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

July 1, 2014

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Table of Contents

BACKGROUND INFORMATION ........................................................................................................ 6
A. Contact Information .................................................................................................................. 6
B. Program History ..................................................................................................................... 6
C. Options .................................................................................................................................. 6
D. Program Delivery Modes ........................................................................................................ 7
E. Program Locations .................................................................................................................. 7
F. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them .................................................................................................................. 7

CRITERION 1. STUDENTS ........................................................................................................ 8
A. Student Admissions ................................................................................................................. 8
B. Evaluating Student Performance ........................................................................................... 9
C. Transfer Students and Transfer Courses .............................................................................. 10
D. Advising and Career Guidance ............................................................................................. 11
E. Work in Lieu of Courses ....................................................................................................... 16
F. Graduation Requirements ..................................................................................................... 16
G. Transcripts of Recent Graduates .......................................................................................... 17

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES ................................................... 18
A. Mission Statement .................................................................................................................... 18
B. Program Educational Objectives ........................................................................................... 18
C. Consistency of the Program Educational Objectives with the Mission of the Institution .. 19
D. Program Constituencies ......................................................................................................... 19
E. Process for Review of the Program Educational Objectives ................................................ 21

CRITERION 3. STUDENT OUTCOMES ................................................................................... 23
A. Student Outcomes .................................................................................................................. 23
B. Relationship of Student Outcomes to Program Educational Objectives ............................. 23

CRITERION 4. CONTINUOUS IMPROVEMENT .................................................................... 25
A. Student Outcomes .................................................................................................................. 25
B. Continuous Improvement ....................................................................................................... 39
C. Additional Information ......................................................................................................... 48

CRITERION 5. CURRICULUM .................................................................................................. 49
A. Program Curriculum ................................................................................................................. 49
B. Course Syllabi ......................................................................................................................... 57

CRITERION 6. FACULTY .......................................................................................................... 58
List of Figures

Figure 1-1. Civil Engineering BS Degree “Checklist” ................................................................. 13
Figure 4-1. Aggregated Assessment Results for CE Course Work ........................................... 34
Figure 4-2. Graphical results of exit interview ratings by outcomes and year ............................. 39
Figure 4-3. Student peer evaluations for CEE 3640 group projects ......................................... 46
Figure 4-4. Assessment data for cost-estimating homework problem ....................................... 47
Figure 5-1. Civil Engineering BS Degree Progression Flow Diagram ........................................ 55
Figure D-1. College of Engineering 216
Figure D-2. Office of the Provost ............................................................................................... 217
Figure D-3. Office of the President ............................................................................................. 218
Figure D-4. Program Enrollment and Degree Data ..................................................................... 221
Figure D-5. Personnel ............................................................................................................... 222

List of Tables

Table 1-1. Index Scores for Civil Engineering Freshmen and Transfer Students ....................... 8
Table 1-2. Index Scores for College of Engineering Freshmen and Transfer Students ............... 9
Table 1-3. Index Scores for College of Engineering Transfer Students .................................... 11
Table 2-1. Membership of the CEE Advisory Board ................................................................. 20
Table 3-1. Relationship Between PEOs and Student Outcomes .............................................. 23
Table 4-1. Evaluation Schedule for Program Student Outcome ................................................... 25
Table 4-2. Courses Used to Assess Student Outcomes (elective courses are shaded) .................. 26
Table 4-3. Senior Exit Interview Rubric for Student Outcome Self-Evaluation Questions ............ 29
Table 4-4. Student Outcome Assessment Data for CE Program ................................................ 30
Table 4-5. Aggregated Assessment Results of CE Course Work .................................................. 34
Table 4-6. CE Graduates who passed FE Exam vs. National Annual Pass Rate ......................... 37
Table 4-7. Summary of Student Self Evaluation of Student Outcome Attainment .................... 38
Table 5-1. Curriculum ................................................................................................................. 50
Table 5-2. Course-to-Student Outcome Mapping (elective courses are shaded) ......................... 53
Table 6-1. Faculty Qualifications ............................................................................................... 59
Table 6-2. Faculty Workload Summary ....................................................................................... 62
Table 7-1. Summary of Classroom Space used by the CEE Department .................................... 68
Table 9-1. CE courses that meet Program Criterion #1 ............................................................. 83
Table 9-2. CE courses that meet Program Criterion #2 .............................................................. 84
Table 9-3. CE courses that meet Program Criterion #3 .............................................................. 85
BACKGROUND INFORMATION

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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. The first civil engineering doctoral student graduated in 1965.

In 1995, the Civil and Environmental Department began offering an accredited Bachelor of Science degree specifically for Environmental Engineering. The Civil Engineering (CE) and Environmental Engineering (EnvE) programs within the department are academically interdependent; the EnvE curriculum includes CE courses and the CE curriculum includes EnvE courses. In 2011, the Department of Biological and Irrigation Engineering became the Department of Biological Engineering and the irrigation engineering faculty joined the Civil Engineering program. The most recent ABET review occurred in 2008.

The Civil and Environmental Engineering Department has 25 tenured or tenure-track faculty members (18 CE and 7 EnvE) and five research faculty. The department offers Bachelor of Science degrees in Civil Engineering and in Environmental Engineering. The department also offers Masters of Science, Masters of Engineering, and Doctoral degrees with graduate curriculums in the areas of Environmental, Geotechnical, Structures, Transportation, Water Resources and Hydrology, and Hydraulics and Fluid Mechanics.

C. Options
The Civil Engineering Program consists of a pre-professional (freshmen and sophomore years) program and a professional program (junior and senior years). The Civil Engineering program
consists of a single track that exposes students to six proficiencies areas of Civil Engineering: environmental, geotechnical, hydraulics, structural, transportation, and water engineering.

**D. Program Delivery Modes**

The Civil 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 Civil Engineering Program currently has one web-based technical elective course that is shared with the University of Texas at Austin. Department plans are 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 on the USU campus in Logan, Utah.

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

The Civil Engineering Department had no Deficiencies, Weaknesses, nor Concerns from the last ABET accreditation review (2008).
GENERAL CRITERIA

CRITERION 1. STUDENTS

A. Student Admissions
Utah State University and the Civil 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 (Table 1-1) and transfer students (Table 1-2) enrolled in the Civil Engineering Program for the past five years.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Index Score</th>
<th>Number of Freshmen Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>97</td>
<td>133</td>
</tr>
<tr>
<td>Fall 2012</td>
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<tr>
<td>Fall 2011</td>
<td>95</td>
<td>138</td>
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<tr>
<td>Fall 2010</td>
<td>92</td>
<td>136</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>93</td>
<td>134</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>90</td>
<td>132</td>
</tr>
</tbody>
</table>
Table 1-2. Index Scores for Civil Engineering Transfer Students

<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>
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<tr>
<td>Fall 2013</td>
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<tr>
<td>Fall 2012</td>
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<tr>
<td>Fall 2010</td>
<td>91</td>
<td>126</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>108</td>
<td>119</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>83</td>
<td>120</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 Civil 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 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 Civil 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 student at the end of each semester to detect any problems with student performance or progress. When necessary, warning letters are sent to the respective students and the Department Head and Associate Department Head in the Civil Engineering Program are notified. Students are asked to schedule a meeting with either the Department Head or the Associate Department Head to review past academic performance. The meeting is used to determine causes for poor academic performance and provide the student with resources to help improve future performance. The College of Engineering maintains a complete file on each student as he or she progresses through the program. The Civil Engineering Program maintains an abbreviated file for each student to assist in faculty mentoring and advising. Students have regular contact with program level advisors and faculty advisors.

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 are 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 Advisor addresses 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>97</td>
<td>133</td>
</tr>
<tr>
<td>Fall 2012</td>
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<tr>
<td>Fall 2011</td>
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<tr>
<td>Fall 2010</td>
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<td>136</td>
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<td>Fall 2009</td>
<td>93</td>
<td>134</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>83</td>
<td>132</td>
</tr>
</tbody>
</table>

**D. Advising and Career Guidance**

The Civil 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 the 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 a Civil 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 CE and EnvE programs. The role of this program undergraduate advisor is primarily related to reviewing programs of study for compliance with graduation requirements.
## Civil Engineering Bachelor of Science Degree Checklist

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

2013-2014 Catalog - 150 Credits Total

<table>
<thead>
<tr>
<th>Course</th>
<th>Crs</th>
<th>Grade</th>
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<th>Crs Pts</th>
<th>Subs</th>
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<td><strong>Total</strong></td>
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### General Ed. Courses (20-21 cr)

| Breadth (MI)            | 3   |       |      |         |      |
| Breadth (ICA)           | 3   |       |      |         |      |
| Breadth (SIS)           | 3   |       |      |         |      |
| Breadth (BSS)           | 3   |       |      |         |      |
| Depth (BFA)             | 3   |       |      |         |      |
| **Total**               |     |       |      |         |      |

### Basic Science (12 Cr)

| MATH 131*               | 4   |       |      |         |      |
| MATH 132*               | 4   |       |      |         |      |
| MATH 221*               | 4   |       |      |         |      |
| ENGR 205*               | 3   |       |      |         |      |
| CHEM 111*               | 4   |       |      |         |      |
| CHEM 112*               | 4   |       |      |         |      |
| PHYS 171*               | 4   |       |      |         |      |
| PHYS 221*               | 3   |       |      |         |      |
| **Total**               |     |       |      |         |      |

### Technical and Group II Electives (9 Cr)

| CEE 4080 A              | 3   |       |      |         |      |
| CEE 3100 A              | 3   |       |      |         |      |
| **Total**               |     |       |      |         |      |

### Pre Professional GPA = 2.3

Upper Division Eng/Math/Sci GPA = 3.0

Overall GPA = 3.0

### Additional Science or Engineering Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Crs</th>
<th>Grade</th>
<th>Date</th>
<th>Crs Pts</th>
<th>Subs</th>
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### Pre Professional

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<th>Course</th>
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<th>Subs</th>
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<tbody>
<tr>
<td><strong>Total</strong></td>
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</table>

### Figure 1-1. Civil Engineering BS Degree “Checklist”

**Student Name:**

**Advisor:** Kathy Hayes

**Date:** 01/17/14
There are four special cases, described below, where the advisors play a particularly important role in promoting quality in the Civil 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 of 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 as a rule 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 Civil Engineering Program. A detailed summary of these requirements are published in the on-line General Catalog (see Supplement 4). Occasionally when a student fails to meet these criteria, then the application for admission to the professional program is denied by an advisor. The advisors are not authorized to admit a student to the professional program that is not in good academic standing. A student thus rejected is invited to appeal, in writing, to the Associate Dean. The Associate Dean of 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 Civil 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 delegate within the program faculty and then to the Associate Dean of 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 a student is admitted into the Professional Program (section D2), the College of Engineering assigns each Civil Engineering student a faculty mentor. Students are encouraged to meet with their faculty mentor annual or 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 Undergraduate Research Program (optional program) interact very closely with faculty research mentors.

Students are also guided and mentored by fellow students through participation in the American Society of Civil Engineers (ASCE) student chapter at USU. The organization is student driven with a president, vice president, historian, and secretary; the club also has a primary faculty advisors (Gilberto Urroz). The marquee activities of the club include the student designed and constructed steel bridge and concrete canoe, which are used in competitions associated with the annual ASCE Rocky Mountain Regional Student Conference. Top-placing teams move on to compete at the ASCE National Student Conference. The steel bridge has gone to Nationals each year for six of the last seven years. The concrete canoe team has gone to Nationals the last three years, placing fifth overall in 2013).

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 design a civil engineering structure that features multi-disciplinary components (e.g., structural, hydraulic, geotechnical, environmental, and/or transportation). Each student team selects 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.

Civil Engineering students are also encouraged to do an 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. A Civil Engineering student can earn up to 3 credits toward their degree in Civil and Environmental Engineering by doing an internship. The purpose of an internship is to help a student learn industrial standards, standards of participation, responsibility, time management, critical thinking skills and effective communication skills. 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 work closely with their advisor, our College of Engineering internship coordinator, 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 o 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 Civil 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 Civil 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 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 Civil 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 Program Advisor, then reviewed first by the Department Head or designate, and then by the College 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 under the current assessment process. The graduation requirements for an individual student are those that are in place when he/she enters the 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 Civil Engineering.

**G. Transcripts of Recent Graduates**

The Civil 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 Civil Engineering Program are that within five years of graduation:

PEO 1: Graduates will be successfully employed in civil 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 civil engineering and will promote public health and safety.

PEO 3: Graduates will engage in life-long learning 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. Three Civil Engineering Program PEOs support USU’s mission: continuous learning, diversity of thought and culture, and successful careers.

PEO 1 focuses on a skill set specific to career success. Primary indicators of career “success” include a good knowledge of fundamental engineering principles, good problem-solving skills, effective written 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 Civil 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 civil engineering problems that extend beyond accurate engineering calculations and implementation of standard practices. Sound civil 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. One of the most valuable skills obtained during the pursuit of an academic degree is the ability to learn and apply information and skills related to your field of practice that you were not explicitly taught while in the academic program (i.e., life-long learning). Life-long learning skills are essential for keeping up with improvements in standard engineering practice and productivity tools (technology) as well as diversifying your 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 civil 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 civil engineering for graduates.
PEOs and the Needs of Faculty
Faculty needs relate to their teaching and research roles. All faculty members in the Civil 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; students often have the opportunity to work as teaching assistants or course graders as well as participate as research assistants. 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 Civil and Environmental Engineering (CEE) 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, Envn. Mgmt.</td>
</tr>
<tr>
<td>Dee Hansen</td>
<td>HDC Engineering</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>Cheryl Heying</td>
<td>Dept. of Water Resources</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 Civil Engineering Department are reviewed regularly by all of the constituents. The following paragraphs describe the roles of the constituents.

**Faculty**

The Civil Engineering faculty has the collective responsibility for establishing the PEOs. The 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 Civil and Environmental Engineering Faculty Retreat is a daylong faculty meeting held in August just prior to the start of each school year. The Assessment Committee is allocated time on the retreat agendas. 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 ABET Assessment Committee. The PEOs are reviewed and discussed every year by the faculty at the retreats. 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 CE 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 CEE Advisory Board typically meets once a year. Many members of this group of professionals are alumni of our program and are relied upon for inputs 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 have been updated to reflect these changes. As discussed previously, the PEOs will be presented to the freshman and senior classes starting in the 2014-15 school year for discussion and feedback.
CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes
The Civil 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 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>Table 3-1. Relationship Between PEOs and Student Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEO</td>
</tr>
<tr>
<td>PEO 1 – successful employment</td>
</tr>
<tr>
<td>PEO 2 – incorporate relevant considerations</td>
</tr>
<tr>
<td>PEO 3 – engage in life-long learning</td>
</tr>
<tr>
<td>PEO 4 – professional licensure/certification</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 civil 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’s difficult to find the correct answer if we don’t know the question. 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 ABET Assessment Committee, which consists of four permanent faculty members [two each from the Civil Engineering (CE) and Environmental Engineering (EnvE) program], as well as several rotating faculty depending on specific outcomes being assessed each year. The ABET 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 ABET Assessment Committee review, recommendations for improvement will be made by the Committee (and/or course instructors) 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 CE Program self assessment review.

<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</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</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 CE curriculum are mapped to specific student outcomes (see Table 4-2). Each time a course is taught, the instructor assesses at least one outcome by evaluating each student’s performance 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
The CE 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 courses are shaded)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 2010 Statics</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>ENGR 2030 Dynamics</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>ENGR 2140 Strength of Materials</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>ENGR 2210 Electronics</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>MAE 2160 Material Science</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>MAE 2300 Thermodynamics</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 3020 Structural Analysis</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 3080 Reinf. Concrete Design</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 3210 Transportation</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 3780 Solid/Haz. Waste Mgt</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 3880 Civil Engr. Design I</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 4200 Engr. Economics</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>CEE 4300 Engr. Soil Mechanics</td>
<td>✓ ✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CEE 4870 Civil Engr. Design II</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
</tbody>
</table>

26
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>✔️</th>
<th>✔️</th>
<th>✔️</th>
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<th>✔️</th>
<th>✔️</th>
<th>✔️</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 4880</td>
<td>Civil Engr. Design III</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5001</td>
<td>Irrigation System design</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5005</td>
<td>Irrig. Conveyance &amp; Control</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
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<td>CEE 5010</td>
<td>Matrix Analysis Finite Elements</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5050</td>
<td>Wood/Masonry Design</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5070</td>
<td>Steel Design</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5100</td>
<td>Infrastr. Eval/Renewal</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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</tr>
<tr>
<td>CEE 5190</td>
<td>GIS</td>
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<td>✔️</td>
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<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5220</td>
<td>Traffic Engineering</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5230</td>
<td>Geometric Design Hwy</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CEE 5350</td>
<td>Found Analysis/Design</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
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<td>✔️</td>
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<td>✔️</td>
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</tr>
<tr>
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<td>Sedimentation Engr.</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>CEE 5540</td>
<td>Hydraul. Struct. Design</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>CEE 5550</td>
<td>Hydraul. Closed Conduit</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>CEE 5860</td>
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<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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</table>

**FE Exam**

Passing the FE exam is an important step toward professional licensure and reinforcing life-long learning skills and provides good external, independent assessment data. Starting in the 2014-2015 academic year, all CE 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 PEO 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, our assessment method compares the percentage of students in the program who pass the FE exam prior to graduation to the National FE exam pass rate on an annual basis. Our goal is to have a 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 7). 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 to have 80% or more of the students rating their Student Outcome attainment level as a level 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 = very poor</td>
<td>0</td>
</tr>
<tr>
<td>2 = poor</td>
<td>1</td>
</tr>
<tr>
<td>3 = fair</td>
<td>2</td>
</tr>
<tr>
<td>4 = good</td>
<td>3</td>
</tr>
<tr>
<td>5 = very good</td>
<td>4</td>
</tr>
<tr>
<td>6 = excellent</td>
<td>5</td>
</tr>
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</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 Assessment
The assessment data for student course work in required and elective courses are 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. Note that CEE 3640, CEE 3780, and CEE 5860 are environmental engineering courses and CE elective classes from which the CE students much take one. The majority of the students in the classes are CE students. Consequently, the assessment results from all three classes have been included so as to capture the performance of all of the CE students.
<table>
<thead>
<tr>
<th>Class</th>
<th>Name</th>
<th>Instructor</th>
<th>Term</th>
<th>Method</th>
<th>Enroll.</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>
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<td></td>
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<tr>
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<td>Strengths of Mat.</td>
<td>Bay</td>
<td>Sp2014</td>
<td>exam</td>
<td>107</td>
<td>a-2140-1</td>
<td>circular bar torque (Math and Eng)</td>
<td>15%</td>
<td>0%</td>
<td>85%</td>
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<tr>
<td>CEE 2240</td>
<td>Surveying</td>
<td>Caliendo</td>
<td>F2013</td>
<td>HW</td>
<td>93</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>Computer Progmm.</td>
<td>Urroz</td>
<td>Sp2014</td>
<td>HW</td>
<td>93</td>
<td>a-2870-3</td>
<td>linear regress. programming (Math and Eng)</td>
<td>6%</td>
<td>10%</td>
<td>84%</td>
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<td>CEE 3080</td>
<td>Reinforc. Concrete</td>
<td>Barr</td>
<td>F2013</td>
<td>HW</td>
<td>46</td>
<td>a-3080-4</td>
<td>column load calc (Math)</td>
<td>9%</td>
<td>35%</td>
<td>57%</td>
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<tr>
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<td>Transportation Eng.</td>
<td>Heaslip</td>
<td>Sp2014</td>
<td>HW</td>
<td>34</td>
<td>a-3210-5</td>
<td>force balance &amp; F=ma (Engineering)</td>
<td>24%</td>
<td>18%</td>
<td>59%</td>
</tr>
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<td>CEE 3430</td>
<td>Hydrology</td>
<td>Tarboton</td>
<td>Sp2014</td>
<td>exam</td>
<td>44</td>
<td>a-3430-6</td>
<td>aquifer property calc (Math and Eng)</td>
<td>16%</td>
<td>32%</td>
<td>52%</td>
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<td>Fluid Mechanics</td>
<td>Tullis</td>
<td>Sp2014</td>
<td>exam</td>
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<td>a-3500-7</td>
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<td>15%</td>
<td>85%</td>
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<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>F2013</td>
<td>HW</td>
<td>17</td>
<td>a-3510-8</td>
<td>fluid viscosity &amp; drag force (Eng)</td>
<td>6%</td>
<td>12%</td>
<td>82%</td>
</tr>
<tr>
<td>CEE 3510</td>
<td>Hydraulics</td>
<td>Urroz</td>
<td>Sp2014</td>
<td>HW</td>
<td>51</td>
<td>a-3510-9</td>
<td>moving plate viscous forces (Math and Eng)</td>
<td>2%</td>
<td>0%</td>
<td>98%</td>
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<td>CEE 3610</td>
<td>Envir. Mgmt</td>
<td>McNeill</td>
<td>F2012</td>
<td>quiz</td>
<td>55</td>
<td>a-3610-10</td>
<td>mass balance with 2nd order kinetics (Eng)</td>
<td>7%</td>
<td>0%</td>
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<td>Envir. Mgmt</td>
<td>McNeill</td>
<td>F2013</td>
<td>HW</td>
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<td>a-3610-11</td>
<td>stoichiometry&amp;limit reactant: PM2.5 calc (Sci)</td>
<td>15%</td>
<td>19%</td>
<td>65%</td>
</tr>
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<td>Water&amp;WW Treat</td>
<td>McNeill</td>
<td>Sp2014</td>
<td>HW</td>
<td>14</td>
<td>a-3640-12</td>
<td>population calc (Math)</td>
<td>0%</td>
<td>7%</td>
<td>93%</td>
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<td>Dupont</td>
<td>F2012</td>
<td>HW</td>
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<td>a-3780-15</td>
<td>waste composition mass balance (Eng)</td>
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<td>36%</td>
<td>64%</td>
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<td>Dupont</td>
<td>F2012</td>
<td>HW</td>
<td>42</td>
<td>a-3780-16</td>
<td>waste compos. mass balance-follow up (Eng)</td>
<td>0%</td>
<td>14%</td>
<td>86%</td>
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<td>Maguire</td>
<td>F2013</td>
<td>exam</td>
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<td>a-5070-19</td>
<td>tension connection design (Eng)</td>
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<td>Rahmeyer</td>
<td>Sp2014</td>
<td>design proj</td>
<td>14</td>
<td>a-5470-20</td>
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<td>93%</td>
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<td>Air Quality Mgt</td>
<td>Martin</td>
<td>F2013</td>
<td>exam</td>
<td>12</td>
<td>a-5860-22</td>
<td>convert units: ppm to ug/m3 (Math and Sci)</td>
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<td>17%</td>
<td>75%</td>
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<td>F2013</td>
<td>lab</td>
<td>93</td>
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<td>Tullis</td>
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<td>HW</td>
<td>13</td>
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<td>0%</td>
<td>8%</td>
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<td>Urroz</td>
<td>F2013</td>
<td>HW</td>
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<td>pump curve measurement lab</td>
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<td>18%</td>
<td>76%</td>
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<td>Urroz</td>
<td>Sp2014</td>
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<td>b-3510-3</td>
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<td>0%</td>
<td>92%</td>
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<td>Bay</td>
<td>Sp2014</td>
<td>design proj</td>
<td>15</td>
<td>b-5380-6</td>
<td>tsunami velocity measurement</td>
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<td>Barr</td>
<td>F2013</td>
<td>HW</td>
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<td>Sp2014</td>
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<td>3%</td>
<td>15%</td>
<td>82%</td>
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<tr>
<td>CEE 3640</td>
<td>Water&amp;WW Treat</td>
<td>McNeill</td>
<td>Sp2013</td>
<td>mini-dsgn</td>
<td>16</td>
<td>c-3640-3</td>
<td>env constraint design: coag/floc/sed</td>
<td>0%</td>
<td>6%</td>
<td>94%</td>
</tr>
<tr>
<td>CEE 3640</td>
<td>Water&amp;WW Treat</td>
<td>McNeill</td>
<td>Sp2013</td>
<td>mini-dsgn</td>
<td>16</td>
<td>c-3640-4</td>
<td>env constraint design: filtration/sorp/IX</td>
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<td>13%</td>
<td>88%</td>
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<td>McNeill</td>
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<td>mini-dsgn</td>
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<td>c-3640-5</td>
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<td>14%</td>
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<td>Water&amp;WW Treat</td>
<td>McNeill</td>
<td>Sp2014</td>
<td>mini-dsgn</td>
<td>14</td>
<td>c-3640-6</td>
<td>env constraint design: filtration/sorp/IX</td>
<td>0%</td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
<td>CEE 3780</td>
<td>Solid&amp;HW Mgmt</td>
<td>Dupont</td>
<td>F2013</td>
<td>design proj</td>
<td>34</td>
<td>c-3780-7</td>
<td>waste audit w/ env, cost, H&amp;S, regul. Constraint</td>
<td>3%</td>
<td>6%</td>
<td>91%</td>
</tr>
<tr>
<td>CEE 4880</td>
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<td>Peralta</td>
<td>Sp2014</td>
<td>design proj</td>
<td>55</td>
<td>c-4880-8</td>
<td>design with various constraints</td>
<td>0%</td>
<td>11%</td>
<td>89%</td>
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<td>Martin</td>
<td>F2012</td>
<td>exam</td>
<td>16</td>
<td>c-5860-9</td>
<td>env/regulatory constraints: carbon abs. system</td>
<td>19%</td>
<td>25%</td>
<td>56%</td>
</tr>
<tr>
<td>Class</td>
<td>Name</td>
<td>Instructor</td>
<td>Term</td>
<td>Method</td>
<td>Enroll.</td>
<td>Ref #</td>
<td>Description</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<tr>
<td>CEE 3640 Water &amp; WW Treat.</td>
<td>McNeill</td>
<td>Sp2013</td>
<td>peer eval</td>
<td>16</td>
<td>d-3640-1</td>
<td>peer eval for group project</td>
<td>0%</td>
<td>6%</td>
<td>94%</td>
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<td>McNeill</td>
<td>Sp2014</td>
<td>peer eval</td>
<td>14</td>
<td>d-3640-2</td>
<td>peer eval for group project</td>
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<td>0%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>CEE 3780 Solid &amp; HW Mgmt</td>
<td>Dupont</td>
<td>F2012</td>
<td>peer eval</td>
<td>44</td>
<td>d-3780-3</td>
<td>peer eval for group project</td>
<td>0%</td>
<td>2%</td>
<td>98%</td>
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<td>F2013</td>
<td>peer eval</td>
<td>37</td>
<td>d-3780-4</td>
<td>peer eval for group project</td>
<td>3%</td>
<td>5%</td>
<td>92%</td>
<td></td>
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<tr>
<td>CEE 5860 Air Quality Mgmt</td>
<td>Martin</td>
<td>F2013</td>
<td>peer eval</td>
<td>12</td>
<td>d-5860-5</td>
<td>peer eval for group project</td>
<td>8%</td>
<td>0%</td>
<td>92%</td>
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</tr>
</tbody>
</table>

Outcome (d)

<table>
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<tr>
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<th>Instructor</th>
<th>Term</th>
<th>Method</th>
<th>Enroll.</th>
<th>Ref #</th>
<th>Description</th>
<th>0</th>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td>CEE 2870 Computer Progrm.</td>
<td>Jrroz</td>
<td>Sp2014</td>
<td>HW</td>
<td>93</td>
<td>e-2870-1</td>
<td>pipeline discharge and velocity calcs.</td>
<td>9%</td>
<td>11%</td>
<td>81%</td>
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<td>Halling</td>
<td>Sp2014</td>
<td>HW</td>
<td>63</td>
<td>e-3020-19</td>
<td>moment area method</td>
<td>0%</td>
<td>10%</td>
<td>90%</td>
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<td>HW</td>
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<td>HW</td>
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<td>e-3610-8</td>
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<td>e-3610-9</td>
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<td>Sp2014</td>
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<td>e-3640-10</td>
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Outcome (e)

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<td>f-3880-4</td>
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31
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<td>Urroz</td>
<td>F2013</td>
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<td>g-3510-7</td>
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<td>Urroz</td>
<td>Sp2014</td>
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<td>g-3640-11</td>
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<td>grp proj</td>
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<td>Martin</td>
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<td>Heaslip</td>
<td>Sp2014</td>
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<td>McNeill</td>
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<td>McNeill</td>
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<td>Martin</td>
<td>F2013</td>
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<td>Caliendo</td>
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<td>Caliendo</td>
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<td>HW</td>
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<td>Urroz</td>
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<td>2%</td>
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<td>Urroz</td>
<td>F2013</td>
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<td>exam</td>
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<td>HW</td>
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<td>k-5470-13</td>
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<td>k-5470-14</td>
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<td>unsteady OC flow - HEC-RAS software</td>
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The aggregated Student Outcome assessment results are summarized by Outcome in Table 4-5 and Figure 4-1, which show that percentage of students performing at a 2 level is greater than 70% for all Student Outcomes, with the exception of Outcome f (64%). The percentage of students performing at a level of 1 or 2 is greater than 80% for all Student Outcomes. Except for Outcome f, these results meet the performance goals for the student course work performance.

Table 4-5. Aggregated Assessment Results of CE Course Work

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<td>3%</td>
<td>95%</td>
<td>98%</td>
<td>123</td>
</tr>
<tr>
<td>Outcome e</td>
<td>5%</td>
<td>19%</td>
<td>76%</td>
<td>95%</td>
<td>641</td>
</tr>
<tr>
<td>Outcome f</td>
<td>7%</td>
<td>29%</td>
<td>64%</td>
<td>93%</td>
<td>180</td>
</tr>
<tr>
<td>Outcome g</td>
<td>3%</td>
<td>12%</td>
<td>85%</td>
<td>97%</td>
<td>361</td>
</tr>
<tr>
<td>Outcome h</td>
<td>5%</td>
<td>12%</td>
<td>83%</td>
<td>95%</td>
<td>237</td>
</tr>
<tr>
<td>Outcome i</td>
<td>9%</td>
<td>14%</td>
<td>77%</td>
<td>91%</td>
<td>108</td>
</tr>
<tr>
<td>Outcome j</td>
<td>5%</td>
<td>16%</td>
<td>79%</td>
<td>95%</td>
<td>370</td>
</tr>
<tr>
<td>Outcome k</td>
<td>9%</td>
<td>9%</td>
<td>82%</td>
<td>91%</td>
<td>578</td>
</tr>
</tbody>
</table>
Summary of Outcome Assessments

Assessment was based on the two performance goals: 70% of the students scored a “2” (Goal-1) and 80% of the students will score a “1” or “2” (Goal-2). The Outcome results from Table 4-4 were assessed on an aggregated basis using the summary data in Table 4-5. Even though the aggregated Outcome assessment data meet both performance goals, with the exception of Outcome f, we note that some of the individual assignments assessed in Table 4-4 did not meet both goals, indicating that additional improvement is warranted.

Outcome a – an ability to apply knowledge of mathematics, science, and engineering
This outcome was assessed in 18 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). The aggregated student performance met both goals, with 75% of students rating a 2 and 87% 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. In this particular class, students are allowed to drop their two lowest homework scores for the class. Because this assignment required a relatively high level of effort, some students may have intentionally not turned in the assignment (scoring a “0”). 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 four lab- and lecture-based courses. Overall student performance is satisfactory and meets both Goal-1 (86%) and Goal-2 (94%). 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 ABET 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).

Outcome c – an ability to design a system, component, or process to meet desired needs within realistic constraints
This outcome is assessed in eight 3000-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 (78%) and Goal-2 (96%).

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.
Beginning Spring 2013, the first design class (CEE 3880) began inviting a guest speaker from the USU Psychology Department who presents ideas on effective teamwork. This was an intentional effort to provide instruction on “how to function on a team”, rather than just giving students teamwork opportunities. Student performance is satisfactory and meets both Goal-1 (95%) and Goal-2 (98%).

**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 (76%) and Goal 2 (95%).

**Outcome f – an understanding of professional and ethical responsibility**

Student attainment was assessed in three 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 a quiz. Overall, 93% of student assessments rated a 1 or 2, which met Goal 2. However, Goal 1 was not met, as only 64% 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 3640, CEE 5540). Student performance is satisfactory and meets both Goal 1 (85%) and Goal 2 (97%). We note that starting in Spring 2014, students in the CE 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 in three different courses. Although student performance satisfactorily meets both Goal-1 (83%) and Goal 2 (95%), the number of assessments is relatively small. The ABET 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 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 (77%) and Goal-2 (91%). 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 (79%) and Goal-2 (95%).

**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 MS Excel and EPANET. Overall, student performance is satisfactory and meets both Goal-1 (82%) and Goal-2 (91%). 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 Results**  
Table 4-6 summarizes the percentage of students who had passed the FE exam by the time of graduation for the past six years. The data do not account for the number of attempts required to pass. Prior to the 2009-2010 school year, passing the FE exam was required for graduation (100% pass rate). In 2009-2010, passing the FE exam became optional, but students who did not pass were required to take the exam a minimum of three times. The pass rate that year dropped to just above the national average (75%). For all subsequent years, the pass rates were at or above the 90th percentile and well above the national average. During the 2013-2014 academic year, the faculty decided to reinstate passing the FE exam as a graduation requirement. This will take affect in the 2014-2015 academic year going forward.

The fact that the CE pass rate for the FE exam is high and well above the National average (with the exception of the 2009-2010 academic year) is a very 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. CE Graduates Who Passed FE Exam vs. National Annual Pass Rate |
|-----------------|------|-----|------|-----|------|------|
| Total CE degrees | 55     | 60   | 64     | 50    | 43     | 56     |
| % graduates passing FE | 100% | 75% | 94% | 90% | 95% | 93% |
| national CE pass rate | 72% | 74% | 75% | 74% | 74% | 72% |

**Senior Exit Interview Results**  
The response rate to the senior exit interview is relatively high (70 – 86%, Table 4-7), except for the 2013-2014 academic year (40%), and the students’ rating of their outcome attainment is generally at the ‘2’ level (Figure 4-2). Acknowledging that this is a subjective self-evaluation, these exit interview results are taken as a general indication that students feel they are meeting the outcomes.
Table 4-7. Summary of Student Self Evaluation of Student 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 CE graduates</td>
<td>60</td>
<td>54</td>
<td>50</td>
<td>43</td>
<td>56</td>
</tr>
<tr>
<td>Response rate</td>
<td>80%</td>
<td>80%</td>
<td>70%</td>
<td>86%</td>
<td>40%</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 Civil Engineering program is to create a culture of assessment among the faculty. Starting in the 2013-2014 academic year, faculty members were required to assess at least one Student Outcome per class per year and submit documentation.

To support Continuous Improvement in the Civil Engineering program, the ABET Assessment Committee coordinates the collection of and reviews 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 members during the
annual Fall Retreat. Adjustments are made, as needed, at the individual course level and assessment data are recollected the following year for re-evaluation.

**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 no longer are 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:
  - Emphasize individual effort and accountability toward teammates.
  - 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 Civil 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**

The following documents substantive changes made to the Civil 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: Mechanics of Materials (CEE 3010) was eliminated from the curriculum. Strength of Materials (ENGR 2040) and Structural Analysis (CEE 3020) absorbed the Mechanics of Materials course content. Both courses were increased from 2 credits to 3 to accommodate the course content increase. Change was approved by the Program faculty and implemented Fall 2011.

3. Fall 2010: Professional and Technical Writing (CEE 3870, 2 credits) was eliminated and replaced with Introduction to Technical Communications (ENGL 3080, 3 credits). Change was approved by the Program faculty and implemented Fall 2011.

4. Fall 2010: CEE 2870–Introduction to Programming was added to the curriculum to provide a focused programming experience for CEE students and better prepare them for a new College numerical methods course-ENGR 2450. Sophomore seminar was dropped from the curriculum to make room for the new programming course. This change was approved by the Program faculty and implemented Fall 2010.

5. Fall 2010: Engineering Numerical Methods (ENGR 2450, 3 credits) was added to the curriculum. Intended to improve the problem solving and math skills of students. Implemented Spring 2010.

6. Spring 2011: A 1-credit Physics Lab (PHYS 2215) was added to accompany PHYS 2210. Approved change was designed to provide valuable hands-on laboratory data collection and analysis experience and technical communication through laboratory reports. Change was approved by the Program faculty and implemented Fall 2011.

7. Spring 2011: Managing Organizations and People (MGT 3310, 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 Outcome areas d, f and h through the study of business and public administration, leadership, and teamwork. This change was approved by the Program faculty and implemented Spring 2011.

8. Fall 2011: Uncertainty in Engineering Analysis (CEE 3030, 3 credits) was removed from the undergraduate curriculum. Uncertainty analysis is taught at the graduate level.

9. Spring 2013: Technical Communications (ENGL 3080, 3 credits) was made a prerequisite to CEE 3880 (the first of the capstone course) 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 Program faculty and implemented Spring 2013.

10. Spring 2013: Technical Communication (ENGL 3080, 3 credits) was replaced with a College of Engineering technical writing class (Technical Communications, 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 instructor to teach the course. The course content will be more tailored to engineering
needs and hopefully improve the written communication skills of engineering students.
ENGR 3080 is a prerequisite for CEE 3880. This change was approved by the Program
faculty and implemented Spring 2014.

Examples of Individual Course Improvements
Each instructor is encouraged to document course improvements by comparing assessment data
from before and after the change. Beginning in the 2013-2014 academic year, a standardized
form was implemented for course improvement documentation. These course improvement
forms are archived in the course binder (available for review during the PEV visit). Several
illustrative examples are given below.

**CEE 3610** (outcome j)– Environmental Management, students take 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 was 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** (Outcome d) – Water/Wastewater Treatment (Spring 2013): the 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
(see Figure 4-3). The instructors discussed strategies for effective group work on an individual
student, group, and the entire class basis. All groups functioned more smoothly for the
wastewater project in the second part of the class, and all peer evaluations increased (Figure 4-3).
**CEE 3780** (Outcome a) – Solid and Hazardous Waste Management (Fall 2012): a homework problem was assigned to assess outcome ability to apply knowledge of engineering skills. 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 scored 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 scored a “2”.

**CEE 3080** (Outcome c) – Reinforced Concrete Design (Spring 2013): Throughout the semester, the instructor discussed cost as the main decision making criterion used by owners to decide the type of building or bridge they want. The instructor thought that this was getting through but realized that through classroom discussions, the students did not really realize how the cost was calculated. In addition, they did not understand how one decision would influence costs in other areas. The instructor developed a homework assignment very specific to cost estimation. The assignment was given at the end of the semester so that the students could apply their accumulative knowledge from the entire course. The scores for the homework problem, based on the 0-1-2 scoring method, are presented in Figure 4-4. Of the 46 students in class, 89% scored in the 1-2 range. The goal is to increase the percentage of students scoring a 2 in subsequent years.
CEE 4300 (Outcomes a, b) – Engineering Soil Mechanics (Spring 2013): The laboratory portion of the course needed to be updated to include relative density testing in accordance with ASTM standards D 4253-83 (Maximum Index Density) and D 4254-83 (Minimum Index Density). New equipment was purchased for the laboratory using department funds and a corresponding laboratory exercise was added to the course curriculum and the data produced by these tests are used in solving subsequent geotechnical problems.

CEE 2240 (Outcomes a, k) – Surveying (Fall 2013): Modern surveying equipment and techniques include GPS-based instrumentation. The Department purchased two Trimble GPS systems and a surveying lab exercise has been 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 (Outcome a, i) – Fluid Mechanics (Spring 2013): Completing textbook reading assignments prior to lecture typically improves students’ ability to understand lecture material (the lecture becomes the second exposure to the material and affords students the opportunity to ask question regarding details that were not clear from their reading). It was apparent from students’ inability to respond correctly to the 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 to give 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-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** (Outcome a, e, k) – Systems involving a few pipelines in series, parallel, or branching typically require 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.

**C. Additional Information**

Copies of any of the assessment instruments or materials referenced in 4.A and 4.B will be available for review at the time of the visit. Other information such as minutes from meetings where the assessment results were evaluated and where recommendations for action were made will also be included.
CRITERION 5. CURRICULUM

A. Program Curriculum
Table 5-1 describes the plan of study for students in the Civil Engineering program as well as average section enrollments for all courses in the program over the past two years (2012-2013 and 2013-2014). The curriculum requires a minimum of 129 credit hours, with 34 credits of basic math and science, 71 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 Civil Engineering program uses a semester-based schedule, with classes offered during the Fall, Spring, and Summer semesters. The recommended schedule by year and term was presented earlier in the Degree Progression Flow Diagram in Figure 1-2. 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 5-1. Curriculum
## Civil Engineering

Course Table

<table>
<thead>
<tr>
<th>Course</th>
<th>Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE. ¹</th>
<th>Subject Area (Credit Hours)</th>
<th>Whether Course Contains Significant Design (✓)</th>
<th>General Education</th>
<th>Other</th>
<th>Last Two Terms the Course was Offered: Year and Semester</th>
<th>Maximum Section Enrollment for the Last Two Terms the Course was Offered²</th>
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</thead>
<tbody>
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<th>55%</th>
<th>19%</th>
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<td>Total must satisfy either credit hours or percentage</td>
<td>Minimum Semester Credit Hours</td>
<td>32 Hours</td>
<td>48 Hours</td>
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<tr>
<td>Minimum Percentage</td>
<td>25%</td>
<td>37.5%</td>
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</table>

1. **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** 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

The CE program educational objectives (PEOs) are given in the Criterion 2 section. At a high level, the objectives of 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) ability to apply 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 (first two years) provide students with the math, science and engineering 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 (engineering expertise – PEO 1). 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, problem-solving skills, and some engineering tools that can be utilized in the workplace immediately following graduation (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 assessed as part of Criterion 4.

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<th>Student Outcomes</th>
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<td>MATH 2210 MultiVariable Calculus</td>
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<td>MATH 2250 Linear Algebra/Differential Eqn.</td>
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<td>✓</td>
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<td>GEO 1110 Geography (Dynamic Earth)</td>
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<td>CHEM 1210 Principles of Chemistry I</td>
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<td>✓</td>
</tr>
<tr>
<td>CEE 3020 Structural Analysis</td>
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</tr>
<tr>
<td>CEE 3080 Reinforce Concrete Design</td>
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</tr>
<tr>
<td>ENGL 3080 Technical Communications</td>
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<tr>
<td>CEE 3210 Transportation</td>
<td>✓</td>
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<tr>
<td>CEE 3430 Engr. Hydrology</td>
<td>✓</td>
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<tr>
<td>CEE 3500 Fluid Mechanics</td>
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<tr>
<td>CEE 3510 Hydraulics</td>
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<tr>
<td>CEE 3610 Environ. Mgmt.</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3640 Water/Wastewater Engr.</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 3780 Solid/Haz. Waste Mgt</td>
<td>✓</td>
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<tr>
<td>CEE 3880 Civil Engr. Design I</td>
<td>✓</td>
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<tr>
<td>CEE 4200 Engr. Economics</td>
<td>✓</td>
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<tr>
<td>CEE 4300 Engr. Soil Mechanics</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 4870 Civil Engr. Design II</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 4880 Civil Engr. Design III</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5001 Irrigation system design</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5005 Irrig. Conveyance and control</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5010 Matrix Analysis/Finite element</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5050 Wood/Masonry Design</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5070 Steel Design</td>
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<tr>
<td>CEE 5100 Infrastructure Eval/renewal</td>
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<tr>
<td>CEE 5190 GIS</td>
<td>✓</td>
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<tr>
<td>CEE 5220 Traffic Engineering</td>
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<tr>
<td>CEE 5230 Geometric Design Hwy</td>
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<tr>
<td>CEE 5350 Foundation Analysis/Design</td>
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<td>CEE 5380 Earthquake Engr.</td>
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<tr>
<td>CEE 5430 Groundwater Engineering</td>
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<td>CEE 5450 Hydrologic Modeling</td>
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<td>CEE 5470 Sedimentation Engr.</td>
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<tr>
<td>CEE 5500 Open Channel Hydraulics</td>
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<td>CEE 5540 Hydraulic Structure Design</td>
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<tr>
<td>CEE 5550 Hydraulic of Closed Conduit</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5860 Air Quality Mgmt.</td>
<td>✓</td>
</tr>
<tr>
<td>CEE 5900 Cooperative practice</td>
<td>✓</td>
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</tbody>
</table>
Prerequisite Structure of the Civil Engineering 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 in fundamental math, science, and engineering principles – establishing an enduring foundation of technical fundamentals to build upon 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 34 credit hours of math and science (calculus, linear algebra, differential equations, numerical methods, physics, chemistry, biology, geography), as well as 20 credit hours of engineering fundamentals (statics, dynamics, surveying, computer drafting, computer programming, thermodynamics, strength of materials). 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 the five civil engineering disciplines (i.e., water engineering: fluid mechanics, hydraulics, and hydrology; geotechnical engineering; environmental engineering; transportation engineering; and structural engineering) along with engineering economics and technical writing courses. Following the completion of the core courses, students take five additional technical elective courses (typically 5000-level courses) that include at least one course from four of the five civil engineering disciplines and a minimum of one “senior design” elective. Students also take 15 credits of General Education courses (see Supplement 8).

Capstone Design Experience

The CE capstone design experience is carried out over a three-semester course sequence. In many cases, CE students work jointly with EnvE 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 Civil Engineering program can use a cooperative education experience to obtain up to 3 credits that count as a technical elective (see Supplement 9). The student must first discuss their proposed co-op experience with their faculty advisor. 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 co-op must include significant engineering experience and the student must be supervised by a licensed engineer. Once approved by the advisor, the student registers for CEE 5900 – Civil Engineering Co-operative Practice for the appropriate number of credit hours. Upon completion of the co-op, the student must complete and submit a written report to their faculty advisor. The supervisor also submits a written evaluation of the student’s performance during the co-op.

**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 Civil Engineering undergraduate course associated with Criterion 5 is included in Appendix A.
CRITERION 6. FACULTY

A. Faculty Qualifications

The Civil Engineering faculty within the Civil and Environmental Engineering Department has 22 full-time faculty members (Table 6-1); 15 are tenured (10 full professors, four associate professors), three assistant professors, and four are non-tenure track (research professors). Nineteen faculty have a terminal degree (PhD), with specialties in civil and environmental engineering and agricultural engineering. The CE program is also supported by courses taught by Environmental Engineering faculty (EnvE) in the CEE Department (Table 6-1). Overall in the CE Program, 12 of the 20 faculty are registered as Professional 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 CE faculty can be divided into the following areas:

- **Geotechnical Engineering**: James Bay, Joseph Caliendo, John Rice
- **Hydraulics & Fluid Mechanics**: Steven Barfuss, Michael Johnson, William Rahmeyer, Blake Tullis, Gilberto Urroz
- **Irrigation**: Niel Allen, Richard Peralta
- **Structural Engineering**: Paul Barr, Marv Halling, Marc McGuire
- **Transportation**: Anthony Chen, Kevin Heaslip, Ziqi Song
- **Water Resources**: Jeff Horsburgh, Mac McKee, David Rosenberg, David Tarboton, Jagath Kaluarachchi, Anthony Castronovo
- **Environmental Engineering**: Craig Adams, Ryan Dupont, Laurie McNeill, Randy Martin

The size of the faculty for our teaching needs is adequate to cover the undergraduate curriculum as well as the graduate curriculum. When a faculty member is on sabbatical leave, any 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 a CE 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
#### Civil Engineering

| Faculty Name          | Highest Degree Earned - Field and Year | Rank | Type of Academic Appointment | Years of Experience | Professional Registration/Certification | Level of Activity
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Barfuss, Steve</td>
<td>MS – CEE, 1987</td>
<td>RASC</td>
<td>NTT</td>
<td>0</td>
<td>PE: UT</td>
<td>H M M L</td>
</tr>
<tr>
<td>Barr, Paul</td>
<td>PhD – CE, 2000</td>
<td>P</td>
<td>T</td>
<td>0</td>
<td>PE: UT</td>
<td>M H L</td>
</tr>
<tr>
<td>Bay, James</td>
<td>PhD – CE, 1997</td>
<td>ASC</td>
<td>T</td>
<td>0</td>
<td>None</td>
<td>M M L</td>
</tr>
<tr>
<td>Caliendo, Joseph</td>
<td>PhD – CE, 1986</td>
<td>ASC</td>
<td>T</td>
<td>7</td>
<td>PE: FL, VA</td>
<td>H H L</td>
</tr>
<tr>
<td>Anthony Castronova</td>
<td>PhD-CE, 2012</td>
<td>RAST</td>
<td>NTT</td>
<td>0</td>
<td>FE</td>
<td>M H L</td>
</tr>
<tr>
<td>Chen, Anthony</td>
<td>PhD – CE, 1997</td>
<td>P</td>
<td>T</td>
<td>0</td>
<td>None</td>
<td>H M L</td>
</tr>
<tr>
<td>Heaslip, Kevin</td>
<td>PhD – CEE, 2007</td>
<td>ASC</td>
<td>TT</td>
<td>3</td>
<td>PE: NH</td>
<td>H M L</td>
</tr>
<tr>
<td>Horsburgh, Jeffery</td>
<td>PhD – CEE, 2009</td>
<td>AST</td>
<td>TT</td>
<td>0</td>
<td>None</td>
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<tr>
<td>Johnson, Michael</td>
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<td>RASC</td>
<td>NTT</td>
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<tr>
<td>Kaluarachchi, Jagath</td>
<td>PhD – Env. Sci and Eng., 1988</td>
<td>P</td>
<td>T</td>
<td>3</td>
<td>PE: UT</td>
<td>H M L</td>
</tr>
<tr>
<td>Maguire, Marc</td>
<td>PhD – CE, 2012</td>
<td>AST</td>
<td>TT</td>
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<td>None</td>
<td>H M L</td>
</tr>
<tr>
<td>McKee, Mac</td>
<td>PhD – CEE, 1985</td>
<td>P</td>
<td>T</td>
<td>3</td>
<td>None</td>
<td>M H L</td>
</tr>
<tr>
<td>Faculty Name</td>
<td>Highest Degree Earned - Field and Year</td>
<td>Rank 1</td>
<td>Type of Academic Appointment2</td>
<td>Years of Experience</td>
<td>Professional Registration/Certification</td>
<td>Level of Activity4</td>
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<tr>
<td>Peralta, Richard</td>
<td>PhD – Ag. (Water) Eng., 1979</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>5 30 25 PE: UT, AR</td>
<td>M M L</td>
</tr>
<tr>
<td>Rice, John</td>
<td>PhD – CE, 2007</td>
<td>AST</td>
<td>TT</td>
<td>FT</td>
<td>16 6 6 PE: CA GE: CA</td>
<td>H M L</td>
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<tr>
<td>Rosenberg, David</td>
<td>PhD – CEE, 2008</td>
<td>ASC</td>
<td>TT</td>
<td>FT</td>
<td>3 5 5 EIT</td>
<td>M H L</td>
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<tr>
<td>Song, Ziqi</td>
<td>PhD – CE, 2011</td>
<td>RAST</td>
<td>NTT</td>
<td>FT</td>
<td>2 1 0 None</td>
<td>M M L</td>
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<tr>
<td>Tarboton, David</td>
<td>ScD – CE, 1990</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>0 23 23 PE: UT</td>
<td>M M 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 16 12 EIT</td>
<td>H M L</td>
</tr>
<tr>
<td>Urroz, Gilberto</td>
<td>PhD – CEE, 1988</td>
<td>ASC</td>
<td>T</td>
<td>FT</td>
<td>1.5 30 25 PE: UT</td>
<td>H M L</td>
</tr>
<tr>
<td>Environmental Engineering Faculty (supporting CE Program)</td>
<td>Environmental Engineering Faculty (supporting CE Program)</td>
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<tr>
<td>Adams, Craig</td>
<td>PhD – Env. Health Eng., 1991</td>
<td>P</td>
<td>T</td>
<td>FT</td>
<td>4 22 2 PE: KS; BCEE</td>
<td>H H L</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 33 31 None</td>
<td>M M L</td>
</tr>
<tr>
<td>Martin, Randal</td>
<td>PhD – CE, 1992</td>
<td>RASC</td>
<td>NTT</td>
<td>FT</td>
<td>5 21 13 EIT</td>
<td>H M L</td>
</tr>
<tr>
<td>McNeill, Laurie</td>
<td>PhD – CE, 2000</td>
<td>ASC</td>
<td>T</td>
<td>FT</td>
<td>0 14 13 EIT</td>
<td>M M L</td>
</tr>
</tbody>
</table>

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  

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 each faculty member. 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 members within the College of Engineering, and must demonstrate “effectiveness” in the remaining areas (e.g., teaching and service). Typical annual expectations are that faculty members 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 members teach two to four courses per year, with adjustments based on course size, service commitment, and other factors. For their service role, faculty members 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 activities as well as within the discipline. As can be seen in faculty resumes in Appendix B, these positions include leadership positions in the local society chapters as well as participation in technical committees of professional associations at the nation and international level.
Table 6-2. Faculty Workload Summary

Civil Engineering

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>PT or FT</th>
<th>Classes Taught (Course # - Credit Hrs.) Term and Year</th>
<th>Program Activity Distribution</th>
<th>% of Time Devoted to the Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering Faculty</td>
<td></td>
<td></td>
<td>Teaching and service</td>
<td>Research or Scholarship</td>
</tr>
<tr>
<td>Allen, Niel</td>
<td>FT</td>
<td>None</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td>Barfuss, Steve</td>
<td>FT</td>
<td>None</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Barr, Paul</td>
<td>FT</td>
<td>CEE 3080 – 3, Sp14 CEE 5010 – 3, F13 CEE 6120 – 3, F13</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Bay, James</td>
<td>FT</td>
<td>CEE 4300 – 3, Sp14 CEE 5380/6380 – 3, Sp14 CEE 6360 – 3, F13 ENGR 2140 – 3, Sp14</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Bishop, A. Bruce</td>
<td>PT</td>
<td>CEE 4200 – 2, F13 CEE 6410 – 3, F13</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Caliendo, Joseph</td>
<td>FT</td>
<td>CEE 2240 – 3, F13 CEE 4300 – 3, Sp14 CEE 5350/6350 – 3, F13 CEE 5900 – 3, F13, Sp14 CEE 6320 – 3, Sp14</td>
<td>90%</td>
<td>10%</td>
</tr>
<tr>
<td>Anthony Castronova</td>
<td>FT</td>
<td>None</td>
<td>0%</td>
<td>90%</td>
</tr>
<tr>
<td>Chen, Anthony</td>
<td>FT</td>
<td>On sabbatical 2013-14</td>
<td>0%</td>
<td>0%</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>
</tr>
<tr>
<td>----------------------</td>
<td>----------</td>
<td>--------------------------------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Halling, Marvin</td>
<td>FT</td>
<td>CEE 5100 – 3, Sp14 CEE 5110 – 3, F13, Sp14 CEE 6050 – 3, Sp14 CEE 6130 – 3, F13</td>
<td>45% 55% 0% 100%</td>
<td>100%</td>
</tr>
<tr>
<td>Heaslip, Kevin</td>
<td>FT</td>
<td>CEE 3210 – 3, Sp14 CEE 5220/6220 – 3, F13 CEE 5230/6230 – 3, Sp14</td>
<td>40% 60% 0% 100%</td>
<td>100%</td>
</tr>
<tr>
<td>Horsburgh, Jeffery</td>
<td>FT</td>
<td>CEE 6110 – 3, F13</td>
<td>40% 60% 0% 100%</td>
<td>100%</td>
</tr>
<tr>
<td>Johnson, Michael</td>
<td>FT</td>
<td>None</td>
<td>15% 85% 0% 100%</td>
<td>100%</td>
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<tr>
<td>Kaluarachchi, Jagath</td>
<td>FT</td>
<td>CEE 3430 – 3, Sp14 CEE 5430/6430 – 3, F13</td>
<td>15% 30% 55% 100%</td>
<td>100%</td>
</tr>
<tr>
<td>Maguire, Marc</td>
<td>FT</td>
<td>CEE 5070 – 3, F13</td>
<td>30% 70% 0% 100%</td>
<td>100%</td>
</tr>
<tr>
<td>McKee, Mac</td>
<td>FT</td>
<td>CEE 5500/6500 – 3, F13</td>
<td>10% 15% 75% 25%</td>
<td></td>
</tr>
<tr>
<td>Peralta, Richard</td>
<td>FT</td>
<td>CEE 3880 – 1, Sp14 CEE 4870 – 2, F13 CEE 4880 – 1, Sp14 CEE 5450/6450 – 3, Sp14 CEE 7000 – 4 F13</td>
<td>40% 60% 0% 100%</td>
<td>100%</td>
</tr>
<tr>
<td>Rahmeyer, William</td>
<td>FT</td>
<td>ENGR 2010 – 3, Sp14 CEE 3500 – 3, F13 CEE 5470/6470 – 3, Sp14</td>
<td>70% 30% 0% 100%</td>
<td>100%</td>
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<tr>
<td>Rice, John</td>
<td>FT</td>
<td>CEE 6300 – 3, Sp14 CEE 6330 – 3, F13</td>
<td>40% 60% 0% 100%</td>
<td>100%</td>
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<tr>
<td>Rosenberg, David</td>
<td>FT</td>
<td>ENGR 2930 – 1, F13 CEE 6410 – 3, F13 CEE 6490 – 3, Sp14</td>
<td>40% 60% 0% 100%</td>
<td>100%</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>
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<tr>
<td>--------------------</td>
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<tr>
<td>Tarboton, David</td>
<td>FT</td>
<td>CEE 6400 – 3, F13 CEE 6440 – 3, F13</td>
<td>30% 70% 0% 100%</td>
<td></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% 67% 0% 100%</td>
<td></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% 15% 0% 100%</td>
<td></td>
</tr>
<tr>
<td>Song, Ziqi</td>
<td>FT</td>
<td>CEE 5240/6240 – 3, F13</td>
<td>10% 90% 0% 100%</td>
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</tr>
<tr>
<td>Environmental Engineering</td>
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<tr>
<td>Adams, Craig</td>
<td>FT</td>
<td>CEE 4930/6930 – 3, F13 CEE 6900 – 3, Sp14 CEE 6970/7970 – 3, F13, Sp14</td>
<td>10% 30% 60% 100%</td>
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<tr>
<td>Dupont, Ryan</td>
<td>FT</td>
<td>CEE 3640 – 4, Sp14 CEE 3780 – 3, F13</td>
<td>30% 70% 0% 100%</td>
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</tr>
<tr>
<td>Martin, Randal</td>
<td>FT</td>
<td>CEE 5750 – 3, Sp14 CEE 5860 – 3, F13 CEE 6930 – 3, Sp14</td>
<td>30% 50% 20% 100%</td>
<td></td>
</tr>
<tr>
<td>McNeill, Laurie</td>
<td>FT</td>
<td>CEE/PUBH 3610 – 3, F13 CEE 3640 – 4, Sp14 CEE 6660 – 3, Sp14 CEE 6670 – 2, Sp14</td>
<td>85% 15% 0% 100%</td>
<td></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.
C. Faculty Size
As mentioned above in Section 6.B, the size of the CE faculty is adequate to cover the teaching load of the program. The faculty-to-student ratio is relatively favorable, allowing close interaction with the students. CE faculty actively participate in the advising of both undergraduate and graduate students, and also serve as mentors and advisors for Senior Design projects. Some CE faculty are heavily involved in student organizations at USU including Engineers without Borders and the American Society of Civil Engineers.

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.

The following changes have occurred in the program faculty and staff since the last ABET review (2008):

- **Faculty retirements**: David Bowles, Robert Hill, Wynn Walker.
- **Faculty departures**: Luis Bastidas, Sanjay Chauhan, Thomas Hardy, Gary Merkley, Christopher Neale, Robert Pack, Keri Ryan, Kevin Womack.
- **Newly employed faculty**: Niel Allen, Jeff Horsburgh, Marc Maguire, Richard Peralta, Ziqi Song, Anthony Castronova.
- **Staff retirements and departures**: Carolyn Benson, Becky Hansen, Emily Roska, Abigail MacFarlane.
- **Newly employed staff**: Sheila Jessie, Michelle Lerwill, Rebeca Olsen.

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 2013-2014 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 at 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.

**CE Faculty Professional Development**

A summary of the recent professional development activities for each CE 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 individual CE faculty members, who have significant latitude in creation, modification, and deletion of courses to support the evolving needs of the program. Typically, when a new course idea is suggested by a faculty member, they will also provide a course description, 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 persons 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 Catalogue. Changing course content or prerequisites requires a similar process. After the CEE Faculty has 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 ABET 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 ABET 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 second floor of the Engineering Lab (ENLAB) building and the third 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 members who have their main office at the Utah Water Research Lab (UWRL). Graduate student office space is located in the second floor of the ENGR building and the ENLAB building basement; some CEE students have their office down at the UWRL. Office spaces typically have computers, printers, wired and wireless internet connections, and VOIP phones. The CEE student lounge (ENLAB 229) was recently remodeled 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. In particular, the combined classroom space in both buildings totals 71,594 ft². There are 16 classrooms available with seating capacity ranging from 32 to 219 students. All classrooms provide extensive multi-media support, including computers, document camera, overhead projector, and high-speed internet connections. Scheduling of classrooms in these buildings is the responsibility of the University (Registrar’s office), 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>
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<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>
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<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-managed 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 contains computer, document camera, 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 that 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 of the ENGR building. In summary, the classroom facilities available to the CEE Department are excellent, with no major upgrade needs anticipated in the foreseeable future.

**Laboratory Facilities**
The CEE Department has seven laboratories used by both undergraduate and graduate students and one departmental fabrication and machine shop.

The **Concrete and Materials Laboratory** is located in Room 110 of the Technology Building and occupies about 1800 square feet of floor space. The laboratory was moved since the last ABET visit to provide for more space and improve the laboratory experience for the undergraduate students. The laboratory has heavy use with a number of structural and materials courses, undergraduate and graduate research, and senior design projects. The laboratory also includes equipment used to store, mix and fabricate concrete. The laboratory includes facilities to cure concrete samples and to test concrete in creep. In addition to class activities, the Concrete and Materials Laboratory is used for student projects such as the ASCE concrete canoe and steel bridge contest. The lab has a wide assortment of equipment including welders and grinding machine for steel.

The **Geomatics Lab** is a high-end computer laboratory that is used specifically for the Geographic Information Systems for Civil Engineers course (CEE 5190). 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 colored 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 **Geotechnical and Structural Dynamics Laboratory** is located on the first floor of the ENLAB building and occupies about 1500 square feet of floor space. The Structural and Soil Dynamics Laboratory is used by both structural and geotechnical engineering programs. The
lab is used for calibration and storage of geophysical field-testing equipment. It also houses the Soil dynamics Laboratory. The soil dynamics laboratory contains Resonant Column / Torsional Shear testing equipment, and equipment for resonance and time domain material testing. This laboratory is used extensively for courses in Soil Dynamics, Geotechnical Earthquake Engineering, and Foundation Engineering.

The **Hydraulics Laboratory** is located in ENLAB 130 and occupies about 1600 square feet of floor space. The laboratory is used by several courses. 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 and uses a 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.

The **Soil Mechanics Laboratory** is located on the first floor of the ENLAB building and occupies about 1800 square feet of floor space. The laboratory is used extensively for classes in Soil Mechanics and Laboratory and Field Methods in Geotechnical Engineering. The lab provides equipment for the following tests, Atterberg Limits, relative density, grain size, permeability, compaction, consolidation, fall cone, direct shear, direct simple shear, unconfined compression and tri-axial shear. In addition, the lab contains the necessary equipment to demonstrate cyclic tri-axial shear, resonant column and torsional shear, stress path controlled tri-axial shear, and constant rate of strain consolidation to the undergraduate students. The laboratory utilizes modular testing systems that can be reconfigured for different laboratory tests. The Soil Mechanics Laboratory has three rooms and two constant temperature chambers. Graduate students, who have taken a graduate course in geotechnical laboratory and field methods, take the lead as teaching assistants in the undergraduate soil mechanics lab. These students, under the direction of a faculty member teach laboratory class to groups of not more than 12 undergraduate students. The undergraduate soil mechanics class includes 14 laboratory activities.

The **Structural Laboratory** is located on the first floor of the ENLAB building and occupies about 1300 square feet of floor space. The equipment in the laboratory includes a 600 kip compression machine, an 800 kip compression/tension machine, two Freeze/Thaw chambers, three extensometers, a Vishay data acquisition machine, and a strong floor/beam with pump and jack. The laboratory has heavy use with a number of structural and materials courses, undergraduate and graduate research, and senior design projects. Floor space has been a limitation. The lack of a strong floor limits the amount and type of structural testing that can be conducted. The relocation of part the structural laboratory to the College Technology building is in progress, The Technology building space will provide a larger, stronger floor, and space for several new experiments including space for the student ASCE steel bridge contest. Additional floor space has been acquired with the removal of several walls and the relocation of utilities in the ENLAB building.

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. The laboratory has all of the conventional surveying equipment including levels, theodolites, total stations, GPS equipment, etc. needed for a first
course in surveying. 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. 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. Although crowded, the Surveying laboratory is adequate for the undergraduate surveying course.

The CEE Department **Fabrication and Machining Shop** is located adjacent to the Concrete and Hydraulics labs on the first floor of the EL 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 fabrication and machine shop is staffed by a highly skilled, full-time manager/machinist (Ken Jewkes). The College of Engineering also 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 Civil and Environmental Engineering program in support of instruction.

**B. Computing Resources**

**Open Access Computer Labs**
The Department of Information Technology supports eleven 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, audiovisual 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 can be found in Supplement 10.

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 Visio, 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, 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 am, 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

Each CE 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. A faculty member and/or a graduate teaching assistant supervise the laboratory activity. The experimental setup is performed by the supervisor or, in some cases, the CEE lab and shop manager (Ken Jewkes).

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.

**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 Engineering. 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 4 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**

**Student Laboratory Safety**
Student safety in CE program laboratories is primarily the responsibility of the faculty member associated with the 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.

**Lab Inspections**
The Environmental Health and Safety Office at Utah State University inspects student laboratory facilities approximately every two years. Any lab safety issues are documented and provided to the CEE department and corresponding faculty members for corrective action.

**Improvements to the CE Student Safety Policies and Procedures**
Based on the zero-accident record over the last six years, it can be concluded that the CE program teaching labs are relatively 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 2014-2015 academic year.

1. Faculty members with the primary responsibility of 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 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 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 Civil Engineering (CE) program resides within the Department of Civil and Environmental Engineering (CEE). The leadership of the CE program is a shared responsibility that includes the CEE Department Head (Dr. Craig Adams) and the Associate Department Head for Undergraduate Affairs (Dr. Paul Barr).

The Department Head is the chief administrator of all resources provided to both the Civil Engineering and Environmental 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 ABET Assessment Committee, and work with the Department Head, Division Heads, faculty, and Dean’s office in guiding the future direction of Civil and Environmental undergraduate programs in the department.

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 CE and EnvE 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, 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 CE and EnvE programs 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 completed 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 CE program are sufficient to support student attainment of the student outcomes. Civil and Environmental Engineering are very applied fields, which makes the availability and effective utilization of teaching labs very important. The CE program has seven 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.
- 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, works directly with CE students. Further information on the Advising Center was presented in Criterion 1D.

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, EEOAA, 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 members leave, the department suffers a disruption in both its teaching and research missions. Since the last ABET review (2008), 11 CE faculty members have left (three retirements, five took jobs with a government agency or private practice, three took jobs at different universities). Over that same period of time, the CE program has added nine new faculty members.

At USU, the Office of the Executive Vice President and Provost has become proactive in efforts to retain highly research-productive faculty members. In particular, over the past 8 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 two courses 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 three courses per year after the third 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 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 Civil Engineering are listed in Tables 9-1 through 9-5, along with the ways in which the CE program meets these criteria. The entire CE curriculum is listed in Table 5-1 and described further in section 5.A. See Appendix B – Syllabi for content of individual classes.

Criterion #1

The curriculum must prepare students to apply knowledge of mathematics through differential equations, calculus-based physics, chemistry, and at least one additional basic science, consistent with the program educational objectives

The summary of courses that meet Criterion #1 requirements are shown in Table 9-1.

<table>
<thead>
<tr>
<th>Criterion Subject Area</th>
<th>CE Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>MATH 1210 – Calculus I</td>
</tr>
<tr>
<td></td>
<td>MATH 1220 – Calculus II</td>
</tr>
<tr>
<td></td>
<td>MATH 2210 – Multivariable Calculus</td>
</tr>
<tr>
<td></td>
<td>MATH 2250 – Linear Algebra and Differential Equations</td>
</tr>
<tr>
<td>Calculus-Based Physics</td>
<td>PHYS 2210 – General Physics – Science I</td>
</tr>
<tr>
<td></td>
<td>PHYS 2215 – General Physics – Science I Lab</td>
</tr>
<tr>
<td>Chemistry</td>
<td>CHEM 1210 – Principles of Chemistry I</td>
</tr>
<tr>
<td></td>
<td>CHEM 1215 – Principles of Chemistry Lab I</td>
</tr>
<tr>
<td>Earth Science</td>
<td>GEO 1110/1115 – Dynamic Earth (course &amp; lab)</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>GEOG 1000 – Physical Geology</td>
</tr>
<tr>
<td>Biological Science</td>
<td>BIOL 1010 – Biology and the Citizen</td>
</tr>
</tbody>
</table>
**Criterion #2**  
*Apply knowledge of four technical areas appropriate for civil engineering.*

The CE academic program includes five technical areas of civil engineering, as shown in Table 9-2.

**Table 9-2. CE Courses that Meet Program Criterion #2**

<table>
<thead>
<tr>
<th>Criterion Subject Area</th>
<th>CE Courses</th>
</tr>
</thead>
</table>
| Water:                         | CEE 3430 – Engineering Hydrology  
- Fluid Mechanics  
- Hydraulics  
- Water Resources  
CEE 3500 – Fluid Mechanics  
CEE 3510 – Hydraulics  
CEE 5460 – Water Resources Engineering  
CEE 5470 – Sedimentation  
CEE 5500 – Open Channel Flow  
CEE 5540 – Hydraulic Structure Design  
CEE 5550 – Hydraulics of Closed Conduits |
| Geotechnical Engineering       | CEE 4300 – Engineering Soil Mechanics  
CEE 5350 – Foundation Analysis & Design |
| Structural Engineering         | CEE 3020 – Structural Analysis  
CEE 3080 – Design of Reinforced Concrete Structures  
CEE 5070 – Structural Steel Design† |
| Environmental                  | CEE 3610 – Environmental Management  
CEE 3640 – Water & Wastewater Engineering†  
CEE 3780 – Solid & Hazardous Waste Management†  
CEE 5860 – Air Quality† |
| Transportation Engineering     | CEE 3210 – Transportation Engineering  
CEE 5230 – Geometric Design of Highways |

† CE students select one of three  
5000 level courses are electives
Criterion #3
*Conduct civil engineering experiments analyze and interpret the resulting data.*

CE students have eight required courses with laboratory components (see Table 9-3). In addition, some of the elective courses have laboratory components as well.

<table>
<thead>
<tr>
<th>CE Course Topic</th>
<th>Course Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>PHYS 2215 – Physics lab</td>
</tr>
<tr>
<td></td>
<td>CHEM 1215 – Chemistry lab</td>
</tr>
<tr>
<td>Surveying</td>
<td>CEE 2240 – Surveying</td>
</tr>
<tr>
<td>Reinforced Concrete</td>
<td>CEE 3080 – Design of Reinforced Concrete Structures</td>
</tr>
<tr>
<td>Fluid Mechanics &amp; Hydraulics</td>
<td>CEE 3510 – Hydraulics [no lab design]</td>
</tr>
<tr>
<td></td>
<td>CEE 5540 – Hydraulic Structure Design</td>
</tr>
<tr>
<td>Transportation</td>
<td>CEE 5220 – Transportation Engineering</td>
</tr>
<tr>
<td></td>
<td>CEE 5230 – Geometric Design of Highways</td>
</tr>
<tr>
<td></td>
<td>CEE 5240 – Urban &amp; Regional Transportation Planning</td>
</tr>
<tr>
<td>Soil Mechanics</td>
<td>CEE 4300 – Engineering Soil Science</td>
</tr>
</tbody>
</table>

5000 level courses are electives

Criterion #4
*Design a system, component, or process in more than one civil engineering context.*

CE courses that include the design of a system, component, or process are listed in Table 9-4. The three-semester civil engineering design sequence (CEE 3880, 4780, 4880) represents a significant design experience in the curriculum.

<table>
<thead>
<tr>
<th>CE Course Topic</th>
<th>Course Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 2240 – Surveying</td>
<td>Site planning</td>
</tr>
<tr>
<td>CEE 3510 – Hydraulics</td>
<td>Pipe networks</td>
</tr>
<tr>
<td>CEE 3880 – Civil Engineering Design I</td>
<td>Design skills</td>
</tr>
<tr>
<td>CEE 4300 – Engineering Soil Mechanics</td>
<td>Retaining walls</td>
</tr>
<tr>
<td>CEE 4780 – Civil Engineering Design II</td>
<td>Multidisciplinary civil engineer design project</td>
</tr>
<tr>
<td>CEE 4880 – Civil Engineering Design II</td>
<td>Multidisciplinary civil engineer design project</td>
</tr>
<tr>
<td>CEE 5540 – Hydraulic Structure Design</td>
<td>Orifice &amp; weir applications, detent, pond design</td>
</tr>
<tr>
<td>CEE 3080 – Reinf. Concrete Structures</td>
<td>Building design</td>
</tr>
<tr>
<td>CEE 5070 – Steel Design</td>
<td>Building design</td>
</tr>
<tr>
<td>CEE 5050 – Wood &amp; Masonry Design</td>
<td>Building design</td>
</tr>
<tr>
<td>CEE 5350 – Foundation Analysis &amp; Design</td>
<td>Building foundation design</td>
</tr>
<tr>
<td>CEE 5230 – Geometric Design of Highways</td>
<td>Highway design</td>
</tr>
</tbody>
</table>
**Criterion #5**

*Explain basic concepts in management, business, public policy, and leadership; and explain the importance of professional licensure.*

The courses contributing to Criterion #5 are listed in Table 9-5. As the first course in the three-semester civil engineering design sequence, CEE 3880 (Civil Engineering Design I) is used to provide instruction on ancillary topics related to design, including public policy, leadership, and the importance of licensure. Since Spring 2011, CE students are required to take a management course (MGT 3110) to help meet Criterion #5.

**Table 9-5. CE Courses that Meet Program Criterion #5**

<table>
<thead>
<tr>
<th>CE Course Topic</th>
<th>Course Focus Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGT 3110 – Management Org. &amp; People</td>
<td>Management, business</td>
</tr>
<tr>
<td>CEE 3880 – Civil Engineering Design I</td>
<td>Public policy, leadership, professional licensure</td>
</tr>
</tbody>
</table>

**B. Faculty**

The 2014-2015 program criteria for Civil Engineering state that *the program must demonstrate that faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. The program must demonstrate that it is not critically dependent upon one individual.*

Faculty qualifications are listed in Table 6-1, and teaching assignments for 2013-2014 are listed in Table 6-2. The civil engineering design sequence (CEE 3880, 4870, 4880) is taught by Dr. Richard Peralta, who is licensed Professional Engineer. Faculty members who teach the other classes with significant design content (Table 9-3) have significant relevant research/consulting experience and training for the course content. Five of those faculty members are licensed professional engineers.
Appendix A – Course Syllabi

Civil Engineering

Required and Elective Courses
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
Required

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
Required

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
CEE 1880 – Civil and Environmental Engineering Orientation and Computer Applications
Required

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

Instructor: William Rahmeyer

Textbook: On 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. (F, SP)
- Prerequisites: none
- Co-requisites: none

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
Required

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

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
Required

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
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
PHYS 2210 – Physics for Scientists and Engineers I
Required

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
Required

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
ENGR 2010 –Engineering Mechanics Statics
Required

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

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
GEO 1110 and 1115 – The Dynamic Earth
Required

Credits and contact hours: 4 credits

Specific course information: Covers both the internal and external processes shaping the earth. Major topics covered include plate tectonics, minerals, volcanism, igneous, sedimentary and metamorphic rocks, earthquakes, mass wasting, and landforms associated with streams, ground water, glaciation, deserts and coastal processes.

Criterion #3 Outcomes: a
GEOG 1000 – Physical Geography
Required

Credits and contact hours: 3 credits

Specific course information: Geographic analysis of physical processes and spacial distribution of natural elements (i.e., the atmosphere, hydrosphere, lithosphere, and biosphere).

Criterion #3 Outcomes: a
MATH 2210 – Multivariate Calculus
Required

Credits and contact hours: 3 credits

Specific course information: Vector calculus, multiple integration, partial derivatives, line and surface integrals. The theorems of Green, Gauss, and Stokes.

Criterion #3 Outcomes: a
MATH 2250 – Linear Algebra and Differential Equations
Required

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
ENGR 2030 Dynamics
Required

Course number and name:  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 2140 - Strength of Materials
Required

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

Instructors: Joseph A. Caliendo (Fall), James Bay (Spring)


Specific course information:
• Catalog description: Stress, strain, and deflection due to axial loads; moment and torsion; shear and moment diagrams; and equations of equilibrium and compatibility.
• Prerequisites: ENGR 2010 Statics
• Co-requisites: None

Specific goals for the course:
Specific outcomes of instruction:
• To develop an understanding of the relationship between loads applied to a deformable body and the internal stress, strain, and deformations induced in the body. In addition, analytical and problem-solving skills are developed.
• Criterion 3 outcomes: a, c, e

Brief list of topics covered: normal stress and shear stress & strain, indeterminate structures, thermal effects, stresses on inclined sections, transmission of power, indeterminate torsion, shear and bending moment diagrams, bending stresses, Mohr’s Circle, combined stresses.

Updated: August, 2013
Credits and Contact Hours: 2 credits, 3.5 contact hours per week.

Instructor: Kurt Becker

Textbook: None

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

Specific goals for the course:  
• Acquire and ability to produce accurate computer-aided drawing
• Become familiar with AutoCAD software produced by AutoDesk
• Develop an understanding of sketching, alternate methods of multi-view projection (section view, removed views, and auxiliary views)
• Understand advanced dimensioning techniques and working drawings
• Understand descriptive geometry
• Criterion 3 outcomes: a, e, 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
ENGR 2450 – Engineering Numerical Methods
Required

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

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
MAE 2300 – Thermodynamics I
Selected Elective

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

Course Coordinator: Christine Hailey


Catalog Description:
First and second laws of thermodynamics; analysis of open and closed systems; equations of state; power and refrigeration cycles; problem solving methodology. 3 credits, F, Sp, Su.

Prerequisites: MATH 1220; MATH 2210 (may be taken concurrently)

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

- Describe the thermodynamic properties of a pure substance using tabular data and equations of state.
- Apply the 1st Law of Thermodynamics to analyze idealized closed and open systems
- Apply the 2nd Law of Thermodynamics in order to analyze idealized closed and open system
- Apply ideal cycle analysis to simple power and refrigeration cycles.

Criterion 3 outcomes: a, e, k

Topics Covered:
- Thermodynamics concepts including system, state, state postulate, equilibrium, process and cycle
- Heat, work, first law of thermodynamics, energy balances, energy transfers to and from a system
- Properties of a pure substance
- Energy balances for an idealized closed systems
- Energy and mass balances for idealized control volumes
- Second law of thermodynamics, Carnot cycles, thermal efficiencies
- Entropy, isentropic processes, isentropic efficiencies
- Idealized power cycles: Otto, Diesel, Rankine
- Idealized refrigeration cycles: vapor compression cycle

Updated July 2013
CEE 2870 - Introduction to Computer Programming for CEE
Required

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:
• Programming Excel/CALC in Visual Basic for Applications (class notes in preparation),
  available through the USU Library), 2012

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

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, e, k

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
ENGR 2210 – Electronics
Selected Elective

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

Specific course information: Study and application of DC and AC concepts. Includes circuit fundamentals, theorems, laws, analysis, components, equipment, and measuring devices. Laboratory will include circuit design, construction and analysis of AC/DC circuits, and the use of measuring instruments, power supplies, and signal generators. Not available to students majoring in Electrical Engineering or Computer Engineering.

Prerequisites: Math 1210 and Math 1220

Criterion 3 outcomes: a, e, k
CEE 3020 – Structural Analysis
Required

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

Instructor: Marv Halling


Specific course information:
• Catalog description: Classification of structural types and development of loads. Analysis of trusses, beams, frames, cables, and arches (determinate and indeterminate). Calculation of deflections using superposition, geometric and energy methods. Utilization of approximate methods to analyze large structures.
• Prerequisites: ENGR 2140 Mechanics of Materials
• Co-requisites: None

Specific goals for the course:
• Specific outcomes of instruction:
  An ability to organize, approach, and solve engineering problems that are multi-step problems in which the solutions are not visible at the beginning of the process
  An understanding of the basic techniques involved with approaching engineering problems.
• Criterion 3 outcomes: This course addresses ABET outcomes a, c, e, k

Brief list of topics covered:
• Load Development
• Reactions
• Truss Analysis
• Beam and Frame Analysis
• Cable Analysis
• Arch Analysis
• Influence Lines for Determinate and Indeterminate Structures
• Deflections in Beams and Frames
• Approximate Analysis Methods
• Introduction of Stiffness Method

Updated: September 2013
CEE 3080 – Reinforced Concrete Design  
Required

Credits and contact hours: 3 credits, 3 contact hours per week (3 hours lecture, 2 to 3 labs)

Instructor: Paul Barr (Structural Engineering)


Specific course information:
• Catalog description: Design of reinforced concrete structural elements, simple and continuous reinforced beams, columns, joints, and one-way slabs. Includes steel and concrete materials laboratory.
• Prerequisites: CEE 3010 (Structural Analysis)
• Co-requisites: none

Specific goals for the course:
• Specific outcomes of instruction: At the conclusion of this class, students will develop and working knowledge of structural design using reinforced concrete. Students will have demonstrated an understanding of concrete and steel material behavior, rectangular beam analysis and design, T-beam analysis and design, shear design and analysis, Column design and analysis, footing design and analysis.
• Criterion 3 outcomes: a, c, e, k

Brief list of topics covered:
• Material properties of concrete
• Material properties of steel
• Analysis of rectangular reinforced concrete beams for flexure
• Design of rectangular reinforced concrete beams for flexure
• Analysis of reinforced concrete T-beams for flexure
• Design of reinforced concrete T-beams for flexure
• Analysis of reinforced concrete beams for shear
• Design of reinforced concrete beams for shear
• Analysis of reinforced concrete columns
• Design of reinforced concrete columns
• Analysis of reinforced concrete footings
• Design of reinforced concrete footings

Updated: August, 2013
CEE 3210 – Transportation Engineering

Required

Credits and contact hours: 3 credits, 2.5 contact hours per week (2.5 hours lecture)

Instructor: Kevin Heaslip


Specific course information:

- Catalog description: This course provides an introduction to highway engineering and traffic analysis. Topics covered include an introduction to the significance of highway transportation to the social and economic underpinnings of society, road vehicle performance, geometric design of highways, traffic flow and queuing theory, highway capacity and level of service analysis, traffic control and analysis at signalized intersections, and travel demand and traffic forecasting.

- Prerequisites: none

Specific goals for the course:

The objective of this course is for students to gain a solid understanding of the principles of highway engineering and traffic analysis. This course will present a large number of practical problems, and in sufficient depth, such that the student will be capable of solving real highway related problems.

Criterion 3 outcomes: a, b, c, e, g, h, i, j

Brief list of topics covered:

Introduction - Topics: Transportation and Society and the Role of civil engineering in the planning, design, construction, operation, maintenance of highways and associated transportation facilities and services, and transportation economics.

Geometric Design - Topics: Sight Distance Requirements, Vehicle Cornering, and Horizontal and Vertical Alignments

Traffic Flow and Queuing Theory - Topics: Traffic Stream Parameters and Relationships, Models of Traffic Flow, Queuing Theory and Traffic Flow Analysis, and Applied Queuing Models (D/D/1, M/D/1, M/M/1, M/M/N)

Traffic Control and Analysis at Signalized Intersections - Topics: Basic Signal Control, D/D/1 Queuing, Probabilistic Arrivals, and Traffic Signal Timing

Transportation Planning - Topics: Trip Generation, Mode and Destination Choice Models, and Highway Route Choice Models

Updated: August 2013
CxEE 3430 Engineering Hydrology
Required

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

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 3500 – Elementary Fluid Mechanics
Required

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

Instructor: William Rahymeyer, Blake Tullis


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

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 conservation of mass, energy and 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.
• Design a lab experiment to determine the absolute pipe wall roughness of PVC pipe (currently, students only design the steps for the experiment and a data reduction spreadsheet. They do not conduct the experiment.)
• 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
• Energy correction factor and other topics dealing with energy
• Momentum applications, and momentum correction factor
• Similitude and scale ratios
• Dimensional analysis and modeling
• Pipe discharge & Friction losses
• Open Channel flow & GVF profiles
• Flow measurements

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

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

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 3610 – Environmental Management
Required

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

Instructor: Laurie McNeill


• 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

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 3640 – Water and Wastewater Engineering
Selected Elective

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

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
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.

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 3880 – Civil Engineering Design I
Required

Credits and contact hours: 1 credit, 1 contact hours per week (1 hours 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, completion of design proposal.
- Prerequisites: ENGL 3080  Introduction to Technical Communication
- Co-requisites: None

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

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
CEE 4200 – Engineering Economics
Required

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

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
CEE 4300 – Engineering Soil Mechanics
Required

Credits and contact hours: 4 credits, 6 contact hours per week (4 hours lecture + 2 hours lab)

Instructor: Joseph A, Caliendo (lectures), James Bay (laboratory)


Specific course information:
• Catalog description: Physical and mechanical properties of soils.
• Prerequisites: ENGR 2140, Strength of Materials
• Co-requisites: CEE 3500, Fluid Mechanics

Specific goals for the course:
Specific outcomes of instruction:
• The outcome of the course is that the students will be well prepared to apply Geotechnical principles in a manner that will prepare them for the practice of Geotechnical engineering and/or for further study at the graduate level.

• Criterion 3 outcomes: a, b, e, g, k

Brief list of topics covered:
• Soil classification systems
• Soil permeability
• Seepage and head loss, piping
• Soil stresses
• Settlement analysis
• Soil strength, drained vs. undrained
• Slope stability
• Lateral earth pressures
• Introduction to foundations
• Numerical solutions
• Computer applications

Updated: December, 2012
CEE 4870 – Civil Engineering Design II
Required

Credits and contact hours: 2 credits, 0.25 contact hour per week (2 hours 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 proposed in Junior Design Proposal placed on team work, scheduling, design calculations, and completion of design report.
• Prerequisites: CEE 3880 - Civil Engineering Design I
• Co-requisites: None

Specific goals for the course:
• Specific outcomes of instruction:
  • Criterion 3 outcomes: c, d, 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 4880 – Civil Engineering Design III
Required

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 4880 - Civil Engineering Design III
- Co-requisites: None

Specific goals for the course:
- Specific outcomes of instruction:
- Criterion 3 outcomes: a, b, c, d, e, f, 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
CEE 4930 Special Topics: Geographic Information Systems in Water Resources
Elective

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

Instructor: David G Tarboton

Textbook: None.

Specific course information:
• Catalog description: Principles and operation of geographic information systems. Spatial hydrologic modeling done by developing a digital representation of the environment in the GIS, then adding functions simulating hydrologic processes.
• Prerequisites: None
• Co-requisites: None

Specific goals for the course:
• Specific outcomes of instruction:
  o Plot a map of a hydrologic region including measurement sites and associate it with time series of data measured at those locations;
  o Use web mapping to access geospatial and temporal water resources information;
  o Create a base map of a study region including watersheds, streams, and aquifers by selecting features from regional maps;
  o Interpolate measured data at points to form raster surfaces over a region, and spatially average those surfaces over polygons of interest;
  o Do hydrologic calculations using map algebra on raster grids;
  o Build a geometric network for streams and rivers;
  o Analyze a digital elevation model of land surface terrain to derive watersheds and stream networks
• Criterion 3 outcomes: a, e, k

Brief list of topics covered:
• Introduction to ArcGIS
• Building a Base Map
• Data Sources for GIS in Water Resources
• Geodesy, map projections and coordinate systems
• Spatial analysis using grids
• Digital elevation based watershed and stream network delineation
• Water resources data in space and time
• GIS and Groundwater
• Automating GIS workflows

Updated: September, 2013
CEE 5001 --Field Irrigation Systems Design and Evaluation
Elective

Credits = 3, contact hours = 3 (3 hours lecture)

Instructor: Wynn R. Walker

Criterion #3 Outcomes: a, c, e, g, k
Specific Course Information:
- Soil-water-plant relationships; evapotranspiration and water requirements; irrigation scheduling; infiltration; irrigation systems planning, quality. Evaluation, design and management of surface, sprinkle, and drip irrigation systems including system automation and maintenance.
- Prerequisites: MATH 1220 (calculus II), MATH 2210 (multivariable calculus) or 2250 (linear algebra & differential equations), and ENGR 2010 (statics I), ENGR 2030

Specific Goals for Course
- Gaining factual knowledge (terminology, classifications, methods, trends)
- Learning fundamental principles, generalizations, or theories
- Learning to apply course material (to improve thinking, problem solving, and decisions)
- Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
- Developing creative capacities (...designing...)
- Developing skill in expressing myself orally or in writing
- Learning how to find and use resources for answering questions or solving problems

List of topics to be covered:

<table>
<thead>
<tr>
<th>The Nature and Practice of Irrigation</th>
<th>Using CROPWAT</th>
<th>Sprinkle System Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Farm Water Management</td>
<td>Remote Sensing of ET and Management</td>
<td>Sprinkler Design Flows</td>
</tr>
<tr>
<td>Irrigation System Configurations</td>
<td>Surface Irrigation Evaluation</td>
<td>Solid Set Sprinkler Design</td>
</tr>
<tr>
<td>Irrigation Efficiency and Uniformity</td>
<td>SIRMOD Theory &amp; Programming</td>
<td>Sprinkler System Evaluation</td>
</tr>
<tr>
<td>Soil Moisture Characteristics</td>
<td>Furrow Irrigation System Design</td>
<td>Center Pivots Hydraulics</td>
</tr>
<tr>
<td>Infiltration</td>
<td>Border Irrigation System Design</td>
<td>Drip Irrigation Systems</td>
</tr>
<tr>
<td>Reference Evapotranspiration, ET0</td>
<td>Basin Irrigation System Design</td>
<td>Drip Irrigation and Filtration</td>
</tr>
<tr>
<td>Crop Water Requirements</td>
<td>Surge Flow</td>
<td>Drip Irrigation Evaluation</td>
</tr>
<tr>
<td>Introduction to Irrigation Scheduling</td>
<td>Land Leveling</td>
<td>Drip Irrigation Design</td>
</tr>
<tr>
<td>Penman-Monteith Eq.,Hargreaves Eq.</td>
<td>Pipeline Hydraulics Review</td>
<td>Chemigation</td>
</tr>
<tr>
<td>Intro to CLIMWAT &amp; CROPWAT</td>
<td>Hydraulics of Linear Laterals</td>
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<tr>
<td>Using CLIMWAT</td>
<td>Pressure Distributions in Linear Laterals</td>
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</tbody>
</table>
CEE 5005/6005 – Irrigation Conveyance and Control Systems
Elective

Credits and contact hours: 3 credits (3 hrs lecture)

Instructor: Leila Ahmadi

Textbook:
• USBR Water Measurement Manual, USBR, 2001
• Design of Small Canal Structures, USBR

Specific course information:
• Catalog description: Design, evaluation, and operation of irrigation distribution systems. Measurement and monitoring of flows and water levels, and canal and pipeline automation. Simulation of system hydraulics.

Specific goals for the course:
• Specific outcomes of instruction: Student will understand flow measurement fundamentals and get familiar with various methods of flow measurement methods for open channel and pipe flow. Also, design of water conveyance structures is discussed in the class.
• Criterion 3 outcomes: a, c, e, k

Brief list of topics covered:
• Flow measurement fundamentals
• Flumes for flow measurement in open channels
• Current metering in open channels
• Weirs for flow measurement: Sharp crested weirs, Broad crested weirs
• Calibration of Gates
• Flow measurement in pipes
• Canal design basics
• Design of earthen canals
• Inverted siphon
• Culvert design and analysis
• Flumes and channel transitions
• Energy dissipation structures
• Drop spillway for energy dissipation
• Protective structures and safety considerations

Updated: November, 2013
CEE 5010 – Matrix Analysis of Structures and Introduction to Finite Elements
Required

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

Instructor: Paul Barr (Structural Engineering)


Specific course information:
• Catalog description: Analysis of structures using matrix methods. Application of software based on the stiffness method to practical analysis problems. Introduction of Finite Element method based on stiffness approach and mathematical derivation of simple finite elements, along with application to practical problems.
• Prerequisites: CEE 3010 (Structural Analysis)
• Co-requisites: none

Specific goals for the course:
• Specific outcomes of instruction:
At the conclusion of this course, the students will have:
  • A proficiency in math, science & civil engineering principles
  • Demonstrated ability to solve engineering problems, use the latest engineering tools and technologies in engineering analysis and design.
  • An understanding of the fundamental theory of the FEA method
  • An understanding of the fundamental equations for different finite elements
  • An understanding of the computer modeling of engineering structures using these elements
  • A better understanding of the basic finite elements for truss, beam, frame and triangular plane elements.
  • A basic understanding of the application of FEA in plate and shell problems
  • A basic understanding of modeling approach in civil engineering applications and the ability to:
    1. create models for simple civil engineering structures by means of a FEA software
    2. evaluate FEA analysis results and understand the possible error sources
    3. interpret analysis results for design, analysis and research purposes

• Criterion 3 outcomes: a,e,k

Brief list of topics covered:
• Structural Analysis
• Truss members
• Beam members
• Frame members
• Triangle members
- Point loads
- Distributed loads
- Temperature loads
- Deflections and reactions
- Moment/shear diagrams
- Stresses and strains

Updated: August, 2013
CEE 5050 – Design of Wood and Masonry Structures
Required

Credits and contact hours: 3 credits, contact hours = 3 (3 hours lecture)

Instructor: David Pearson (Adjunct Professor)

Textbook:
- 2011 Building Code Requirements and Specification for Masonry Structures with Commentaries (TMS 402-11/ACI 530-11/ASCE5-11), reported by the MSJC.

Specific course information
- Catalog description: Design of beams, columns, joints, walls, and diaphragms in both wood and masonry materials. Current design codes will be utilized.
- Develop a general familiarity with the structural design of both wood and reinforced masonry structures. This included concepts of general structural analysis and design, as well as specific design procedures that are unique to each specific material. Focuses on Code Compliant design.
- Prerequisites: CEE 3080

Criterion 3 outcomes: a, b, e

Brief list of topics to be covered:
- Wood structural design
- Reinforced masonry structural design
- Structural code compliance

Updated Spring 2014
CEE 5070 – Structural Steel Design
Selected Elective

Credits and contact hours: 3 credits, 2.5 contact hours per week (2.5 hours lecture)

Instructor: Marc Maguire


Specific course information:
• Catalog description: Structural steel design using load and resistance factor design (LRFD) method. Focuses on design of structural beams, columns, and connections utilizing steel design codes.
• Prerequisites: CEE 3020 (Structural Analysis), CEE 3080 (Design of Reinforced Concrete Structures)
• Co-requisites: none

Specific goals for the course:
• Specific outcomes of instruction: Students will develop and understanding of structural steel theory and design, show proficiency in the mathematics and basic sciences required in order to solve structural engineering problems, and demonstrate the ability to organize, approach, and solve engineering problems that are multi-step problems in which the solutions are not visible at the beginning of the process.
• Criterion 3 outcomes: a, c, d, k

Brief list of topics covered:
• Describe basic properties of steel and steel behavior.
• Describe basic concepts of safety and load as they relate to structural steel design.
• Analyze and design tension members.
• Analyze and design compression members (axially loaded columns).
• Analyze and design braced and unbraced beams.
• Perform serviceability checks on steel beams and simple frames with diagonal bracing.
• Perform engineering tasks as part of a team.
• Prepare written communications to convey information about engineering activities.

Updated: August, 2013
CEE 5100 – Infrastructure Evaluation and Renewal  
Selected Elective

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

Instructor: Marv Halling

Textbook: Required: None

Specific course information:
- Catalog description: Evaluation of existing structural systems and techniques to improve their performance. Focuses on structures which are seismically deficient.
- Prerequisites: CEE 3080 (Reinforced Concrete Design), CEE 5070 (Structural Steel Design)
- Co-requisites: None

Specific goals for the course:
- Specific outcomes of instruction:
  - 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.
  - A broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
  - An understanding of the value of evaluation, maintenance, and renewal of existing infrastructures and the importance of these activities in the professional lives of modern structural engineers.
- ABET outcomes: c, h

Brief list of topics covered:
- Building Evaluation
- Building Rehabilitation
- Buildings – Case Studies
- Bridges, Evaluation-Visual
- Bridges, Evaluation-Material Testing
- Bridges, Evaluation-NDE Techniques
- Bridges Rehabilitation
- Bridges - Case Studies
- Dams, Evaluation and Rehabilitation
- Rail Systems, Evaluation and Rehabilitation
- Energy Generation Systems
- Water Systems

Updated: May 2014
CEE 5190 – GIS for Civil Engineers
Elective

Not taught in 2013-14.

Jeff Horsburgh (new instructor) will develop a new course for 2015-16
CEE 5220/6220 – Traffic Engineering
Elective

Credits and contact hours: 3 credits, 3.0 contact hours per week (2 hours lecture + 1 hour lab)

Instructor: Kevin Heaslip


Specific course information:
- Catalog description: Introduction to fundamentals of urban traffic engineering, including data collection, analysis, and design. Traffic engineering studies, traffic control devices, capacity and level of service analysis of freeways and urban streets. Application of traffic operations computer simulation models to the design of isolated intersection and coordinated traffic signal control systems.
- Prerequisites: CEE 3210 Transportation Engineering

Specific goals for the course:
- Specific outcomes of instruction: 1) Define the profession of transportation engineering; 2) Understand components of a transportation system; 3) Describe the characteristics of transportation system components; 4) Understand fundamental principles of traffic flow; 5) Know how to conduct traffic engineering studies; 6) Identify safety issues; 7) Incorporate safety in highway design; 8) Understand how intersections work and how to set intersection timing; 9) Understand highway capacity analysis procedures; 10) Apply highway capacity procedures to analyze traffic operation

- Criterion 3 outcomes: a, b, d, e, i, j, k

Brief list of topics covered:

Characteristics of the Driver, the Pedestrian, the Vehicle, and the Road
Traffic Engineering Studies
Highway Safety
Fundamental Principles of Traffic Flow
Intersection Design
Intersection Control
Capacity and Level of Service: Two-Lane and Multilane Highways
Capacity and Level of Service at Signalized Intersections

Updated: August 2013
CEE 5230 – Geometric Design of Highways
Selected Elective

Credits = 3, contact hours = 3 (1.5 hours lecture + 1.5 hours lab)

Instructor: Kevin Heaslip

Textbooks:
- A Policy on Geometric Design of Highways and Streets (AASHTO) published by the American Association of Highway and Transportation Officials, 2004
- Exploring AutoCAD Civil 3D 2012 by Sham Tickoo, Publ.:CADCIM Technologies, Schererville, IN.

Specific course information
- Catalog description: Principles of highway location and planning, with full consideration of economic, environmental, and other impacts. Capacity analysis of intersections and highways, passing-lane design, and risk-cost based horizontal and vertical alignment design. Introduction to design software through coursework and term projects.
- Prerequisites: CEE 3210 (Transportation Engineering)

Specific goals for the course
- Students will develop a good understanding of fundamental highway design at the system and component level, including performance and driver safety aspects.
- Criterion 3 outcomes: a, b, c, e, k

Brief list of topics to be covered:
- Highway classification
- Highway design controls and criteria (design vehicles, driver performance, traffic characteristics, highway capacity, safety, environment, economics)
- Highway basic element design (sight distance, horizontal & vertical alignment, cross section elements, at-grade intersections, grade separation and interchanges)
- Highway design guidelines (local, collector, rural, freeways)

Updated August 2013
CEE 5240 – Urban & Regional Transportation Planning
Elective

Credits and contact hours: 3 credits, 3 contact hours per week (2 hours lecture + 1 hour lab)

Instructor: Ziqi Song


Specific course information:
• Catalog description: Examination of travel demand forecasting, data collection, and survey data analysis techniques. Focuses on transportation-land use interactions and impact of market-based policies on travel demand. Theories and applications of traditional and advanced trip distribution, mode choice, and route assignment models.
• Prerequisites: CEE 3210 – Introduction to Transportation Engineering
• Co-requisites: none

Specific goals for the course:
• Specific outcomes of instruction: Proven themselves proficient in the fundamentals of transportation planning. Demonstrated the ability to apply the basic techniques learned in this course to model, plan, and evaluate transportation systems. Shown a capacity for investigation in transportation planning along with the ability to analyze and interpret transportation planning data. Demonstrated the capability to write a professional project report.
• Criterion 3 outcomes: a, b, c, e, h, i, j, k.

Brief list of topics covered:
• Transportation Planning Process
• 4-Step Travel Forecasting Model
• Statistical Analysis
• Trip Generation Analysis
• Trip Distribution Analysis
• Mode Choice Analysis
• Route Choice and Network Equilibration
• Network Design and Project Evaluation

Updated: September, 2013
CEE 5350 - Foundation Engineering
Selected Elective

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

Instructors: Joseph A. Caliendo (Fall)

Specific course information:

Prerequisites: CEE 4300, Soil Mechanics

- Co-requisites: None

Specific goals for the course:
Specific outcomes of instruction:

- CEE 5350 / 6350 is the application of the theories studied in Soil Mechanics CEE 4300 which is the pre-requisite for this course. The goal of the course is to introduce students to design and construction considerations for various foundation types.

- Criterion 3 outcomes: a, c, e, f, g, i, j, k

Brief list of topics covered: piles, drilled shafts, conventional retaining walls, and mechanically stabilized earth support systems. Field investigation techniques and computer software programs are also discussed

Updated: August, 2013
CEE 5380 – Earthquake Engineering
Selected Elective

Credits and contact hours: 3 credits, 3.5 contact hours per week

Instructor: James A. Bay


Specific course information:
- Catalog description: Covers wide variety of earthquake engineering topics, including seismology and earthquake source characterization, strong ground motion, seismic hazard analysis, wave propagation, soil dynamics, ground response, local site effects, liquefaction, seismic slope stability, soil improvement, vibrational analyses, and structural seismic design.
- Prerequisites: CEE 4300 - Engineering Soil Mechanics
- Co-requisites: None

Specific goals for the course:
- Specific outcomes of instruction, students will: 1) understand the principles and terminology of seismology relating to seismic hazard analysis; 2) understand the inputs and outputs of a seismic hazard analyses; 3) understand wave propagation and soil dynamics relating to seismic ground response; 4) be able to predict a sites susceptibility to soil liquefaction, 5) be able to perform simple seismic slope stability analyses; and 6) be able to predict seismic retaining wall loading.
- Outcome 3 criterion: (a), (b), (c), (e), (f), and (i)

Brief list of topics covered:
- Seismology, Vibrations, Seismic hazard analyses, Wave propagation, Soil dynamics, Seismic ground response, Liquefaction, Seismic slope stability, and Seismic retaining wall design.

Updated: November 2013
CEE 5430 – Ground Water Engineering
Elective

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: Junior level math and calculus background

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 5450/6450 – Hydrologic Modeling
Elective

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

Instructor: Richard C. Peralta

Textbook: PDFs of:
1. U.S. Geological Survey:
   c. Introduction to ground-water Hydraulics, by Gordon D. Bennett, 1976.
3. Corps of Engineers:
   a. HEC-HMS Vs 3.5 User’s Manual, Aug 2010
   b. HEC-HMS Vs 3.5 QuickStart_Guide, Aug 2010

Specific course information:
- Catalog description: Case studies and hands-on experience with hydrologic models and modeling methods for: (1) Design floods and spillway evaluation; (2) Flood plain delineation; (3) Dam break and inundation modeling; (4) Reservoir yield and time series modeling; (5) Reservoir inflow forecasting and operation; and (6) Urban hydrology, detention, and sedimentation basins.
- Prerequisites: Training in hydrology and numerical methods
- Co-requisites: None

Specific goals for the course:

Learning Outcomes for Groundwater
- Be able to apply Darcy's law to solve problems of flow through porous media.
- Understand the governing equations for 2D and 3D groundwater flow, including simplifying assumptions used in their derivation.
Be able to develop conceptual groundwater flow system models and appropriate boundary conditions.
Understand the basic structure and organization of the MODFLOW groundwater flow model.
Be able to select appropriate MODFLOW packages and develop input for a particular problem.
Understand MODFLOW solver issues and be able to address common instability issues.

Learning Outcomes for Watershed flow

Be able to apply common techniques to develop runoff hydrographs for watersheds.
Be able to use simple hydraulic calculators for surface water passing through hydraulic structures.
Be able to use software to route water through a surface water system.

• ABET Criteria Outcomes: a, k

Brief list of topics covered:
• Aquifers and Groundwater Storage
• Hydraulic Conductivity & Introduction to Groundwater Flow
• Darcy Law for layered flow
• Flow Direction and the Bernoulli Equation
• Darcy Law applied to multiple cells of a confined aquifer
• Finite Difference approximation for groundwater flow equation
• Introduction to MODFLOW
• Making MODFLOW input files
• Theis Solution and Superposition method
• Modflow and GMS: the grid approach
• Modflow and GMS: Anisotropy, confined-unconfined aquifer
• Modflow and GMS: Building, saving, and running a simulation, and reading model output
• Modflow and GMS: Head Dependent Boundaries and Zone Budget
• Modflow and GMS: Calibration, solver parameters, wetting and drying
• Modflow and GMS: Post Processing Viewing and Display Options
• Modflow and GMS: Contouring and Particle Tracking
• Urban Hydrology for Small Watersheds (USDA, TR-55)
• NRCS National Engineering Handbook, Ch. 16
• HEC-HMS user’s manual
• HEC-HMS QuickStart Guide
• Overview of rainfall, runoff and routing
• SCS Runoff curve Number Method and Hydrographs
• US Army Corps of Engineers HEC-HMS software
• Precipitation data
• Calibration, diversion, sources, sinks, junctions, canopy
• Using HEC-HMS software
• Flood flow statistical analysis
• HEC-SSP statistical analysis and HEC-RAS overview

Updated: October, 2013
CEE 5470 – Sedimentation Engineering
Selected Elective

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

Instructor: William Rahmeyer

Textbook: Online lecture notes and references

Specific course information:
• Explore river response, sediment transport, sediment and watershed yield, flow resistance, scour and erosion, and floodplain management.
• Prerequisites: CEE 3500
• Co-requisites: none
• Selected elective

Specific goals for the course:
• This course focuses on the basic principles and concepts of sedimentation engineering and transport. Application of the concepts and sedimentation design is produces through homework and a series of projects. The final exam is a project design that is an actual engineering problem and requires the final design to consider problems of sediment transport, erosion, and sediment deposition. The design of sediment control structures is covered.
• Criterion 3 outcomes: c, h, j, k

Brief list of topics covered:
• River Response and morphology
• Sediment yield, characteristics, measurements and field investigations
• Flow resistance
• Compound channels
• Sediment transport
• Local and general scour and scour from hydraulic structures and bridge crossings
• Sediment deposition in rivers, reservoirs, flood plains, and alluvial fans
• Settling basins
• Diversion structures
• Sediments delivery ratio and budgets
• Methods and procedures required by FEMA and flood plain management
• Stream stabilization
• Sediment hydrographs
• Erosion and bank protection
• Case studies in sediment problems

Updated: August, 2013
CEE 5500 – Open Channel Hydraulics with an Emphasis on Gradually Varied Flow
Selected Elective

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

Instructor: Mac McKee


Specific course information:

- Catalog description: Theory and applications of steady uniform and gradually varied flow under both subcritical and supercritical flow conditions. Solutions to multiple-network canal systems by solving systems of combined ordinary differential and algebraic equations. Method for defining natural channel systems and solving steady-state flows in them.
- Prerequisites: CEE 3500, Civil and Environmental Engineering Fluid Mechanics; CEE 3510, Civil and Environmental Engineering Hydraulics
- Co-requisites: None

Specific goals for the course:

- Specific outcomes of instruction: (1) understand the fundamental concepts of open channel flow, including development of basic governing equations for one-dimensional flow; (2) understand how to apply concepts of mass, energy, and momentum conservation to solve basic open channel design problems; (3) understand the fundamental principles of one-dimensional nonuniform gradually varied flow and how to apply them to the solution of simple design problems; (4) understand common open channel calculational techniques used in engineering practice
- Criterion 3 outcomes: a, c, e, k

Brief list of topics covered:

- specific energy, continuity, momentum
- forces on structures
- energy in open channels
- super/subcritical flows
- normal depth
- flow measurement
- momentum function, hydraulic jumps
- constant height waves, moving waves, moving hydraulic jumps
- unsteady flow equations, steady state gradually varied flow equations
- nonuniform flow, rapidly varied flow, gradually varied flow, control points
- open channel transition design
- common techniques in practice: use of HEC RAS

Updated: August, 2013
CEE 5540 - Hydraulic Structure Design
Selected Elective

Credits and contact hours: 3 credits, 3 contact hours per week (1.5 lecture + 1.5 lab)

Instructor: Blake Tullis

Textbook: None

Specific course information:

• Catalog Description: Design of a variety of hydraulic structures is explored, both in the classroom and laboratory. Integrates student-developed, original computer programs; commercially available software; field trips; and hands-on laboratory design projects to further students’ understanding of hydraulic structures.

• Prerequisites: CEE 3500, 3510

• Co-requisites: None

Specific goals for the course:

• Develop ability to apply fundamental hydraulic engineering skills in solving practical problems.

• Develop engineering design skill set that will potentially allow students to contribute immediately upon entering the profession.

• Recognize the importance of and enhance their ability to succeed in life-long learning activities will be reinforced.

• Criterion 3 outcomes: a, b, c, e, g, i, j, k

Brief list of topics covered:

• energy, continuity

• orifices: flow measurement and outfall diffuser applications

• weirs: flow measurement, nonlinear weirs

• dams: flow control structures

• storm water system components

• detention pond design and flood routing

Updated: August, 2013
CEE 5550 - Hydraulics of Closed Conduits
Elective

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

Instructor: Blake Tullis


Specific course information:
- Catalog Description: Design and operation of pipelines, economic analysis, pipe material and pressure class, pump hydraulics and selection, flow control valves, cavitation analysis and design, and hydraulic transients modeling and analysis.
- Prerequisites: CEE 3500, 3510
- Co-requisites: None

Specific goals for the course:
Students will develop a better understanding of how pipeline components influence overall system performance. They will develop a skill set that will potentially allow them to contribute immediately upon entering the profession.

Criterion 3 outcomes: a, c, e, g, i, j, k

Brief list of topics covered:
- energy, continuity, momentum
- economic analysis
- pipeline design and sizing
- pumps: head-discharge, net positive suction head, efficiency
- control valve selection and characteristics
- valve cavitation
- hydraulic transients

Updated: August, 2013
CEE 5860 – Air Quality Management
Selected Elective

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 3780, CEE 3760/BENG 3760, MAE 2300
• 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
  o inertial separation (cyclones)
  o electrostatic precipitation (ESPs)
  o fabric filtration (bag houses)
  o wet scrubbing
• Gaseous Control Technologies
  o condensation
  o thermal/catalytic oxidation (incineration)
  o adsorption
  o absorption

Updated: August 2013
CEE 5900 – Cooperative Practice
Elective

Credits and contact hours: 3 credits

Instructor: Joseph Caliendo, Kristina Glaittli

Textbook: Cooperative Education Internship Program, Employer Manual (Utah State University), available at http://usu.edu/career/htm/students/obtain-an-internship/coopmanual

Specific course information:
- Catalog description: A planned work experience in industry. Detailed program must have prior approval. Written report required.
- Prerequisites: none
- Co-requisites: none

Specific goals for the course:
- Students participate in on-the-job Civil Engineering work experience, are supervised by a professional engineer, and apply knowledge and skills learned in their undergraduate Civil Engineering program.
- Criterion 3 outcomes: a, d, e, f, g, h, i, j, k

Brief list of topics covered:
Topics/experiences vary with the specific job but may include:
- Drafting
- Design work
- Surveying
- Field inspections
- Report writing

Updated: August 2013
ENGL 2010 – Intermediate Writing: Research Writing in a Persuasive Mode
Required

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:
a. 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.
b. Prerequisites: English 1010 or examination.

Specific Goals for the Course:
a. 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.
b. Criterion 3 Outcomes: g

Updated: June 2014
ENGL 3080 – Intro to Technical Communication
Required

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

Instructor: English Department

Specific course information:
Catalog description: Introduces students to a variety of technical documents and improves their written and oral communication skills. Available to non-majors as a technical communication service course.

Criterion #3 Outcomes: g
MGT 3110 – Managing Organizations and People
Required

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

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:
  - Planning
  - Structure/Organizing
  - Leadership/Motivation/Team Building
  - 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

Updated: January 2014
Appendix B – Faculty Vitae

Civil Engineering Faculty
Lee Niel Allen

**Education**
Ph.D., Civil Engineering, University of Idaho, Moscow, Idaho. 1991
M.S., Agricultural & Irrigation Engineering, Utah State University, Logan, Utah. 1980
B.S., Agricultural & Irrigation Engineering, Utah State University, Logan, Utah. 1979

**Academic experience**
Utah State University, Associate Professor, Irrigation Extension Specialist, 2012- Present, full time
Utah State University, Extension Irrigation Engineer and Research Engineer, 1985-1992, full time
University of Nevada, Reno, Associate Professor, Extension Water Specialist for Southern Nevada, 1992-1993, full time

**Non-academic experience**
Natural Resources Consulting Engineers, Inc., Fort Collins, Colorado, Senior Engineer, water resources consulting, 1997-2012, full time.
Snyder Irrigation and Agri-Services, Inc. Salt Lake City, Utah, Irrigation Engineer, agriculture irrigation system design, sales, and construction, 1981-1985, full time.
Pitcher Irrigation, Preston, Idaho, Irrigation Engineer, agriculture irrigation system design, sales, and construction, 1980, full time

**Certifications or professional registrations**
Professional Civil Engineer, California, No. C51308, 1994
Professional Civil Engineer, Nevada, No. 011476, 1995
Professional Civil Engineer, Utah, No. 172734-2202, 1987
Professional Civil Engineer, New Mexico, No.15602, 2002

**Current membership in professional organizations**
American Society of Civil Engineer
US Committee on Irrigation Drainage

**Service activities**
At USU:
Civil and Environmental Engineering Department Irrigation Division Planning Committee Chair.
PhD Student Committees (3)
MS Student Committee (1)
Cache County Water Master Plan Steering Committee
Utah Water Users Workshop Planning Committee
Most important publications and presentations from the past five years

“Irrigation Strategies for Forage Production”, presentation at Utah Hay and Forage Symposium in St. George, Utah attended by about 200 producers, January 31- February 1, 2013.

“Irrigation Management for Safflower Production”, presentation at Safflower Production School in Logan, Utah attended by about 150 oil seed producers, February 26, 2013

“Water Banks”, presentation at Cache County Water Master Plan Steering Committee and interested public in Nibley, Utah attended by about 40 people on January 16, 2013.

“Irrigation Strategies for Best Use of Water Supplies”, presentation at Utah Irrigation Expo in Springville, Utah attended by about 150 people on February 28, 2013.


“Irrigation of Small Plots”, presentation at Utah Urban and Small Farm Conference in Salt Lake City, Utah attended by about 200 people on February 27, 2013.


Recent professional development activities

Attendance at U.S. Committee on Irrigation and Drainage Meetings in September 2010 in Fort Collins, Colorado; April 2012 in Austin, Texas; and April 2013 in Phoenix, Arizona.
Steven L. Barfuss

Education
M.S. in Civil and Environment Engineering, Utah State University, 1987
B.S. in Civil and Environmental Engineering, Utah State University, 1986

Academic experience
Utah State University, Research Associate Professor, 2013-Present
Utah State University, Research Assistant Professor, 2006-2013
Utah State University, Civil and Environmental Engineering course instructor, 2000-2009
Utah State University, Adjunct Assistant Professor, 1999-2006

Non-academic experience
Utah State University Research Foundation, Senior Engineer, 1996-2006
- Consulting Engineer, 1992-present
- Utah State University Research Foundation, Research Engineer, 1987-1996

Certifications or professional registrations
P.E., Civil Engineer, Utah No. 174703-2202, 1992-present

Current membership in professional organizations
- American Society of Civil Engineers (ASCE)
- United States Society on Dams (USSD)
- American Society of Mechanical Engineers (ASME)
- American Water Works Association (AWWA)
- International Association of Hydro-Environment Engineering and Research (IAHR)
- Association of State Dam Safety Officials (ASDSO)

Honors and awards
- Outstanding Researcher, CEE Department, Utah State University, Logan 2010
- Outstanding Undergraduate Research Mentor, CEE Department, Utah State University, Logan 2010
- Division best paper award, Journal AWWA 2010
- Division best paper award, Journal AWWA 2012

Service activities
At USU: none
Professional service: Member of USSD Hydraulics of Dams committee; USSD Spillways Subcommittee Chair; 2010 to present; ASME Main Fluids Committee Member; AWWA Water Loss Committee Member; AWWA Customer Metering Practices Committee Member

Most important publications/presentations from the past two years (* authorship)


Hydraulic Jump Air Entrainment Scale Effects in Closed Conduits. 35th International Association of Hydraulic Research World Congress (IAHR), Chengdu, China, (*, Joshua D. Mortenson, Michael C. Johnson)


Parshall Flume Discharge Correction Coefficients Through Modelling. Journal of Water Management, Institute of Civil Engineering (ICE), DOI: 10.1680/wama.12.00112, (Bruce Savage, Bryan Heiner, *)


Evaluation and Development of Unmanned Aircraft (UAV) for UDOT Needs. Utah Department of Transportation Research Division (UDOT), 40 Pages, Final Report (*, Austin Jensen, Shannon Clemens)

Effects of Particulates on Water Meter Accuracy through Expected Life. Journal of American Water Works Association (AWWA), Volume 104, Number 4 (April 2012), pp. 231-242, (Skyler Buck, Michael C. Johnson, *)


Recent professional development activities

USSD annual conference 2014, AWWA annual conference 2014
Paul J. Barr

Education
Ph.D. in Civil Engineering, University of Washington, 2000
M.S. in Civil Engineering, University of Washington, 1998
B.S. in Civil and Environmental Engineering, Utah State University, 1995

Academic experience
Utah State University, Associate Department Head, 2012-Present, Part-Time
Utah State University, Director of Utah Transportation Center, 2011-Present, Part-Time
Utah State University, Associate Professor, 2008-Present, full-time
Utah State University, Assistant Professor, 2003-2008, full-time
New Mexico State University, Assistant Professor, 2001-2003, full-time

Non-academic experience - none

Certifications or professional registrations
P.E., Civil Engineer, Utah No. 276287-2202, 2012-present

Current membership in professional organizations
American Society of Civil Engineers (ASCE)
Structural Engineers of Utah (SEAU)

Honors and awards
Engineering Educator of the Year, Structural Engineers Assoc., Utah, 2012
Outstanding Teacher, CEE Department, Utah State University, Logan 2012
Outstanding Teacher, CEE Department, Utah State University, Logan 2010
Outstanding Advisor, CEE Department, Utah State University, Logan 2009
Outstanding Advisor, CEE Department, Utah State University, Logan 2008

Service activities
At USU: Promotion and Tenure Committees (6), Chair of Safety Committee, Faculty Senate, Chair of the Undergraduate Curriculum Committee, Member of CEE Scholarship Committee, Advisor for ASCE Concrete Canoe Team, Advisor for ASCE Steel Bridge Team, Member of Faculty Search Committee (2), Taught Engineering State Challenge Sessions (5 years), Taught FE Review Sessions (8), Senior Design Project Faculty Advisor (~15 groups), Conducted Senior Exit Interviews.

Professional service: Member of Transportation Research Board Committee on Concrete Bridges, Member of American Society of Civil Engineers Committee on Methods of Monitoring, Member of American Society of Civil Engineers Committee on Structural Identification, Control Member of American Society of Civil Engineers Committee of Seismic Effects.

Most important publications and presentations from the past five years
• **Rodriguez, L.E., Barr, P.J.** and Halling, M.W.  “Temperature Effects on a Box Girder, Integral Abutment Bridge.” Accepted to the ASCE Journal of Performance of Constructed Facilities. 2012 (DOI 10.1061/(ASCE)CF.1943-5509.0000437)

• **Wells, Z.G., Barr, P.J.** and James, P.H.  “Performance of Post-Tensioned Curved-Strand Connections in Transverse Joints of Precast Deck Panels.” Accepted to the ASCE journal of Bridge Engineering. 2012.  (DOI 10.1061/(ASCE)BE.1943-5592.0000440)

• **Hodson, D.J., Barr, P.J.,** and Pockels, L.  “Live Load Comparison and Load Ratings of a Post Tensioned Box Girder Bridge.” Accepted to the ASCE Journal of Performance of Constructed Facilities. 2012. (DOI: 10.1061/(ASCE)CF.1943-5509.0000356)


**Recent professional development activities**

Engineering Education Session, TRB, January 2013
James A. Bay

Education
B.S., Civil and Environmental Engineering, Utah State University, 1986
M.S., Civil and Environmental Engineering, Utah State University, 1987
Ph.D., Civil Engineering, The University of Texas at Austin, 1997

Academic experience
The University of Texas at Austin, Associate Research Engineer, 1997-1998. full time.
Utah State University, Assistant Professor, 1998-2005, full time
Utah State University, Associate Professor, 2005-present, full time

Non-academic experience
None

Certifications or professional registrations
None

Current membership in professional organizations
ASCE

Honors and awards
C.A. Hogentogler Award for outstanding paper in ASTM Geotechnical Testing Journal 2012

Service activities
At USU: Geotechnical Division Head

Professional service: Utah Seismic Hazards Ground Shaking Committee

Most important publications and presentations from the past five years


- “Modifications of resonant column and torsional shear device for the large strain,” Y-S Bae, J.A. Bay, Computers and Geotechnics, September 2010

• “Stress integration approach for soil damping measurement in torsional Shear testing”, Inthuorn Sasanakul, James A. Bay, and Yoon-Shin Bae Proceedings: Geotechnical Earthquake Engineering and Soil Dynamics IV, May 2008.

Recent professional development activities
None
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 Contractor’s (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.
Education
University of South Carolina Civil and Environmental Engineering PhD, 2012
University of South Carolina Civil and Environmental Engineering MS, 2011
Clarkson University Civil and Environmental Engineering BS, 2007

Academic experience
2014 – present Research Assistant Professor Utah State University
2012 – 2014 Postdoctoral Research Associate University of South Carolina

Non-academic experience – none

Certifications or professional registrations - none

Current membership in professional organizations
American Geophysical Union (AGU)
American Society of Civil Engineers (ASCE)
American Water Resources Association (AWRA)

Honors and awards
Deepal S. Eliatamby Graduate Student Fellowship, 2008 - 2009

Service activities
Member of the AWRA Technical Committee

Selected Publications and Presentations (2010 – 2014)


Anthony Chen

Education
Ph.D., Civil Engineering, University of California at Irvine, 1997
M.S., Civil Engineering, University of California at Irvine, 1994
B.S., Civil Engineering, University of California at Irvine, 1992

Academic experience
Tongji University, Shanghai, China, Visiting Professor, 2013
Utah State University, Full Professor, 2010 – Present, full-time
Chulalongkorn University, Bangkok, Thailand, Visiting Professor, 2007
University of Seoul, Seoul, Korea, Visiting Professor, 2006
Utah State University, Associate Professor, 2004 – 2010, full-time
Utah State University, Transportation Division Head, 2001–Present,
Utah State University, Assistant Professor, 1999–2004, full-time
University of California at Irvine, Postdoctoral Researcher, 1999, full-time
Hong Kong University of Science and Technology, Research Fellow, 1998, full-time

Non-academic experience – none

Certifications or professional registrations – none

Current membership in professional organizations
Transportation Research Board (TRB)
International Scientific Committee Member of the International Symposium on Transportation
Network Reliability (INSTR)
International Advisory Committee Member of the Hong Kong Society for Transportation
Studies (HKSTS)

Honors and awards
2011 Shanghai Ministry of Education, China: Specially-Appointed Professor - Oriental Scholar
2009 University of Hong Kong: William Mong Visiting Research Fellowship
2005 Outstanding Paper Award, 6th Conference of the Eastern Asia Society for Transportation
Studies, Bangkok, Thailand
2004 Outstanding Paper Award, 9th International Conference of the Hong Kong Society for
Transportation Studies, Hong Kong
2002 Utah State University – CEE Department: Outstanding Researcher
2002 National Science Foundation (NSF) CAREER Award

Service activities
At USU: Promotion Committees (8), Post Tenure Committees (4), Civil Engineering
Department Head Search Committee (1), Faculty Search Committee (1), ABET Assessment
Committee, Faculty Senate, Transportation Research Board University Representative,
Graduate Advisor for the Transportation Division
Professional service: Transportmetrica (Associate Editor), Transportation Research Part B (Editorial Board Member), ASCE Journal of Urban Planning and Development (Editorial Board Member), TRB Committee, Organizer of the 4th International Symposium on Transportation Network Reliability, Organizer of the Workshop on Modeling and Analytical Methodologies for the Future Transportation Systems, Promotion and Tenure Reviews (domestic and international), reviewer for journals/proposals

Most important publications and presentations from the past five years


Recent professional development activities - None
Marvin W. Halling

Education
Ph.D., Applied Mechanics, California Institute of Technology (Caltech), Pasadena, CA, 1995
M.S., Civil Engineering, Stanford University, 1986
B.S., Civil Engineering, Summa cum laude, Utah State University, 1985

Academic experience
Professor, Utah State University, 2011-Present, Full Time
Associate Professor, Utah State University, 2000-2011, Full Time
Assistant Professor, Utah State University, 1994-2000, Full Time
Division Head, Structures Division, USU, Aug 01 - present
Associate Director, Utah Transportation Center, Aug 06 – Aug 11

Non-academic experience
Civil Engineer, Lindvall Richter Associates, Earthquake Sciences and Engineering, Los Angeles, CA, 3/89-9/90. Performed Seismic Risk Analyses
Civil Engineer, Johnson and Nielsen Associates, Consulting Structural Engineers, Los Angeles, CA, 6/86-3/89. Designed Commercial Buildings

Certifications or professional registrations
P.E., Civil Engineer, California No. C 43664, Aug 88 - present
S.E., Structural Engineer, Utah No. 4551629-2203, Dec 08 - present
P.E., Civil Engineer, Utah No. 4551629-2202, May 00 – Dec 08

Current membership in professional organizations
Fellow, American Society of Civil Engineers (F. ASCE) (Mar 08)

Honors and awards
UTRAC Trailblazer Award, Utah Department of Transportation, Research Division, presented to one person annually (Apr 13)
Fellow, American Society of Civil Engineers (F. ASCE) (Mar 08)
Outstanding Teacher and Professor of the Year, USU College of Engineering (01)
Outstanding Advisor, USU College of Engineering (97)
Outstanding Researcher, Department of Civil and Environmental Engineering (09, 08, 00)
Outstanding Teacher, Department of Civil and Environmental Engineering (11, 01, 00, 97)
Outstanding Advisor, Department of Civil and Environmental Engineering (07, 97)
Utah Engineering Educator of the Year Award, Structural Engineers Association of Utah (SEAU) (07, 05, 02)
Utah Engineering Educator of the Year Award, American Society of Civil Engineers (ASCE), Utah Chapter (04)
Achievement Rewards for College Scientists (ARCS) Scholar, Caltech, (93-95)

Service activities
At USU:
USU Central Promotion and Tenure Committee (12 - 13)
USU Graduate Council Member (05- 08)
USU Faculty Senate (13-16, 01 - 04)

Professional service:

Associate Editor, ASCE Journal of Structural Engineering (05-10)
Chair, ASCE Methods of Monitoring Committee (10-14)
Chair Elect, ASCE Methods of Monitoring Committee (07-10)
Control Member, ASCE Seismic Effects Committee, (05- 11)
Member, TRB Committee on Dynamics and Field Testing of Bridges (AFF40), (07-present)

Most important publications and presentations from the past five years


Recent professional development activities

Attend TRB, ASCE Structures Congress, as well as other conferences yearly.
Kevin Heaslip

Education
PhD, Civil Engineering (Transportation), University of Massachusetts Amherst, 2007
M.S., Civil Engineering (Transportation), Virginia Polytechnic Institute & State University, 2003
B.S., Civil Engineering, Virginia Polytechnic Institute & State University, 2002

Academic experience
Utah State University, Assistant Professor, (2008-Present), full time
University of Florida, Post Doctoral Associate, (2007-2008), full time

Non-academic experience
Gannett Fleming, Inc., Traffic Engineer, (2003-2004), full time

Certifications or professional registrations
Professional Engineer (Civil) #11773, New Hampshire

Current membership in professional organizations
Transportation Research Board (TRB)
Institute of Transportation Engineers (ITE)
Intelligent Transportation Society of America (ITS America)
American Society of Civil Engineers (ASCE)
American Public Transit Association (APTA)
Chi Epsilon, National Civil Engineering Honor Society

Honors and awards
2013 Civil & Environmental Engineering Undergraduate Research Mentor of the Year
2012 Transportation Research Board Annual Meeting Practice Ready Paper Designation for “Evaluation of Transportation Network Resiliency with Consideration for Disaster Magnitude”
2012 Civil & Environmental Engineering Outstanding Researcher
2011 Civil & Environmental Engineering Outstanding Researcher
2011 College of Engineering Undergraduate Research Mentor of the Year
2011 Civil & Environmental Engineering Undergraduate Research Mentor of the Year
2010 Energy Dynamics Laboratory Engineering Collaborator of the Year (with Kevin Womack)

Service activities
At USU:
Search Committee Chair (1), University Transportation Sustainability Council, ABET
Assessment Committee, Guest Lecturer (2 courses), Instructor, Utah State University
Fundamentals of Engineering Review Class, Instructor, Utah State University Curling Class,
Utah State University College of Engineering Strategic Planning - Untenured Professors
Committee, Engineering Undergraduate Research Program Selection Committee Co-Chair,
USU Institute of Transportation Engineers Student Chapter Faculty Advisor
Professional service:
ITS America Electronic Payment Systems Special Interest Group (Co-Chair), Transportation Research Board (AHD55): Committee on Signing and Marking Materials (Member), Transportation Research Board (AHB30): Vehicle Highway Automation, (Member), Transportation Research Board (AHB55): Work Zone Traffic Control Committee, (Member), Institute of Transportation Engineers Transportation Curriculum Advisory Committee (Member), Intelligent Transportation Society of America Crosscutting Forum (Member), Workshop Organizing Committee (3), Session Chair (6), Invited Panel Member (1), Paper & Proposal Reviewer (83)

Most important publications and presentations from the past five years

Recent professional development activities - none
Jeffery S. Horsburgh

Education
PhD, Civil and Environmental Engineering, Utah State University, 2009
M.S., Civil and Environmental Engineering, Utah State University, 2001
B.S., Environmental Engineering, Utah State University, 1999

Academic experience
Utah State University, Assistant Professor, 2013 – Present, full time
Utah State University, Research Assistant Professor, 2009 – 2013, full time
Utah State University, Research Engineer, 2001 – 2009, full time

Non-academic experience
Idaho National Engineering and Environmental Laboratory (INEEL), Summer Fellow, 1997, 1998, part time

Certifications or professional registrations – none

Current membership in professional organizations
American Geophysical Union (AGU)
American Water Resources Association (AWRA)

Honors and awards - none

Service activities
At USU: Faculty Search Committees (1), Staff Search Committees (4)

Professional service: National Science Foundation EarthCube Community Workshop Organizing Committee, CUAHSI / United States Geological Survey Optical Sensor Workshop Organizing Committee, Environmental Information Management Conference Organizing Committee, reviewer for journals/proposals

Most important publications and presentations from the past five years


Recent professional development activities
Michael C. Johnson

Education
Ph.D. in Civil and Environmental Engineering, Utah State University, 1996
M.S. in Civil and Environmental Engineering, Utah State University, 1994
B.S. in Civil and Environmental Engineering, Utah State University, 1992

Academic experience
Utah State University, Research Associate Professor, 2013-Present
Utah State University, Research Assistant Professor, 2000-2013
University of Utah, Instructor, 1997
Utah State University, Teaching Assistant, 1995

Non-academic experience
Independent Consultant, 1996-Present
Bingham Engineering, Project Engineer, 1996-1998
Harward Irrigation, System Designer, 1984-1990

Certifications or professional registrations
P.E., Civil Engineer, Utah No. 186063, 1997-present

Current membership in professional organizations
American Society of Civil Engineers (ASCE)
American Water Works Association (AWWA)
United States Society on Dams (USSD)

Honors and awards
Outstanding Teacher, College of Engineering, Utah State University, Logan 2003
Outstanding Teacher, CEE Department, Utah State University, Logan 2003
Outstanding Teacher, CEE Department, Utah State University, Logan 2002
Outstanding Advisor, CEE Department, Utah State University, Logan 2002
Division Best Paper, Journal AWWA, 2012
Division Best Paper, Journal AWWA, 2010
Division Best Paper, Journal AWWA, 2007

Service activities
At USU: UWRL Lab Expansion Committee, Lab Safety Committee, Senior Design Advisor, Taught Engineering State Challenge Sessions (3 years), Conducted Senior Exit Interviews.

Professional service: Member of AWWA Butterfly Valve Standards Committees 161 and M49 Manual, Member of AWWA Water Meter Standards Committees C700, C701, C702, C703, C704, C705, C706, C707, C708, C709, C710, C712, C713 and Manual M6. Member of Gate and Check Valves Standard Committee 242.

Most important publications and presentations from recent years

175


Jagath J. Kaluarachchi

Education
PhD, Environmental Sciences and Engineering, Virginia Tech, 1988

Academic experience
Utah State University, Professor, Senior Associate Dean, 2013 – now, full-time
Utah State University, Professor, Associate Dean, 2007 – 2012, full-time
Utah State University, Professor, Head, Water Division, 2004 – 2007, full-time
Utah State University, Professor, 2001 – now, full-time
Utah State University, Associate Professor, 1995 – 2001, full-time
Utah State University, Assistant Professor, 1991 – 1995, full-time

Non-academic experience
Royal Institute of Technology, Stockholm, Sweden, Visiting Professor on sabbatical, 1997-1998, full time

Certifications or professional registrations
Professional Engineer, State of Utah, License Number 96-295746-2202

Current membership in professional organizations
Fellow, ASCE
Member, AGU
Member, AWRA

Honors and awards
Fellow, ASCE
Diplomate, American Academy of Water Resources Engineering
Robins Award for Faculty Research of the Year, 2007-2008
Outstanding Researcher, College of Engineering, USU, 2006-2007

Selected Service activities
Provost’s Advisory Committee on Promotion and Tenure, 2002-2005
Graduate Council, 1999-2002
Present’s Committee on Selected Investments, 2004

Selected Professional services:
Chair, Watershed Council, EWRI, 2006-2009
Chair, Ground Water Quality Committee, EWRI, 2000-2002

Most important publications and presentations from the past five years
• Anayah, F. and J. J. Kaluarachchi. Improving the complementary methods to estimate evapotranspiration under different climatic and physical conditions. Journal of Hydrology, in review, 2013.


• Kim, D. and J. J. Kaluarachchi, Predicting natural streamflows in snowmelt-driven watersheds: Applicability between the flow duration curve and lumped modeling, accepted, Hydrology and Earth System Sciences, June 2013.

**Recent professional development activities**
Contributor, Ground water Hydrology Manual, EWRI, 2011
Member, EPA-STAR Review Panel, 2013
Marc J. Maguire

**Education**
PhD, Civil Engineering, Virginia Polytechnic Institute and State University, 2013
M.S., Civil Engineering, University of Nebraska-Lincoln, 2009
B.S., Civil Engineering, University of Nebraska-Lincoln, 2007

**Academic experience**
Utah State University, Assistant Professor, August 2013-Present, full-time
Virginia Polytechnic Institute and State University, Research Engineer, 2011-2013, full-time

**Non-academic experience**
Nebraska Department of Roads, Internship/Co-Op, Assisted engineers of the Bridge Division with highway bridge rating, research and rehabilitation, 2007, part-time

**Certifications or professional registrations**
EIT (2007)

**Current membership in professional organizations**
American Society of Civil Engineers (ASCE)
American Concrete Institute (ACI)

**Honors and awards**
2010 Virginia Tech – Graduate Research Development Program Grant
2010-2011 Virginia Tech – Dept. of Engineering Education: Dean’s Teaching Fellowship
2009-2011 Virginia Tech – Dept. of Civil and Environmental Engineering: Charles E. Via Fellowship

**Service activities** – none

**Most important publications and presentations from the past five years**
- “Understanding Concrete in Developing Countries.” Collins, W., **Maguire, M.** *Concrete International*. (Under Review)
• “Ultimate Strength and Detailing Considerations for Continuous Members with Unbonded Tendons.” Maguire, M., Collins, W., Halbe, K., Roberts-Wollmann, C. ACI Conference, Dallas, TX, 2012.

Recent professional development activities – none
Mac McKee

Education
PhD, Civil and Environmental Engineering, Utah State University, 1985
MS, Plant Ecology (Range Science), Utah State University, 1979
BS, Philosophy, Utah State University, 1972

Academic experience
Utah State University, Professor of Civil and Environmental Engineering, 1999-present, full time
Utah State University, Director, Utah Water Research Laboratory, 2003-present, full time
Utah State University, Associate Director, Utah Water Research Laboratory, 1999-2003
Humboldt State University, Professor of Environmental Resources Engineering, 1990-1998
Humboldt State University, Associate Professor of Environmental Resources Engineering, 1984-1990

Non-academic experience
Harza Engineering Company, Senior Water Resources Engineer, 1992, full time
Harza Engineering Company, Chief of Party and Resident Manager, India (Pune and New Delhi), 1990-1991, full time

Current membership in professional organizations
Universities Council on Water Resources

Service activities
At USU: member and chair of numerous Promotion and Tenure committees; currently, member of approximately 30 graduate advisory committees; member and chair of numerous University level advisory committees, search committees, and advisory committees

Professional service: Member, Utah Governor’s Unmanned Aerial Systems Test Site Advisory Board (2013-2014); President, Universities Council on Water Resources (2003-2004; 2012-2013); Board of Directors, Universities Council on Water Resources (2002-2003; 2006-2012); Member, US Presidential Advisory Committee on Water Information (2003-2012); Member, Great Salt Lake Planning Project Scientific Review Committee (1999-2000); Advisor, Utah Division of Water Resources, Utah State Water Master Plan Team (1999-2000)

Most important publications and presentations from the past five years
- Refereed Journal Articles (McKee students in Italics):

Recent professional development activities – none
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
• Groundwater optimization handbook: flow, contaminant transport, and conjunctive
  management. Peralta, R. with I. Kalwij. International Water Association and CRC Press,
• Strategic optimization for national water plan implementation. Peralta, R., A. Lueck,
• Intelligent space tube optimization for speeding groundwater remedial design.
• Non-adaptive and adaptive hybrid approaches for enhancing water quality management.
• Practical remedial design optimization for large complex plumes. Peralta, R. C., Kalwij, I.
  September 2008.

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
Practice (CAP^3), Regional and National Judge for the ASCE Steel Bridge Competition, and ASCE Department Heads Council.

**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
John D. Rice

Education
B.A., Geology, Humboldt State University, 1984
M.S., Civil Engineering, Utah State University, 1989
Ph.D., Civil Engineering, Virginia Tech, 2008

Academic experience
Utah State University, Assistant Professor, 2008 – Present, full time.
Virginia Tech, Instructor and Graduate Research Assistant, 2005-2008, part time
Virginia Tech, Via Fellow and Graduate Research Assistant, 2004 -2005, part time
Santa Rosa Junior College, Adjunct Instructor, 2001, part time
Chabot College, Adjunct Instructor, 1990, part time

Non-academic experience
Kleinfelder, Inc., Senior Geotechnical Engineer, 1996 -2004, full time
Woodward-Clyde Consultants, Assistant Project Engineer, 1990-1996
Kleinfelder, Inc., Senior Staff Engineer, 1988 – 1990

Certifications or professional registrations
Geotechnical Engineer, California, 1999
Civil Engineer, California, 1993

Current membership in professional organizations
American Society of Civil Engineers, 1995 to present.
Geo-Institute of ASCE, 1998 to present.
International Society for Soil Mechanics and Geotechnical Engineering, 2010 to present.
United States Society on Dams, 2005 to present.
Association of Dam Safety Officials, 2008 to present.

Honors and awards
ASCE – Utah Branch, Engineering Educator of the Year, 2013

Service activities
At USU:
CEE Graduate Affairs Committee

Professional service:
Journal Reviewer:
Journal of Geotechnical and Geoenvironmental Engineering (ASCE)
- 20 reviews, 2008 to 2013
International Journal of Geomechanics (ASCE)
- 1 review in 2010
Geotechnical and Geological Engineering (Springer)
- 3 reviews in 2010 and 2011
Most important publications and presentations from the past five years


Recent professional development activities

- PDCA – Professor’s Driven Pile Institute, June 2011
- NSF - CAREER Proposal Writing Workshop – March 2009
- Fourth NEES Centrifuge Workshop (Rensselaer Polytechnic Institute) – September 2008
- ADSC – Professor’s Drilled Shaft Course, June 2008.
- USSD - Risk Assessment for Dams Workshop (1-day), May 2006.
David E. Rosenberg

Education
PhD, Civil and Environmental Engineering, University of California, Davis, 2008
M.S., International Agricultural Development, University of California, Davis, 2003
M.S., Civil and Environmental Engineering, University of California, Davis, 2003
B.S.E Civil and Environmental Engineering, Cornell University, 1998

Academic experience
Utah State University, Assistant Professor, 2008 – present, full-time

Non-academic experience
Middle East Water Project, Consultant, 2005, part-time
U.S. Army Corps of Engineers, Hydraulic Engineer, Davis, CA, 2001-2003, full-time
Geologic Services Corporation, Staff Engineer, Columbia, MD, 2001, full-time
Royal Society for the Conservation of Nature (Jordan), Wetland Reserve Staff, 1998-2000, full-time

Certifications or professional registrations – none

Current membership in professional organizations
American Society of Civil Engineers (ASCE)
ASCE Environmental Water Resources Institute (EWRI)
American Water Resources Association (AWRA)
American Geophysical Union (AGU)

Honors and awards
2013 ASCE-EWRI – Quentin Martin Best Research-Oriented Paper Award, Journal of Water Resources Planning and Management
2012 National Science Foundation – Early Faculty CAREER Development Award
2010 ASCE-EWRI -- Best Reviewer, Journal of Water Resources Planning and Management
2010 Universities Council on Water Resources -- Best Ph.D. Dissertation in Water Policy and Socioeconomics
2009 Utah State University – CEE Department: Outstanding Faculty Advisor

Service activities
At USU: Faculty Search committees (1), CEE Department Graduate Affairs committee, ABET Technical Writing committee

Professional service: ASCE-EWRI Environmental Water Resources Systems committee and control group member, AWRA Utah Chapter board member, co-organizer and co-host of AWRA student paper writing competition (2012-2013), propose, organize, and moderate sessions at national meetings of AGU and ASCE-EWRI, review 6 to 13 articles per year for journals
Most important publications and presentations from the past five years


Recent professional development activities
Ziqi Song

Education
Ph.D., Civil and Coastal Engineering, University of Florida, 2011
M.S., Industrial and Systems Engineering, University of Florida, 2011
M.Phil., Civil Engineering, The University of Hong Kong (China), 2006
B.S., Transportation Engineering, Southeast University (China), 2003

Academic experience
Utah State University, Research Assistant Professor, 2013 – Present, full-time
University of Florida, Postdoctoral Research Associate, 2012 – 2013, full-time
Technical University of Munich (Germany), Postdoctoral Research Fellow, 2011, full-time

Non-academic experience
Jiangsu Provincial Transportation Planning Institute (China), Assistant Engineer, 2003 – 2004, full-time

Certifications or professional registrations
none

Current membership in professional organizations
Member, Transportation Research Board (TRB)
Member, Institute for Operations Research and the Management Sciences (INFORMS)
Member, Institute of Transportation Engineers (ITE)

Honors and awards
2011 Institute for Mobility Research (BMW Group): IFMO Postdoctoral Fellowship
2010 ITS Florida: Anne Brewer Scholarship Award
2006 – 2010 University of Florida: Alumni Graduates Fellowship

Service activities
At USU: none


Most important publications and presentations from the past five years

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
National Institute for Transport and Road Research, Pretoria, South Africa, Research on

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
American Water Resources Association, Utah Section, Award for Outstanding Service in the
Utah State University Civil and Environmental Engineering Department Outstanding Researcher

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:
Host for 2013 CUAHSI Conference on Hydrologic Information Systems and Modeling,
Program Chair for Water Data Integration and plenary session panelist, 2012 AWRA
Spring Specialty Conference Geographic Information Systems (GIS) and Water
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
ENSRR, 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 Assessment 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
Environmental Engineering Faculty
(supporting CE program)
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
(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)
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
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 Assessment 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
Appendix C – Equipment Used in Support of Instruction
Soil Mechanics Laboratory

The Soil Mechanics Laboratory is located on the first floor of the EL building and occupies about 1800 square feet of floor space. The laboratory is used extensively for classes in Soil Mechanics and Laboratory and Field Methods in Geotechnical Engineering. The lab provides equipment for the following tests, Atterberg Limits, relative density, grain size, permeability, compaction, consolidation, fall cone, direct shear, direct simple shear, unconfined compression and tri-axial shear. In addition, the lab contains the necessary equipment to demonstrate cyclic tri-axial shear, resonant column and torsional shear, stress path controlled tri-axial shear, and constant rate of strain consolidation to the undergraduate students. The laboratory utilizes modular testing systems that can be reconfigured for different laboratory tests. The Soil Mechanics Laboratory has three rooms and two constant temperature chambers.

Graduate students, who have taken a graduate course in geotechnical laboratory and field methods, take the lead as teaching assistants in the undergraduate soil mechanics lab. These students, under the direction of a faculty member teach laboratory class to groups of not more than 12 undergraduate students. The undergraduate soil mechanics class includes 14 laboratory activities.

Geotechnical Laboratory Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tru-Path Triaxial System</td>
<td>2</td>
<td>Can be used for conventional triaxial testing or kₜ consolidated triaxial in compression or tension. Can also be used for constant rate of strain consolidation testing.</td>
</tr>
<tr>
<td>Trautwein Direct Simple Shear Device</td>
<td>1</td>
<td>Custom direct simple shear device</td>
</tr>
<tr>
<td>SBEL Cyclic Triaxial System</td>
<td>1</td>
<td>Pneumatic cyclic triaxial system</td>
</tr>
<tr>
<td>Digi-Shear Direct Shear Device/Automated consolidation/unconfined compression</td>
<td>2</td>
<td>Each system can be configured as one direct shear device, or two automated incremental consolidation systems, or two unconfined compression devices</td>
</tr>
<tr>
<td>GeoNor Fall Cone</td>
<td>1</td>
<td>Fall cone device</td>
</tr>
<tr>
<td>Resonant Column/Torsional Shear</td>
<td>1</td>
<td>Stokoe-type resonant column/torsional shear device on vibration isolation table</td>
</tr>
<tr>
<td>Consolidation/Oedometer Devices</td>
<td>8</td>
<td>Dead-weight, incremental loading consolidation devices</td>
</tr>
<tr>
<td>Atterberg Limits testing stations</td>
<td>6</td>
<td>Atterberg limits testing equipment</td>
</tr>
<tr>
<td>Sieves and shakers</td>
<td>3</td>
<td>Sieves and shakers for mechanical grain size analysis</td>
</tr>
<tr>
<td>Hydrometer equipment</td>
<td>8</td>
<td>Hydrometers and cylinders for sedimentation grains size analysis</td>
</tr>
<tr>
<td>Compaction equipment</td>
<td>4</td>
<td>Hammers and molds for standard and modified Procter testing</td>
</tr>
<tr>
<td>Lab Vane</td>
<td>1</td>
<td>Laboratory vane shear device</td>
</tr>
<tr>
<td>Item</td>
<td>Quantity</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Constant-Head Permeameters</td>
<td>3</td>
<td>Device to measure permeability of course grained soils</td>
</tr>
<tr>
<td>Falling-Head Permeameters</td>
<td>3</td>
<td>Device to measure permeability of fine grained soils</td>
</tr>
<tr>
<td>Sand Cones</td>
<td>4</td>
<td>Device to measure in situ soil density</td>
</tr>
<tr>
<td>Pin Hole Dispersion Device</td>
<td>1</td>
<td>Device to measure internal erosion in soils</td>
</tr>
<tr>
<td>LA Abrasion Device</td>
<td>1</td>
<td>Device to measure abrasion resistance of aggregates</td>
</tr>
<tr>
<td>X-Ray Device</td>
<td>1</td>
<td>High-energy X-Ray device for imaging soil specimens</td>
</tr>
<tr>
<td>Oven</td>
<td>1</td>
<td>Oven for drying soil specimens</td>
</tr>
<tr>
<td>0.01 g Scale</td>
<td>1</td>
<td>Scale with 0.01 g resolution</td>
</tr>
<tr>
<td>0.05 g Scale</td>
<td>1</td>
<td>Scale with 0.05 g resolution</td>
</tr>
<tr>
<td>Standard Penetration Test Equipment</td>
<td>1</td>
<td>Tripod, catshead, drill rod, drill, and sampler</td>
</tr>
<tr>
<td>Dynamic signal analyzer</td>
<td>2</td>
<td>For laboratory and field testing of dynamic soil properties</td>
</tr>
<tr>
<td>Geophones</td>
<td>≈30</td>
<td>Various geophones for engineering geophysics</td>
</tr>
<tr>
<td>Accelerometers</td>
<td>≈12</td>
<td>Various accelerometers for field and laboratory dynamic testing</td>
</tr>
<tr>
<td>Drop-weight trailer</td>
<td>1</td>
<td>Custom 4500 lb drop-weight geophysical source</td>
</tr>
<tr>
<td>100-lb electro-magnetic shaker</td>
<td>1</td>
<td>100-lb, low-frequency electro-magnetic shaker with amplifier for dynamic/geophysical testing</td>
</tr>
<tr>
<td>Pile load testing facility</td>
<td>1</td>
<td>Piles, load frame, loading, measurement systems for performing axial and lateral pile load tests. This is a permanent test facility.</td>
</tr>
<tr>
<td>Groundwater measurement facilities</td>
<td>2 sites</td>
<td>Two sites are permanently instrumented for groundwater monitoring. One site has artesian aquifers, and the other perched aquifers. Instrumentation includes: Stand-pipes, pneumatic piezometers, vibrating wire piezometers, and a barometer.</td>
</tr>
</tbody>
</table>

**Structures and Concrete & Materials Laboratories**

The Structural Testing laboratory is located on the first floor of the EL building and occupies about 400 square feet of floor space. The laboratory has heavy use with a number of structural and materials courses, undergraduate and graduate research, and senior design projects.

The Concrete and Materials Laboratory is located in Room 110 of the Technology Building and occupies about 1800 square feet of floor space. The laboratory was moved since the last ABET visit to provide for more space and improve the laboratory experience for the undergraduate students. The laboratory has heavy use with a number of structural and materials courses, undergraduate and graduate research, and senior design projects. The laboratory also includes equipment used to store, mix and fabricate concrete. The laboratory includes facilities to cure
concrete samples and to test concrete in creep. In addition to class activities, the Concrete and Materials Laboratory is used for student projects such as the ASCE concrete canoe and steel bridge contest. The lab has a wide assortment of equipment including welders and grinding machine for steel.

Structures and Materials Laboratory Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinius-Olsen tension/compression machine</td>
<td>1</td>
<td>250 kip capacity</td>
</tr>
<tr>
<td>Forney Compression Machine</td>
<td>1</td>
<td>600 kip Capacity</td>
</tr>
<tr>
<td>Forney beam testing Machine</td>
<td>1</td>
<td>50 kip capacity</td>
</tr>
<tr>
<td>Freeze-thaw machine</td>
<td>1</td>
<td>ASTM 666 concrete testing</td>
</tr>
<tr>
<td>Two concrete mixers</td>
<td>2</td>
<td>3.5 cu. ft. capacity</td>
</tr>
<tr>
<td>Vishay Data acquisition</td>
<td>1</td>
<td>Strain, lvdt, thermocouple and high voltage</td>
</tr>
<tr>
<td>Geokon Datalogger</td>
<td>1</td>
<td>Vibrating wire strain gage datalogger</td>
</tr>
<tr>
<td>Geokon Multiplexers</td>
<td>3</td>
<td>16 channel VWSG connection box</td>
</tr>
<tr>
<td>Several rams of various sizes and capacities</td>
<td>1</td>
<td>25 kips – 400 kip capacity</td>
</tr>
<tr>
<td>6 creep rigs</td>
<td>6</td>
<td>4000 psi capacity for 6 x 12 inch cylinder</td>
</tr>
<tr>
<td>HP VXI data acquisition system</td>
<td>1</td>
<td>Strain gage and accelerometer acquisition</td>
</tr>
<tr>
<td>National instruments SCXI Data Acquisition system</td>
<td>1</td>
<td>Strain gage and accelerometer acquisition</td>
</tr>
<tr>
<td>36 one Hz velocity transducers</td>
<td>36</td>
<td>Linear velocity transducers for acceleration measurements</td>
</tr>
<tr>
<td>Force Balanced Accelerometers</td>
<td>10</td>
<td>Accelerometers for seismic measurements</td>
</tr>
<tr>
<td>20 kip eccentric mass shaker</td>
<td>1</td>
<td>Forced vibration machine to impart sinusoidal loads to structures</td>
</tr>
<tr>
<td>100 lb horizontal electromagnetic shake table</td>
<td>1</td>
<td>Class room model shaker for demonstrations</td>
</tr>
<tr>
<td>200 lb vertical electromagnetic shaker</td>
<td>1</td>
<td>Class room model shaker for demonstrations</td>
</tr>
<tr>
<td>Welder</td>
<td>1</td>
<td>Used for welding of student projects</td>
</tr>
</tbody>
</table>
Surveying Laboratory

The Surveying Laboratory is located on the first floor of the EL 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. The laboratory has all of the conventional surveying equipment including; levels, theodolites, total stations, etc. that is needed for a first course in surveying. 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. 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. Although crowded, the Surveying laboratory is adequate for the undergraduate surveying course.

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>5</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>2</td>
<td>2 rover units Logan City provides base station</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 EL building and occupies about 1600 square feet of floor space. The laboratory is used by several courses. The laboratory includes a basement area used for vertical pumps and recirculation water sumps. Activities in the undergraduate laboratory are supplemented by research projects in the Hydraulics Lab that is located in the Utah Water Research Laboratory (UWRL) (equipment not listed in below table). 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.</td>
</tr>
<tr>
<td>Culvert test setup</td>
<td>1</td>
<td>Used to experiment with culvert flow in the tilting flume with focus on inlet and outlet control.</td>
</tr>
<tr>
<td>50 by 100 ft floor models</td>
<td>multiple</td>
<td>Located at the UWRL to demonstrate physical modeling of hydraulic structures.</td>
</tr>
<tr>
<td>3 ft, 4ft, and 8ft wide flumes</td>
<td>multiple</td>
<td>Located at the UWRL to demonstrate open channel flow, sediment transport, and channel resistance.</td>
</tr>
<tr>
<td>4 inch to 72 inch diameter test pipelines</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 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. Institutional accreditation:

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:

- Department of Biological Engineering (Biological Engineering undergraduate program)
- Department of Civil and Environmental Engineering (Civil Engineering undergraduate program and Environmental Engineering undergraduate program)
- Department of Electrical and Computer Engineering (Electrical Engineering undergraduate program and Computer Engineering undergraduate program)
- Department of Mechanical and Aerospace Engineering (Mechanical Engineering undergraduate program)

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.

Organization charts showing the position of the engineering and computer science programs within the College are shown at Figures D-1. 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. College of Engineering
OFFICE OF THE EXECUTIVE VICE PRESIDENT AND PROVOST

EXECUTIVE VICE PRESIDENT AND PROVOST
Noelle E. Cockett

VICE PRESIDENTS

EXECUTIVE SENIOR VICE PROVOST
Laurren H. Smith

VICE PROVOST
Janis L. Boedtger
Robert W. Wagner
Travis R. Peterson

SENIOR VICE PROVOST
Rosita R. Meline

VICE PROVOST INTERNATIONAL EDUCATION
Mary S. Muddard

DEANS

DIRECTOR
AFFIRMATIVE ACTION/EQUAL OPPORTUNITY
Stacy A. Sturgeon

DIRECTOR
ANALYSIS, ASSESSMENT, & ACCREDITATION
Michael J. Tomens

INTERIM DIRECTOR HONORS PROGRAM
Nicholas E. Morrison

DIRECTOR
CENTER FOR INNOVATIVE DESIGN & INSTRUCTION
John S. LouMere

DIRECTOR
CENTER FOR WOMEN AND GENDER
Ann M. Austin

DIRECTOR
STEAM CENTER
David W. Felton

Source: USU Office of the Provost

Last updated 7/19/2013
OFFICE OF THE PRESIDENT

BOARD OF REGENTS

BOARD OF TRUSTEES

PRESIDENT
Stan L. Albrecht

ASSISTANT TO THE PRESIDENT
Nancy R. Hanks

DIRECTOR
GOVERNMENT RELATIONS
Neil H. Averette

CHANCELLOR, USU EASTERN
Joe Peterson

CHIEF OF STAFF AND SECRETARY TO THE BOARD OF TRUSTEES
Sydney M. Peterson

GENERAL COUNSEL
Craig J. Simper

CHIEF AUDIT EXECUTIVE
Jodi Bentley

VICE PRESIDENT AND DIRECTOR
ATHLETICS
S. Scott Barnes

VICE PRESIDENT
BUSINESS & FINANCE
David T. Cooley

VICE PRESIDENT
EXTENSION & DEAN, AGRICULTURE
Kenneth L. White

EXECUTIVE VICE PRESIDENT AND PROVOST
Noelle E. Cottrell

VICE PRESIDENT
RESEARCH & DEAN, GRADUATE STUDIES
Mark R. McLean

VICE PRESIDENT
STUDENT SERVICES
James D. Marses

VICE PRESIDENT
UNIVERSITY ADVANCEMENT & COMMERCIALIZATION
Robert T. Belton

CIO & ASSOCIATE
VICE PRESIDENT
INFORMATION TECHNOLOGY
Eric Hawley

Source: USU Office of the President

Last updated 8/2/2013

218
4. **Academic Support Units**

The typical engineering or computer science student has a number of elective and required courses that may place him or her in contact with a number of academic programs on the USU campus. The principal supporting programs and their department heads are enumerated below.

- Department of Biology, Alan Savitzky, Department Head
- Department of Chemistry and Biochemistry, Alvan Hengge, Department Head
- Department of Geology, V. David Liddell, Department Head
- Department of Mathematics and Statistics, D. Richard Cutler, Department Head
- Department of Physics, Jan Sojka, Department Head

5. **Non-academic Support Units**

Engineering and computer science students are supported by a number of non-academic units on campus. The principal programs and their leadership are enumerated 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
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**

Table D-4 describes the program enrollment and degree data. Table D-5 describes the personnel supporting the Civil and Environmental Engineering program.
### Figure D-4. Program Enrollment and Degree Data

#### Civil Engineering

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year</th>
<th>Total Undergrad</th>
<th>Total Grad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2013</td>
<td>FT 45 36 40 116 1</td>
<td>238</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>PT 5 8 5 17 0</td>
<td>35</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Fall 2012</td>
<td>FT 42 32 48 103 1</td>
<td>226</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>PT 7 3 8 16 0</td>
<td>34</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Fall 2011</td>
<td>FT 35 48 48 105 2</td>
<td>238</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>PT 5 7 5 6 0</td>
<td>23</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Fall 2010</td>
<td>FT 54 41 44 130 -</td>
<td>269</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>PT 4 3 7 13 -</td>
<td>27</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Fall 2009</td>
<td>FT 54 42 57 130 -</td>
<td>283</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>PT 9 6 3 12 -</td>
<td>30</td>
<td>39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degrees Awarded</th>
<th>Associates</th>
<th>Bachelors</th>
<th>Masters</th>
<th>Doctorates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Fall 2012</td>
<td>43</td>
<td>48</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2 Fall 2011</td>
<td>50</td>
<td>44</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>3 Fall 2010</td>
<td>64</td>
<td>47</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4 Fall 2009</td>
<td>60</td>
<td>40</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

Give official fall term enrollment figures (head count) for the current and preceding four academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

---

221
Figure D-5. Personnel

Civil and Environmental Engineering

Year¹: 2013

<table>
<thead>
<tr>
<th>Category</th>
<th>HEAD COUNT</th>
<th></th>
<th>FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FT</td>
<td>PT</td>
<td></td>
</tr>
<tr>
<td>Administrative²</td>
<td>1</td>
<td>2</td>
<td>1.16</td>
</tr>
<tr>
<td>Faculty (tenure-track)³</td>
<td>23</td>
<td>2</td>
<td>13.06</td>
</tr>
<tr>
<td>Other Faculty (excluding student Assistants)</td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Student Teaching Assistants⁴</td>
<td>42</td>
<td></td>
<td>6.6</td>
</tr>
<tr>
<td>Technicians/Specialists</td>
<td>4</td>
<td></td>
<td>3.8</td>
</tr>
<tr>
<td>Office/Clerical Employees</td>
<td>1</td>
<td>1</td>
<td>1.75</td>
</tr>
<tr>
<td>Others⁴</td>
<td></td>
<td></td>
<td></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.

⁴ Specify any other category considered appropriate, or leave blank.
Signature Attesting to Compliance

By signing below, I attest to the following:

That Civil Engineering (Name of the program(s)) 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 or Computing Programs to include the General Criteria and any applicable Program Criteria, and the ABET Accreditation Policy and Procedure Manual.

Christine E. Hailey
Dean

Signature: ___________________________ Date: June 30, 2014