems; wastewater and sanitation systems (soak pits, lagoons, latrines, etc); determination of soil properties; watershed calculations; thermal water heating systems; water quality calculations; and many other systems.”
- Prerequisites: CEE 5630 (UG): In professional program of any engineering major, or by permission.
- Co-requisites: None.
- Elective

Specific goals for the course:
- Specific outcomes of instruction: Students successfully completing CEE 5630 (UG) / CEE 6630 (Grad) are expected to:
  1. Demonstrate familiarity with the principles and technologies associated with basic sanitation in developing countries, including control of infectious diseases, water supply and treatment, and disposal of excreta and refuse.
  2. Be able to design and conduct technical calculations related to a wide range of technologies covered in class.
  3. Identify technologies that are appropriate for use in developing countries, as well as strategies for implementing them in various international settings that are far different politically, economically, and socially than those normally encountered in the U.S..
  4. Be able to apply principles unique to achieve engineering project success in developing nation and rural environments.
- Criterion 3 outcomes: a, b, c, d, f, h, i, j

Brief list of topics covered:
- Public Health
- Participatory Approaches, Project Management, Education
- Topographical Surveying, Engineering Materials, Soil Props
- Construction Techniques

134
o Water Use, Access, Health, Water Quality Analysis
o Manually Constructed Water Wells, Natural Springs
o Rainwater Harvesting, review, discussion
o Water Treatment
o Wastewater Composition and Generation
o Latrines, Wash Areas/Soak Pits
o Lagoons and wetlands, review
o Solid Waste Management
o Indoor Air / Video
o Solar Photovoltaics/Power
o Outdoor Air pollution
o Public Health

Updated: April, 2013
ENGL 2010 – Intermediate Writing: Research Writing in a Persuasive Mode

Credits and Contact Hours: 3 credits; 3 contact hours per week (3 hours lecture)

Instructor: varies (multiple sections offered each semester)

Textbook: varies

Specific Course Information:
- Catalog Description: Writing of reasoned academic argument supported with appropriately documented sources. Focuses on library and Internet research, evaluating and citing sources, oral presentations based on research, and collaboration.
- Prerequisites: English 1010 or examination.
- Required course

Specific Goals for the Course:
- Specific Outcomes include:
  - Demonstrate an understanding of audience and purpose.
  - Write logical, clear, and unique persuasive arguments that contain appropriate and sufficient evidence.
  - Locate, select, and evaluate appropriate sources and integrate information from sources in papers.
  - Cite and document sources using the MLA parenthetical documentation format.
  - Demonstrate a command of Standard English, including punctuation, grammar and usage.

Updated: June 2014
ENGR 3080 – Technical Communication in Engineering

Credits and Contact Hours: 3 credits; 2.5 contact hours per week

Instructor: Melissa Sheaffer


Specific Course Information:
- The goal of this course is to prepare engineering students with the foundational research, individual and collaborative writing, teamwork, and presentation skills necessary to be effective technical and professional communicators in academic and professional environments. This course meets the criteria for a Communications Intensive (CI) course.
- Prerequisites: English 2010 and Admission to the Professional Program in the College of Engineering. No co-requisite.
- Required course for all undergraduate students in the College of Engineering.

Specific Goals for the Course:
a. Specific Outcomes include:
- Understanding the importance, purposes, audiences, and conventions of written communication in technical fields.
- Articulating complex engineering ideas appropriate to the audience.
- Planning, drafting, revising, editing, and critiquing professional documents through individual and collaborative writing.
- Writing effective technical and business documents common to engineering disciplines.
- Working in and contributing to multi-disciplinary teams.
- Preparing and delivering presentations through applying principles of effective oral communication.
- Learning principles of document and information design to create effective written documents and presentations.
- Researching, analyzing, and applying information to create technical reports.
- Recognizing ethical and cultural implications of communication in professional contexts.
- Understanding the importance of communicating a professional image.

b. Criterion 3 Outcomes: d, f, g

Brief List of Topics Covered:
- Importance of communication for engineers
- Barriers to communication
- Audience analysis
- Process approach to writing
• Listening
• Cross cultural communication
• Importance of grammar, proofreading, and editing
• Collaborative writing
• Document design
• Writing technical reports (abstracts, proposals, formal reports, progress reports, instructions, feasibility reports)
• Writing business documents (letters, memos, emails)
• Writing employment documents
• Research methods
• Working in teams
• Preparing and delivering presentations in individual and team formats
• Ethics of technical communication

Updated October 2013
MGT 3110 – Managing Organizations and People

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture + 0 hours lab)

Instructor: David Herrmann

Textbooks: The 7 Habits of Highly Effective People, Stephen R. Covey, Any Edition

Specific course information:
• Catalog description: Overview of the role of management, and an introduction to leadership theory and practice. Includes defining of mission goals, organizing work, and managing human performance.
• Prerequisites: Admittance to a USU major; cumulative GPA of 2.67 or higher; and completion of at least 40 credits.
• Co-requisites: none
• Required

Specific goals for the course:
• Specific outcomes of instruction: Every organization is as complex and individual in nature as human beings. Indeed they are living entities made up of a mix of corporate culture, top management, and employees interacting with each other in a myriad of ways. Your success in an organization will depend on your ability to understand its nature and direct it, (or your portion of it), to success. Therefore, I will teach you proper theories and applications of:
  o Planning
  o Structure/Organizing
  o Leadership/Motivation/Team Building
  o Monitoring/Control
The concepts of projection, implementation, evaluation, and revision and how organizations deal with them will be covered. Also, you will be required to develop your communication skills through written and oral presentations. Since most of you will end up working for smaller companies or starting your own company, I will give some insights on how these principles are applied in a small company environment.

• Criterion 3 outcomes: d, f, k

Brief list of topics covered:
• Introduction, Groups and Projects
• What is Management?
• Management Today
• Management History
• The Business Environment
• Planning/Goal Setting/ Managing Change
• Speaking up
• Creating and Executing Strategy
• International Management
• Organizing/Structure
• Ethics and Corporate Social Responsibility
• Leadership
• Motivation and Individual Behavior
• Fraud and Corruption
• Human Resource Management
• Communications
• New Enterprise Development
• Operations Management Overview

Updated: January 2014
Appendix B – Faculty Vitae

Environmental Engineering Faculty
Craig D. Adams, PhD, PE, F.ASCE

Education
Ph.D. Environmental Health Engineering, University of Kansas, 1991
M.S. Environmental Health Engineering, University of Kansas 1988
B.S. Chemical Engineering, University of Kansas, 1983

Academic experience
Utah State University, Head and Professor, 2012-present, full time
University of Kansas, Chair, Constant Distinguished Professor, 2008-2012 full time
Missouri University of Science and Technology, Mathes Chair and ERC Director, 1995-2008, full time
Clemson University, Assistant Professor, 1991-1995 full time

Non-academic experience
Optical Coating Laboratory, Inc., Process Engineer, 1983-1987 full time
Advanced Product Development Division

Certifications or professional registrations
Registered Professional Engineer, State of Kansas, License No. 12048
Board Certified Environmental Engineer (No. 10-E0033), American Academy of Environmental Engineers

Current membership in professional organizations
American Academy of Environmental Engineers, American Society of Civil Engineers, American Water Works Association, Association of Environmental Engineering and Science Professors, Chi Epsilon, International Water Association, American Chemical Society

Honors and awards
2008 Eddy Wastewater Principles and Processes Medal – 2008, Water Environment Federation (for outstanding contribution to wastewater principles or processes research)
2003 ASCE Rudolph Hering Medal winner (American Society of Civil Engineers) for “most valuable contribution to the increase of knowledge in, and to the advancement of, the environmental branch of the engineering profession” for the paper: Adams, C., Wang Y., Loftin K., Meyer M. (2002), “Removal of Antibiotics from Surface and Distilled Water in Conventional Water Treatment Processes” J. Environmental Engineering, 128:3, 253-260

Service activities
At USU: Department Head for CEE
Professional service:
2005-present Fellow, American Society of Civil Engineers
2008-present Secretary and Treasurer, United States of America National Committee (USANC) of the International Water Association (IWA)
2003-present Member, American Water Works Association, Organic Contaminants Control Committee
2007-present Member, American Water Works Association, Contaminant Candidate List 3 (CCL3) Workgroup

Most important publications and presentations from the past five years


Recent professional development activities
Presentation of workshop at WQTC (Long Beach, CA); Keynote talk at ACS Conference (Dallas, TX)
William J. Doucette

Education
PhD., Water Chemistry, University of Wisconsin-Madison, 1985
M.S., Chemistry, University of Minnesota-Duluth, 1980
B.S., Chemistry, University of Wisconsin-Superior, 1978

Academic experience
Utah State University Professor, 2000 – Present, full-time
Utah State University, Associate Professor, 1990 - 2000, full-time
Utah State University, Assistant Professor, 1985 – 1990, full-time

Non-academic experience
Senior Environmental Chemist, Lilly Research Laboratories, A Division of Eli Lilly and
Company, P.O. Box 708, Greenfield, IN 46140
Research Specialist, EPA Environmental Research Laboratory, Duluth, MN. (Cooperative
project with University of Wisconsin, Superior).
Research Assistant, EPA Environmental Research Laboratory, Duluth, MN. (Cooperative
project with University of Wisconsin, Superior).

Certifications or professional registrations
OSHA 50 hour Emergency Responder Train-the-Trainer Course

Current membership in professional organizations
American Chemical Society, Environmental Chemistry Division
Society of Environmental Toxicology and Chemistry
International Phytotechnology Society
Association for Environmental Health Sciences Foundation

Honors and awards - none

Service activities
At USU: Promotion and Tenure Committees (7), EHS search committee
Professional service: Environmental Chemistry Editor, Environmental Toxicology and
Chemistry (9/1999-present), reviewer for journals/proposals

Most important publications and presentations from the past five years
• Perez, D. J., Menone, M, Doucette, WJ. Root to shoot transfer and distribution of endosulfan
in the wetland macrophyte Bidens laevis L. Environ. Toxicol. Chem. (Accepted 9/1/13)
Volatilization of Trichloroethylene from Trees and Soil: Measurement and Scaling
• Doucette, WJ, McNeill, LS, Mendenhall, S, Hancock, PV, Wells, JE, Thackeray, KJ, Gosen,
DP. 2013. The sky is falling: Chemical characterization and corrosion evaluation of
deposition produced during the static testing of solid rocket motors. Sci. Total Environ.
Recent professional development activities

Workshop on plant uptake of pesticides in FOCUS leaching models for the pesticide registration process in the EU. September 2, 2013, University of York
Guest Instructor. Modeling of Plant Uptake (Course #12906), Technical University of Denmark (DTU), June 17-21, 2013 in Lyngby, DK
Organized and Chaired session entitled "Contaminant transfer into plants-risk, remediation and biomonitoring" at the 33nd Annual Meeting of the Society of Environmental Toxicology and Chemistry. Long Beach, CA, Nov 11-15, 2012


Greenwood, M, Sims, RC, Mclean, JE, Doucette, WJ, Kuhn, J. 2007. Sorption of Methyl tert-Butyl Ether (MTBE) and tert-Butyl Alcohol (TBA) to Hyporheic Zone Soils. Soil and Sediment Contamination. 16:423-431.
R. Ryan Dupont

Education
PhD, Environmental Health Engineering, University of Kansas, Lawrence, 1982
M.S., Environmental Health Engineering, University of Kansas, Lawrence, 1979
B.S., Civil Engineering, University of Kansas, Lawrence, 1977

Academic experience
Utah State University, Full Professor w/Tenure, 1995 – present, full time
Utah State University, Associate Professor w/Tenure, 1988 – 1995, full time
Utah State University, Assistant Professor, 1985 – 1988, full time
Utah State University, Research Assistant Professor, 1982 – 1985, full time

Non-academic experience
RT Sprague Consulting, LLC, Louisville, CO, 2013-present, part time consulting
Civil Science, Lehi, Utah, 2012-present, part time consulting
WesTech Engineers, Salt Lake City, Utah, 2007-present, part time consulting

Certifications or professional registrations – EIT

Current membership in professional organizations
Engineers Without Borders (EWB)
American Society of Civil Engineers (ASCE)
Air and Waste Management Association (AWMA)
Water Environment Federation (WEF)
American Society of Engineering Educators (ASEE)
Solid Waste Association of North America (SWANA)
Government Refuse Collection and Disposal Association (GRCDA)

Honors and awards
Undergraduate Research Mentor, College of Engineering, 2009

Service activities
At USU: Promotion and Tenure Committees (5), Faculty co-advisor for WEAU Wastewater Design Team, Faculty Mexico Team advisor for Engineers Without Borders, Engineering State, Outreach for Environmental Engineering Division, University General Education Committee Science Subcommittee Chair, University Sustainability Council Member.
State and Community service: Salt Lake County Solid Waste Management Council Member, Cache County Solid Waste Advisory Board Member, Utah Solid and Hazardous Waste Control Board (2007 to 2013), Jordan River TMDL Advisory Committee Member
Most important publications and presentations from the past 5 years


Recent professional development activities

Engineering Faculty Engagement in Learning Through Service (LTS) workshop, Aug 2012
Randal S. Martin

Education
PhD, Civil and Environmental Engineering, Washington State University, 1992
M.S., Civil and Environmental Engineering, Washington State University, 1989
B.S., Environmental Engineering, Montana Inst. of Mining and Technology (MT Tech), 1982

Academic experience
Utah State University, Associate Research Professor, 2000 – Present, full-time
Utah State University, Associate/Assistant Professor, 1992 – 2000, full-time

Non-academic experience
Southern Research Institute, Environmental Engineer, 1982-1987

Certifications or professional registrations
EIT-Montana

Current membership in professional organizations
Air and Waste Management Association
  Chair, Higher Education Division (2003-2007)
  Vice-Chair, Higher Education Division (2001-2003; 2007- 2010)
  Chair, Scholarship Awards Committee (1996-2001)
  Chair, Student Affairs Committee (2000-2002)
American Geophysical Union
American Society of Agricultural & Biological Engineers
Association of Environmental Engineering and Science Professors
American Chemical Society
Engineers Without Borders

Honors and awards
2007 Utah State University: Outstanding Engaged Scholar, Utah Campus Compact

Service activities
At USU: Transportation Sustainability Committee, Faculty mentor for Engineers without Borders (EWB), Faculty advisor for Engineers Without Borders, Invited Speaker Science Unwrapped (Sept. 2013)

Professional service: AWMA, Higher Education Committee (Chair and Vice Chair), AWMA Student Affairs Committee (Chair), AWMA Scholarship Selection Committee, AGU International Meeting Session Organizer and Chair, reviewer for journals/proposals
Most important publications and presentations from the past five years


Recent professional development activities

None
Michael J. McFarland

Education

Academic experience
Utah State University, Associate Professor 1993-2013, full-time

Non-Academic experience
US Environmental Protection Agency, Special Government Employee Member of Science Advisory Board, 1998-2008, part-time

Certifications or professional organizations
Board Certified Environmental Engineer (BCEE)
American Academy of Environmental Engineers (92-10025)
Professional Engineering License – State of Utah 0883109730
Wastewater Treatment Operator – Grade IV, State of Utah 1738E05154
Water Treatment Operator – Grade IV, State of Utah 934537
Certified Visible Emissions Evaluator – Federal Ref. Methods 9 and 22 – 28070

Current membership in professional organizations
American Academy of Environmental Engineers
Water Environment Federation
Water Environment Association of Utah

Honors and awards
Engineering Educator of the Year – Great Basin Division

Service activities
Water Environment Association of Utah – Board of Directors (2013 – Present)
State of Utah Biosolids Technical Committee (2011 –Present)

Important publications/presentations of last five years

2013 “Protecting Groundwater Resources at Biosolids Recycling Sites” Journal of Environmental Quality

2013 “Electrocoagulation treatment of Metal Finishing Wastewater” Water Environment Research Journal

2012 “Chemical Treatment of Chelated Metal Finishing Wastes” Water Environment Research Journal
2012 “Groundwater Quality Protection at Biosolids Land Application Sites” Water Research

Recent professional development activities
Water Environment Association of Utah – Biosolids Land Applier Certification, Examination Instructor
Joan E. McLean

Education
M.S., Soil Chemistry, University of California Davis, 1978
B.S., Chemistry, University of San Francisco, 1975

Academic experience
Utah State University, Research Associate Professor, 2002 – Present, full-time
Utah State University, Research Assistant Professor, 1994-2002, full-time

Non-academic experience – none

Certifications or professional registrations – none

Current membership in professional organizations
American Chemical Society
Soil Science Society of America

Honors and awards - none

Service activities
At USU:  Chair USU Chemical Hygiene Committee, Member Campus Safety Committee

Professional service: Reviewer for journals/proposals

Most important publications and presentations from the past five years


Presentations


**Recent professional development activities** - none
Laurie S. McNeill

Education
PhD, Civil Engineering, Virginia Polytechnic Institute and State University, 2000
M.S., Civil Engineering, University of Colorado at Boulder, 1996
B.S., Chemical Engineering, Univ. of Colorado at Boulder, 1994

Academic experience
An-Najah National University (Palestine), Visiting Professor, 2007 – 2008, full-time
Utah State University, Associate Professor, 2006 – Present, full-time
Utah State University, Assistant Professor, 2000 – 2006, full-time

Non-academic experience – none

Certifications or professional registrations – EIT

Current membership in professional organizations
Engineers Without Borders (EWB)
American Society of Civil Engineers (ASCE)
American Water Works Association (AWWA)
Association of Environmental Engineering and Science Professors (AEESP)
American Society for Engineering Education (ASEE)

Honors and awards
2013 Utah State University: Outstanding Faculty Advisor (Robins Award)
2011 Virginia Tech – College of Engineering: Outstanding Young Alumna
2010 Carnegie Foundation for the Advancement of Teaching: Utah Professor of the Year
2009 Utah State University – CEE Department: Outstanding Faculty Advisor
2007 Utah State University: Eldon J. Gardner Teacher of the Year Award (Robins Award)

Service activities
At USU: Promotion and Tenure Committees (6), Goldwater Selection Committee, Faculty
Search Committees (2), Carnegie Professor of the Year Selection Committee, University
Libraries Advisory Council, Engineering Undergraduate Research Program (EURP)
Committee, Faculty advisor for Society of Environmental Engineering Students (SEES),
Faculty co-advisor for WEAU Wastewater Design Team, Undergraduate Research and
Creative Opportunities (URCO) Program Proposal Reviewer, ABET Committee chair, Faculty
advisor for Engineers Without Borders, Engineering State, Outreach for Environmental
Engineering Division, USU New Faculty Teaching Academy, Office of Global Engagement
Global Academy Program, Honors in Engineering committee

Professional service: State of UT Drinking Water Board, Water Research Foundation
Technical Advisory Committee, AWWA University Student Activities Committee, AWWA
Intermountain Section Research and Student Activities Committee, reviewer for
journals/proposals
Most important publications and presentations from the past five years


Recent professional development activities

ABET Symposium, Portland OR, April 2013
EWB Training Workshop, Boulder CO, October 2012
Engineering Faculty Engagement in Learning Through Service (LTS) workshop, Aug 2012
Bethany T. Neilson

**Education**
Ph.D., Civil and Environmental Engineering, Utah State University, 2006  
M.S., Civil and Environmental Engineering, Utah State University, 2001  
B.S., Environmental Engineering, Utah State University, 1998

**Academic experience**
Utah State University, Civil and Environmental Engineering, Assistant Professor, 2008-Current, Full Time.  
Utah State University, Civil and Environmental Engineering, Research Assistant Professor, 2006-2007, Full Time.  
Tufts University, Civil and Environmental Engineering, Research Scientist, Summer 2002, Full time.  
Utah State University, Civil and Environmental Engineering, Research Technician, 1998-2000, Full Time.

**Non-academic experience** – none

**Certifications or professional registrations** – EIT

**Current membership in professional organizations**
American Geophysical Union – 2006-current  
American Water Resources Association – 2006-current  
American Society for Engineering Education - 2009 - current  
American Society of Limnology and Oceanography - 2010 - current  
Geological Society of America - 2011-current  
American Society of Civil Engineers- 2012-current

**Honors and awards**
USU Civil and Environmental Engineering Researcher of the Year Award 2012-2013  
Recipient of “2007 UCOWR Ph.D. Dissertation Award in Natural Sciences and Engineering”  
Outstanding Student Paper - AGU Fall Conference 2005  
Graduate Assistance in Areas of National Need (GAANN) Fellowship 2003-2006  
USU Graduate Research Assistantship 1998-2001

**Service activities**
At USU:  
2013, CEE Graduate Affairs Committee Member  
2012, Dec -Mar 2013 CEE Faculty Search Committee Member  
2011, April- Research Engineer Search Committee  
2009-2011 - Senior Exit Interviews

Professional service:  
2012 – Current – Utah State University Ecology Center Associate
2008 – Current – Universities Council on Water Resources (UCOWR) Delegate
2007-Current - American Geophysical Union Water Quality Technical Committee
2009-2010 Salt Lake County Watershed Modeling Advisory Committee
2009-2012 Jordan River Technical Advisory Committee

Most important publications and presentations from the past five years


Recent professional development activities
National Science Foundation Arctic Field Training, Logan, UT, 2013.
Proposal Writing Institute, Logan, UT, 2012.
Write Winning Grants Workshop, Logan, UT, 2011.
Region 8 Nutrient Criteria Workshop, Salt Lake City, UT, 2011.
NSF Regional Workshop, Salt Lake City, UT, 2010.
David K. Stevens

Education
Ph.D., Civil and Environmental Engineering, University of Wisconsin-Madison, 1983.
B.S., Civil Engineering, Tufts University, 1976.
Summer Institute in Water Pollution Control, 1981 - Manhattan College, Bronx, NY

Academic experience
2001-Present: Professor, Utah State University, Logan, UT.
2009: Visiting Erskine Fellow, University of Canterbury, Christchurch, New Zealand.
1995: Visiting Professor, University of New Hampshire, Durham, NH.
1990-2001: Associate Professor, Utah State University, Logan, UT.
1986-1990: Assistant Professor, Utah State University, Logan, UT.

Non-academic experience
1984-1986: Postdoctoral Research Associate, University of Cincinnati, Cincinnati, OH.
1976-1978: Irrigation Engineer, Dept. of Irrigation and Drainage, Melaka, Malaysia.

Certifications or professional registrations
EIT – Massachusetts, 1976
PE – Ohio, 1985-Present

Current membership in professional organizations
Water Environment Federation (WEF)
Universities Council on Water Resources (UCOWR)
Engineers Without Borders

Honors and awards
USU Awards

Department of Civil and Environmental Engineering
Researcher of the Year (2x)
Advisor of the Year

College of Engineering
Researcher of the Year

Service activities
At USU: Promotion Committees (many), Faculty Search Committees (2), Graduate Student Committees (many), Faculty mentor for Engineers without Borders (EWB), ABET Committee chair, Faculty Senate, Faculty Senate Professional Responsibilities and Practices Committee, Environmental Engineering Division Head

Most important publications and presentations from the past five years

Publications

Presentations

Recent professional development activities - none
Civil Engineering Faculty
(who contribute to the EnvE program)
Joseph Anthony Caliendo

Education
PhD, Civil and Environmental Engineering, Utah State University, 1986
M.S., Civil and Environmental Engineering, Utah State University, 1977
B.S., Oceanography, Humboldt State University, 1974
B.S., Civil Engineering, University of Detroit, 1969

Academic experience
Utah State University, Associate Professor, 1992 - present, full-time
University of Florida, Visiting Professor (Sabbatical) 2003 - 2004
University of Florida, Adjunct Professor, 1986 - 1992
Florida State University, Adjunct Professor, 1986 - 1992

Non-academic experience
Florida Department of Transportation, State Geotechnical Engineer 1986 – 1992
Veteran, United States Navy Seabees – Diver/Engineer, Underwater Construction Team II

Certifications or professional registrations
PE, Florida, Virginia

Current membership in professional organizations
Fellow, American Society of Civil Engineers (ASCE)
Pile Driving Contractor’s Association (PDCA) – Technical Member
Association of Drilled Shaft Contractors (ADSC) – Technical Member

Honors and awards
CEE Department - Outstanding Teacher Award - 2013, 2009, 2008
Elected to Fellow status – American Society of Civil Engineers 2013
Presidential Award for Distinguished Service, Pile Driving Contractor’s Association 2013
Tau Beta Pi Eminent Engineer, Florida alpha, 1988

Service activities
At USU: Promotion Committees, Faculty Search Committees, Utah State University ASCE student chapter support, Fundamentals of Engineering – review sessions, Faculty Senate, numerous graduate committees, unofficial student liaison for pertinent employment with industry.

Most important recent publications and presentations


Recent professional development activities

Certified Instructor for National Highway Institute 1992 - present. Instructor for the following courses which are presented to numerous State Departments of Transportation Engineers and Technicians. These courses are taught several times each year nationwide.

NHI Course 130221, “Driven Pile Foundations - Design and Construction”, 4 day course
NHI Course 130222, “Driven Pile Foundations - Construction Monitoring”, 2 day course
NHI Course 132070, “Drilled Shaft Inspector’s Qualification Course”, 2.5 day course

Instructor for American Society of Civil Engineers Continuing Education Program 1998 - present: “Deep Foundations: Design, Construction & Quality Control”. This two day course is taught two times a year nationwide to industry and government professionals. Topics include: subsurface Investigation, Pile / Drilled Shaft Capacity, Wave Equation Analysis, Load Testing, Dynamic Testing, Construction Specifications.

Organize and host a 5 day event for invited Geotechnical faculty across the nation, Professor’s Driven Pile Institute (PDPI) which is funded by the Pile Driving Contractor’s Association. This consists of classroom lectures, computer demonstrations, and field events including pile driving and pile load tests. Offered in: 2002, 2003, 2005, 2007, 2009, 2011, 2013. The PDCA has made a permanent commitment to USU by donating the materials and labor associated with the construction of a full scale load frame (estimate value, $100,000) on University property west of the main campus.
Richard C. Peralta

**Education**

B.S., Chemistry, University of South Carolina, 1971  
M.S., Ag. & Irrigation Engr., Utah State University, 1976  
Ph.D, Ag. (Water) Engr., Oklahoma State University, 1979

**Academic experience**

- Utah State University, Full Professor, 1993-current, full time  
- Utah State University Research Foundation, Director, Water Dynamics Laboratory, 2003-2005, full time  
- Utah State University, Interim Head, Dept. of Biological and Irrigation Eng., 2002-2003, full time  
- Utah State University, Associate Professor 1988-1993, full time  
- University of Arkansas, Assistant/Associate Professor, 1980 – 1988

**Non-academic experience**

- U.S. Air Force Reserve, Bioenvironmental Engineer (retired as Colonel), 1979 – 2005, part time  
- U.S. Geological Society, IPA Hydrologist, 1985-1987, part time  
- U.S. Air Force Reserve, IPA Engineer, 1985-1987, part time  
- Several organizations, Consulting Engineer, 1986-2008, part time

**Certifications or professional registrations**

- Registered Professional Engineer in Arkansas  
- Registered Professional Engineer in Utah

**Current membership in professional organizations**

- American Geophysical Union  
- American Society of Agricultural and Biological Engineers  
- American Society of Civil Engineers  
- National Ground Water Scientists Association  
- Society of Hispanic Professional Engineers

**Honors and awards**

- Nominated for Julian Hinds Award, American Society of Civil Engineers, 2012 and 2013  
- Fellow American Society of Civil Engineers, 2012  
- Outstanding Researcher Award for Col. of Eng., 1998  
- Outstanding Young Man of Amer.: 1981, 84, 85, 90.  
- 2000 Notable American Men, 1994 (2nd Ed.)  
Service activities
At USU:
2011-2013 Professional Responsibilities and Procedures Committee (PRPC)
2013 Runoff Conference Session Chair
2013 Engineers without Borders Mentor in US and Peru
2012-2013 Mentoring, judging, and presenting at annual Society of Hispanic Professional Engineers conference in Fort Worth
2012-2013 Reviewer of proposals to Agricultural Experiment Station

Professional service:
Secretary of ASCE/EWRI Groundwater Management Committee;
Control Member of ASCE/EWRI International Council;
Member of ASCE/EWRI Environmental and Water Resources Systems Committee

Most important publications and presentations from the past five years

Recent professional development activities
• One day workshop on hydrofracking at ASCE/EWRI conference in May 2013.
William J. Rahmeyer

Education
PhD, Civil and Environmental Engineering, Colorado State University, 1980
M.S., Civil and Environmental Engineering, Colorado State University, 1975
B.C.E, Civil and Environmental Engineering, Colorado State University, 1973

Academic experience
Director of the Hydro Composite Modeling Laboratory at Utah State University, 2012-Present, full-time
Utah State University, Department Head of Civil and Environmental Engineering, 2005 – 2012, full-time
Utah State University, Professor, 1994 – Present, full-time
Utah State University, Associate Professor, 1988-1994, full-time
Utah State University, Assistant Professor, 1986-1988, full-time
Colorado State University, Assistant Research Professor, 1980-1986, full-time

Non-academic experience
Fluor Engineers, Project Engineer, 1975-1977, full-time

Certifications or professional registrations
PE-Colorado

Current membership in professional organizations
American Society of Civil Engineers (ASCE)
International Association of Hydro-Environmental Engineering Research (IAHR)
Transportation Research Board (TRB)
American Water Works Association (AWWA)
American Society of Engineering Educators (ASEE)
Association of Dam Safety Officials (ASDSO)

Honors and awards
2005 AHRAE Technical / Symposium Paper Award, the ASHRAE Crosby Field Award for Research
2007 South Pacific Division Regional Project Delivery Team Award from the U.S. Army Corps of Engineers
2011 ACEC of Idaho Engineering Excellence Grand Award for the I-84 New York Canal Modeling and Modification
2012 Idaho Transportation Department Excellence in Transportation Award
2012 National AECE Honorable Mention in Transportation Research

Service activities
At USU: Department Head (2005-2012), Co-Faculty advisor for the Student Chapter of ASCE

Professional service: Board of Directors for the Utah Floodplain and Storm Water Management Association, ASCE Committee on the Academic Prerequisites for Professional
Most important publications and presentations from the past five years

- “Composite Modeling of the Success Dam Spillway; Lessons Learned”, ASDSO 2010 Annual Conference, Seattle Washington, (Savage, Rahmeyer, Barfuss, and Graff).
- “Water Systems - Piping Components”, ASHRAE Short Course, St. Louis, January 2010 (Rahmeyer and Hegberg).

Recent professional development activities – none
David G. Tarboton

Education
Sc.D. Civil Engineering, Massachusetts Inst. of Technology, 1989
M.S. Civil Engineering, Massachusetts Inst. of Technology, 1987
B.S. Civil Engineering, University of Natal, Durban, South Africa, 1981

Academic experience
Utah State University, Assistant, then associate, then full professor, 1990-2014. Associate department head, 2013-.

Non-academic experience

Certifications or professional registrations
Professional Engineer, Utah

Current membership in professional organizations
American Society of Civil Engineers, Member
American Geophysical Union
American Water Resources Association

Honors and awards
Utah State University Civil and Environmental Engineering Department Outstanding Researcher 2001-2002.

Service activities
At USU:
Organizer and Committee Chair for USU Spring Runoff Conference, April 9-10, 2013
Panelist for USU Research Week Panel on NSF opportunities, April 6, 2012.
Member of Utah State University Graduate Program Review Task Force 2011-2012.

Professional service:
http://www.awra.org/proceedings/Spring2012/committee.html
Most important publications and presentations from the past five years


"Simulated watershed responses to land cover changes using the Regional Hydro-Ecological Simulation System (RHESSYS)," Mohammed, I. N. and D. G. Tarboton, (2013), Hydrological Processes, (Early view online), http://dx.doi.org/10.1002/hyp.9963.


Recent professional development activities

Blake P. Tullis

Education
PhD, Civil and Environmental Engineering, University of Michigan, 1996
M.S., Civil and Environmental Engineering, University of Michigan, 1992
B.S., Civil and Environmental Engineering, Utah State University, 1990

Academic experience
École Polytechnique Fédérale de Lausanne (EPFL), Switzerland, Visiting Professor, 2012
Utah State University, Associate Professor, 2008 – Present, full-time
Utah State University, Assistant Professor, 2002 – 2008, full-time
Utah State University, Research Assistant Professor, 1997-2002, full-time

Non-academic experience
ENSR, Project Engineer, 1996-1997, full-time

Certifications or professional registrations
EIT-Utah

Current membership in professional organizations
American Society of Civil Engineers (ASCE)
International Association of Hydro-Environmental Engineering Research (IAHR)
Transportation Research Board (TRB)
ASTM International

Honors and awards
2013 Utah State University-College of Engineering: Outstanding Undergrad. Research Advisor
2010 Utah State University-CEE Department: Outstanding Graduate Advisor

Service activities
At USU: Promotion Committees (1), Faculty Search Committees (1), Utah State University Undergraduate Research Program (URP) Committee, Faculty mentor for Engineers without Borders (EWB), ABET Committee chair, Faculty advisor for Engineers Without Borders, Faculty Senate, Faculty Senate Executive Committee, Budget and Faculty Welfare Committee (University), Calendar Committee (University)

Professional service: EWRI-ASCE Hydraulic Structure Committee (Chair), IAHR Hydraulic Structure Committee, TRB Committee, Organizer of the 4th International Junior Researcher and Engineer Workshop on Hydraulic Structures (IAHR), ASTM Erosion Control Committee, reviewer for journals/proposals
Most important publications and presentations from the past five years


Recent professional development activities
ABET Symposium, Portland OR, April 2013
Gilberto E. Urroz, Ph.D., P.E.

Education
- B.S., Civil Engineering, Universidad Nacional Autonoma de Nicaragua, 1980
- M.S., Civil and Environmental Engineering, The University of Iowa, 1982
- Ph.D., Civil and Environmental Engineering, The University of Iowa, 1988

Academic experience
- Utah State University, Associate Professor, Head of Water Engineering Division, 2008 to present, full time
- Utah State University, Associate Professor, 1994 to present, full time
- Utah State University, Assistant Professor, 1988 to 1994, full time
- The University of Iowa – Institute of Hydraulic Research, Graduate Research Assistant, 1983 to 1988, half time
- Universidad Nacional Autonoma de Nicaragua, Instructor, 1980 to 1983

Non-academic experience
- Nicaragua’s Ministry of Construction and Transportation – Division of Planning, computer programmer, producing FORTRAN programs for data processing and numerical simulation, 1979-1980

Certifications or professional registrations
- State of Utah Professional Engineer – 1991 to present

Current membership in professional organizations
- American Society of Civil Engineers, member
- Society of Hispanic Professional Engineers, lifetime member
- Tau Beta Pi (the Engineering Honor Society), member

Honors and awards
- CEE Outstanding Adviser, 2011-2012
- College of Engineering’s Advising Excellence award, 2012

Service activities
At USU:
- USU Student Chapter Adviser, American Society of Civil Engineers, since 2006
- USU Student Chapter Adviser, Society of Hispanic Professional Engineers, since 2009
- USU Student Chapter Adviser – Utah Gamma Chapter, Tau Beta Pi (The Engineering Honor Society), since 2007

Professional service:
- American Society of Civil Engineers – Rocky Mountain Section, 2013 Student Conference, Utah State University
Most important publications and presentations from the past five years

- Tau Beta Pi’s Lecture: Mastering Your Calculator (Fall 2009)
- Tau Beta Pi’s Lecture on Maple and Maxima (Fall 2009)
- CEE 3510 Hydraulics - A Course Reader, 2012, Utah State University
- CEE 3510 Hydraulics Laboratory Guide, 2012, Utah State University

Recent professional development activities

- CUAHSI (Consortium of Universities for the Advancement of Hydrologic Science) Software Carpentry Bootcamp – a short course, July 2013, Utah State University
- Writing Winning Grant Proposals – a short course, September 2013, Utah State University
Appendix C – Equipment Used in Support of Instruction
Environmental Teaching Laboratory

The Environmental Teaching laboratory is located on the second floor of the Engineering Laboratory (ENLAB) building and occupies about 1600 square feet of floor space. The lab is used for courses in Environmental Quality Analysis (CEE 5610), Environmental Microbiology (CEE 2620), and Hazardous Chemicals Handling and Safety (CEE 5670). A significant amount of additional environmental, field, and analytical equipment (not included in Table C-1) is available at the Utah Water Research Laboratory, and a variety of Upper Division and Senior Design course experiences are provided through access to this equipment.

### Table C-1: Environmental Teaching Laboratory Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisher Scientific balance</td>
<td>1</td>
<td>4 place digital balance</td>
</tr>
<tr>
<td>Millipore SuperQ water system</td>
<td>1</td>
<td>18-MΩ Ultra-pure water system</td>
</tr>
<tr>
<td>Hanna Instruments pH/EC/TDS meters</td>
<td>4</td>
<td>Handheld meter to measure pH, EC, TDS, and temperature</td>
</tr>
<tr>
<td>Corning 313 pH meters and pH probes</td>
<td>4</td>
<td>Handheld meter to measure pH and temperature</td>
</tr>
<tr>
<td>Fisher Scientific FS60H Sonicator/water bath</td>
<td>1</td>
<td>Sonicating water bath</td>
</tr>
<tr>
<td>Hach Digital Titrator</td>
<td>3</td>
<td>Measures alkalinity 10 – 4000 mg/L as CaCO₃</td>
</tr>
<tr>
<td>Leica Galen III microscopes</td>
<td>3</td>
<td>Microscope with 4x, 10x, 40x, 100x objectives and 2x3” slides</td>
</tr>
<tr>
<td>Stalker Pro radar gun</td>
<td>1</td>
<td>For measuring car velocities during air quality field measurement lab</td>
</tr>
<tr>
<td>Thermo Scientific Orion Star A223 DO meter and probe</td>
<td>2</td>
<td>Portable DO meter and probe (6 m cable)</td>
</tr>
<tr>
<td>HACH dissolved oxygen field kits</td>
<td>2</td>
<td>Measures dissolved oxygen</td>
</tr>
<tr>
<td>Precision Scientific 815 incubator</td>
<td>1</td>
<td>-10°C to +50°C incubator, 20 ft³ capacity</td>
</tr>
<tr>
<td>Milton Roy Spectronic 21</td>
<td>8</td>
<td>320 – 1000 nm analog spectrometers</td>
</tr>
<tr>
<td>Hach DR2010 field spectrometer</td>
<td>1</td>
<td>Measures 240 different water quality parameters</td>
</tr>
<tr>
<td>Hach DR2800 field spectrometers</td>
<td>1</td>
<td>Measures 240 different water quality parameters</td>
</tr>
<tr>
<td>Hach 2100Q portable turbidimeter</td>
<td>1</td>
<td>0 – 1000 NTU turbidimeter</td>
</tr>
<tr>
<td>Kemmerer samplers</td>
<td>3</td>
<td>For obtaining field samples</td>
</tr>
<tr>
<td>BODTrac II respirometer</td>
<td>1</td>
<td>Measures real-time BOD simultaneously in 6 samples</td>
</tr>
<tr>
<td>6-place paddle stirrer</td>
<td>5</td>
<td>Jar tests for coagulation and softening experiments</td>
</tr>
<tr>
<td>Heating plates, shakers</td>
<td>multiple</td>
<td>General lab use</td>
</tr>
<tr>
<td>Burets, pipets, beakers, flasks, sampling bottles</td>
<td>multiple</td>
<td>General lab use</td>
</tr>
</tbody>
</table>
Surveying Laboratory

The Surveying laboratory is located on the first floor of the ENLAB building and occupies about 500 square feet of floor space. The laboratory is used primarily to store and distribute surveying equipment for the undergraduate surveying course (Table C-2).

Table C-2: Surveying Laboratory Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Levels</td>
<td>10</td>
<td>Mostly automatic levels several dumpy levels</td>
</tr>
<tr>
<td>Theodolites</td>
<td>8</td>
<td>30 minute to 3 second precision</td>
</tr>
<tr>
<td>Total Stations</td>
<td>4</td>
<td>5 second precision, with charging units</td>
</tr>
<tr>
<td>Engineering Transits</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Philadelphia Rods</td>
<td>12</td>
<td>Extendible to 13.5 ft</td>
</tr>
<tr>
<td>100 ft Steel Tapes</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>GPS Units</td>
<td>5</td>
<td>4 rover units and one base unit</td>
</tr>
<tr>
<td>Tripods</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
Hydraulics Laboratory

The Hydraulics laboratory is located on the first floor of the ENLAB building and occupies about 1600 square feet of floor space. The laboratory is used by several courses and is shared with other departments. The laboratory includes a basement area used for vertical pumps and recirculation water sumps. Activities in the undergraduate laboratory are supplemented by research projects (equipment not listed Table C-3) in the Hydraulics Lab that is located in the Utah Water Research Laboratory (UWRL). Students take several field trips to the UWRL for hydraulic and fluid mechanics demonstrations.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armfield re-circulating hydraulics benches</td>
<td>2</td>
<td>Self-contained, recirculating, pump-and-tank bench for tests.</td>
</tr>
<tr>
<td>Armfield weir experiments</td>
<td>2</td>
<td>Experiments on open channel flow measurement and flow depth measurement</td>
</tr>
<tr>
<td>Serial and parallel pumps</td>
<td>1</td>
<td>Demonstrates characteristics of pumps in series and parallel applications</td>
</tr>
<tr>
<td>Laminar and turbulent flow experiment</td>
<td>1</td>
<td>Demonstrates measurement of Reynold’s number, use of manometers and pressure transducers, and friction loss</td>
</tr>
<tr>
<td>Variable slope flume, 12 inch wide by 24 ft long</td>
<td>1</td>
<td>Laboratory flume for tests on open-channel flow.</td>
</tr>
<tr>
<td>Soil liquefaction tank</td>
<td>1</td>
<td>Demonstrates the principles of soil liquefaction and seismic interaction.</td>
</tr>
<tr>
<td>6 inch magnetic flow meter</td>
<td>1</td>
<td>State-of-the-art flow metering technology.</td>
</tr>
<tr>
<td>4 inch venture flow meter</td>
<td>1</td>
<td>Flow meter used to demonstrate pressure differential flow measurement</td>
</tr>
<tr>
<td>½ inch, 24 ft long copper pipe apparatus</td>
<td>1</td>
<td>Experiments on friction loss in closed conduit flow</td>
</tr>
<tr>
<td>Weight-tank and scale</td>
<td>1</td>
<td>Used to provide primary flow measurement</td>
</tr>
<tr>
<td>Pump torque test setup</td>
<td>1</td>
<td>Used to determine pump efficiency, calculation of specific speed, and horsepower Used to experiment with culvert flow in the tilting flume with focus on inlet and outlet control.</td>
</tr>
<tr>
<td>Culvert test setup</td>
<td>1</td>
<td>Located at the UWRL to demonstrate physical modeling of hydraulic structures.</td>
</tr>
<tr>
<td>50 by 100 ft floor models</td>
<td>multiple</td>
<td>Located at the UWRL to demonstrate open channel flow, sediment transport, and channel resistance</td>
</tr>
<tr>
<td>3 ft, 4ft, and 8ft wide flumes</td>
<td>multiple</td>
<td>Located at the UWRL to demonstrate closed conduit flow, control valves, cavitation, and transients</td>
</tr>
</tbody>
</table>
Appendix D – Institutional Summary

1. The Institution
   a. Name and address of the institution:

   Utah State University
   4100 Old Main Hill
   Logan, UT 84322-4100

   b. Name and title of the chief executive officer of the institution:

   Stan L. Albrecht
   President

   c. Name and title of the person submitting the Self-Study Report:

   Christine E. Hailey
   Dean, College of Engineering
   4100 Old Main Hill
   Phone: 435-797-2776
   Fax: 435-797-2679

   d. Name the organizations by which the institution is now accredited, and the dates of the initial and most recent accreditation evaluations.

   USU is accredited by the Northwest Commission on Colleges and Universities (NWCCU). USU received initial accreditation in 1924 and accreditation was reaffirmed in February, 2012. Most of the degree programs on campus also have accreditation from their appropriate accreditation agencies.

2. Type of Control

   Utah State University is part of an eight institution state system of higher education governed by the Utah Board of Regents, the members of which are appointed by the Governor and confirmed by the Legislature. The university also has its own Board of Trustees. The president of the institution reports to the Board of Regents.

3. Educational Unit

   The College of Engineering is one of eight academic colleges at USU and it accounts for approximately 14% of the total university enrollment on the main campus. The College of Engineering has five engineering departments and one computer science department. Faculty members in College of Engineering teach graduate and undergraduate subjects and conduct research. The four engineering departments which house six different programs accredited by the Engineering Accreditation Commission of ABET are:
The fifth engineering department, Engineering Education, offers a doctoral degree in engineering education. The Engineering Education faculty members teach freshmen and sophomore engineering classes as well as doctoral-level engineering education courses and conduct research in engineering education.

The Computer Science Department houses one undergraduate program accredited by the Computer Accreditation Commission of ABET as well as a masters and doctoral graduate program in computer science.

Figure D-1 shows an organization chart for the engineering and computer science programs within the College of Engineering. Shown in Figures D-2 and D-3 are the positions of the College of Engineering relative to the Office of the Provost and the Office of the President, respectively. The names and titles of the administrative heads are included in the organization charts.
Figure D-1: Organizational chart for USU College of Engineering
OFFICE OF THE EXECUTIVE VICE PRESIDENT AND PROVOST

EXECUTIVE VICE PRESIDENT AND PROVOST
Noelle E. Cockett

EXECUTIVE SENIOR VICE PROVOST
Lauren H. Smith

DEANS

VICE PRESIDENTS

VICE PROVOST
Janis L. Boettiger

VICE PROVOST
Robert W. Wagner

VICE PROVOST
Travis R. Peterson

Senior Vice Provost
Ronda R. Menlove

Vice Provost
Mary S. Kusmush

Vice Provost
Nicholas E. Morrison

Interim Director
John S. Lowery

Director
Ann M. Austin

Director
David W. Feldon

Director
Stacy A. Sturgeon

Director
Michael J. Torrens

Source: USU Office of the Provost
Last updated 7/19/2013

Figure D-2: Organizational Chart for the Office of the Provost
Figure D-3: Organizational Chart for the Office of the President
4. Academic Support Units

Environmental Engineering students have a number of elective and required courses that place them in contact with other academic programs on the USU campus. The principal supporting programs and their department heads are listed below.

- Department of Biology (BIOL and PUBH): Alan Savitzky, Department Head
- Department of Chemistry and Biochemistry (CHEM): Alvan Hengge, Department Head
- Department of Mathematics and Statistics (MATH and STAT): D. Richard Cutler, Department Head
- Department of Physics (PHYS): Jan Sojka, Department Head
- Department of Plants, Soils, and Climate (PSC): Paul Johnson, Interim Department Head
- Department of Watershed Sciences (WATS): Chuck Hawkins, Interim Department Head

5. Non-academic Support Units

Environmental Engineering students are supported by a number of non-academic units on campus. The principal programs and their leadership are listed below.

- College of Engineering Advising Office, V. Dean Adams, Associate Dean for Undergraduate Affairs
  - Engineering Advisors: Kathy Bayn, Katherine Grover, Isobel Roskelley
  - Computer Science Advisor: Myra Cook
  - Retention Specialist: Kristina Glaittli
  - Staff Assistant: Sarah Wallace
  - Peer Tutors
  - Student Ambassadors

- Information Technology, Eric Hawley, Chief Information Officer
  - Computer Labs
  - Service Desk

- Merrill-Cazier Library, Richard Clement, Dean of Libraries
  - Pamela Martin, Subject Librarian

- Student Services, James Morales, Vice President
  - Health, Wellness, and Recreation, James Davis, Executive Director
    - Student Health and Wellness Center
    - Counseling and Psychological Services
    - Campus Recreation
    - Disability Resource Center
  - Student Involvement and Leadership, Linda Zimmerman, Executive Director
    - Student Involvement and Leadership Center
    - Access and Diversity Center
    - Student Sustainability
  - Student Success, Donna Crow, Executive Director
6. **Credit Unit**

Consistent with NWCCU standards, one credit is awarded for each three hours of student work per week during a 15-week semester. For traditional courses, this is interpreted as one 50-minute class period plus two hours of study per week per credit. One 50-minute period per week during a semester equals 12.5 contact hours per credit. One credit is awarded for each three hours of student laboratory participation per week.

7. **Tables**

Tables D-1 and D-2 summarize enrollment and graduation data for all degree levels in the Environmental and Civil Engineering programs, respectively. Note that graduate enrollment and degree totals are included as a total for both the Civil Engineering and Environmental Engineering programs, as shown in Table D-2. Table D-3 summarizes the faculty and staff head count for the Department of Civil and Environmental Engineering.
<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>Total Undergrad</th>
<th>Total Graduate*</th>
<th>Degrees Awarded*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Year</td>
<td>2013-2014</td>
<td>FT</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>14</td>
<td>-</td>
<td>35</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>2012-2013</td>
<td>FT</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>13</td>
<td>2</td>
<td>34</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2011-2012</td>
<td>FT</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>17</td>
<td>-</td>
<td>41</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2010-2011</td>
<td>FT</td>
<td>18</td>
<td>11</td>
<td>5</td>
<td>15</td>
<td>-</td>
<td>49</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2009-2010</td>
<td>FT</td>
<td>9</td>
<td>6</td>
<td>7</td>
<td>12</td>
<td>-</td>
<td>34</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PT</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

FT--full time
PT--part time

* Graduate enrollment and degrees awarded are included in the Civil Engineering total in Table D-1.2 (next page).
<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year</th>
<th>Total Undergrad</th>
<th>Total Graduate*</th>
<th>Degrees Awarded*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
<td></td>
<td></td>
<td>Associates Bachelors Masters Doctorates</td>
</tr>
<tr>
<td>Current Year</td>
<td>2013-2014</td>
<td>45 36 40 116 116</td>
<td>238 61</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td>5 8 5 17 0</td>
<td>35 48</td>
<td>47 37 6</td>
</tr>
<tr>
<td>1</td>
<td>2012-2013</td>
<td>42 32 48 103 1</td>
<td>226 73</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>FT</td>
<td>7 3 8 16 0</td>
<td>34 46</td>
<td>43 48 12</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td>5 7 5 6 0</td>
<td>23 55</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>2011-2012</td>
<td>35 48 48 105 2</td>
<td>238 81</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>FT</td>
<td>5 7 5 6 0</td>
<td>23 55</td>
<td>50 44 9</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td>4 3 7 13 -</td>
<td>27 54</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>2010-2011</td>
<td>54 41 44 130 -</td>
<td>269 74</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>FT</td>
<td>4 3 7 13 -</td>
<td>27 54</td>
<td>64 47 1</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td>9 6 3 12 -</td>
<td>30 39</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>2009-2010</td>
<td>54 42 57 130 -</td>
<td>283 59</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>FT</td>
<td>9 6 3 12 -</td>
<td>30 39</td>
<td>60 40 9</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td>5 8 5 17 0</td>
<td>35 48</td>
<td>47 37 6</td>
</tr>
</tbody>
</table>

FT--full time
PT--part time
* Graduate enrollment and degrees awarded include both Civil Engineering and Environmental Engineering
Table D-3: Personnel

Department of Civil and Environmental Engineering

Year¹: 2013

<table>
<thead>
<tr>
<th></th>
<th>HEAD COUNT</th>
<th>FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FT</td>
<td>PT</td>
</tr>
<tr>
<td>Administrative²</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Faculty (tenure-track)³</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>Other Faculty (excluding student Assistants)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Student Teaching Assistants⁴</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>Technicians/Specialists</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Office/Clerical Employees</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Others⁴</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Report data for the program being evaluated.

1. Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

2. Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

3. For faculty members, 1 FTE equals what your institution defines as a full-time load

4. For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc.

5. Specify any other category considered appropriate, or leave blank.
Signature Attesting to Compliance

By signing below, I attest to the following:

That the Environmental Engineering program has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET’s *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual*.

__________________________  ______________________
Christine E. Hailey        Date
Dean

__________________________  ______________________
Signature                    Date

June 20, 2014