Program Improvement Plan (PIP)
Bachelor of Science in Civil Engineering

Department of Civil Engineering
College of Engineering, Computer Science, and Construction Management
California State University, Chico

Approved by the Department of Civil Engineering and the Professional Advisory Board

Fourth Edition
May 25 2016
Note: This document describes the Civil Engineering Program Improvement Plan (PIP). Summaries of findings and actions resulting from implementation of the PIP are provided in the companion documents, Program Improvement Report (PIR).

The PIP is updated periodically, but only when justified by significant changes to any part of the plan.

The PIRs are compiled on an academic year cycle and are based on the PIP in effect at the time of the report. Minor deviations from the applicable plan are called out in each report.

History of Modifications to the Program Improvement Plan:

<table>
<thead>
<tr>
<th>Version</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 2009</td>
<td>Comprehensive revision of the plan (2nd Edition).</td>
</tr>
<tr>
<td>May 2016</td>
<td>Major revision of program educational objectives (PEOs) (4th Edition).</td>
</tr>
</tbody>
</table>

The current edition of the PIP and all editions of the PIR are archived at: [http://www.csuchico.edu/ce/menu_about/menu_program_assessment.shtml](http://www.csuchico.edu/ce/menu_about/menu_program_assessment.shtml)
# Program Improvement Plan
Bachelor of Science in Civil Engineering

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1.0 Introduction
The Civil Engineering Department has, for many years, incorporated multiple means of programmatic assessment. These include graduating senior surveys, alumni surveys, employer surveys, the pass-rate on the Fundamentals of Engineering Examination, input from the Civil Engineering Professional Advisory Board (PAB), critical evaluations by the Engineering Accreditation Commission of ABET, and instructor self-assessment of courses. Although these past practices have been invaluable to the BSCE program, development and refinement of assessment strategies are ongoing.

Since the Fall 2003, the department has employed a comprehensive plan for direct assessment of all identified student learning outcomes within the academic program. This undertaking provides program assessment through direct measures of student achievement, as collected and evaluated within student assignments embedded in selected required courses in the CE curriculum.

2.0 Program Student Learning Outcomes

2.1 Program Student Learning Outcomes

The Department of Civil Engineering has adopted for the BSCE degree program the student learning outcomes (SLOs) specified by ABET and shown below. The SLOs are specific statements that describe what students are expected to know and be able to do by the time of graduation.

| Students completing the civil engineering program at CSU, Chico must demonstrate the: |
|---------------------------------|---------------------------------|
| a. Ability to apply knowledge of mathematics, science, and engineering, including: |
|   a1. mathematics through differential equations, |
|   a2. calculus-based physics, |
|   a3. chemistry, |
|   a4. biology, and |
|   a5. four technical areas appropriate to civil engineering; |
| b. Ability to design and conduct civil engineering experiments, as well as to analyze and interpret the resulting data; |
| c. Ability to design a system, component, or process to meet desired needs in more than one civil engineering context and within realistic constraints; |
| d. Ability to function on multidisciplinary teams; |
| e. Ability to identify, formulate, and solve engineering problems; |
| f. Understanding of professional and ethical responsibility, including the importance of professional licensure; |
| g. Ability to communicate effectively by written, verbal, and visual means; |
| h. Ability to understand the impact of engineering solutions in a global, economic, environmental, and societal context; |
| i. Ability and recognition of the need for to engage in life-long learning; |
| j. Knowledge of contemporary issues as they relate to civil engineering; |
| k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice; and |
| l. Understanding of basic concepts in management, business, public policy, and leadership |
2.2 Distribution of Learning Outcomes Throughout the Curriculum

The Civil Engineering curriculum is comprised of a minimum of 128 units of general education, mathematics, sciences, and engineering courses. The program is hierarchical in structure, a feature typical of engineering programs. Consequently, most courses are specified by the faculty rather than selected by the student and prerequisite chains are common (Table 2.1).

The identified learning outcomes (a through l) are distributed throughout the program so as to provide a gradual increase in student proficiency (Table 2.2). Concepts are generally introduced in basic courses and then practiced in more advanced courses. In some courses where concepts are practiced, students are also assessed in order to measure their proficiency in selected program outcomes.

Each program outcome is addressed in multiple courses through a progressive distribution of content across the major. For example, outcome c: an ability to design a system, component, or process to meet desired needs in more than one civil engineering context and within realistic constraints is introduced, within different contexts, in three courses, is practiced in at least six courses, and is directly assessed in two courses – CIVL 461 Water Resource Engineering and CIVL 5###C Capstone Design Selection (Table 2.2).

The courses selected for assessment of student learning outcomes all provide significant treatment of the target outcome, do so in a manner that can be assessed, and complement each other when more than one course is identified for a single outcome (rather than just providing redundancy). Assessment is generally undertaken at the upper-division level so as to measure student achievement of a particular awareness, skill, or ability at a relatively advanced level.

2.3 Direct and Embedded Assessment

The direct assessment process as developed by the CIVL department is a valuable component of the portfolio of assessment measures. Changes to the process are continuous; if nothing more than to reflect differing pedagogy when instructional assignments change. One key feature of the CIVL assessment plan is that it is “embedded” as a natural feature in each related course – so the assessment metric must be tied not just to the course but to the individual instructor, as well.

A detailed description of the assessment methodology is provided in Appendix A: Direct Assessment Measures. The assessment plan addresses program assessment through direct measures of student achievement such as the final grade in a course or a score on a specific course assignment. The assessment results are used to focus on possible weaknesses in and suggested enhancements to the civil engineering program. For example, if the assessment results for ABET outcome c: ability to design a system, component or process to meet desired needs as measured in CIVL 461 Water Resource Engineering consistently fall short of the specified standard, then the department will consider increased or enhanced treatment of this topic. These programmatic improvements might be incorporated in the assessed course, CIVL 461 in this example, but attention might just as well focus on a preceding required course containing this same learning outcome, e.g., a perceived weakness in this outcome as assessed in CIVL 461 might be addressed by enhancements to CIVL 321 Fluid Mechanics, a course preceding CIVL 461 that contributes to this same learning outcome.
TABLE 2.1 COURSE SEQUENCE IN THE CIVIL ENGINEERING CURRICULUM

Bachelor of Science in Civil Engineering

University Catalog 2014-2015

Major Academic Flowchart

Fall Semester (15 units)
- GE Area A2: Written Communication
- CIVL 101: Introduction to Civil Engineering
- MATH 120: Analytic Geometry and Calculus I
- CHEM 111: General Chemistry

Freshman Year

Spring Semester (17 units)
- HIST 130: U.S. History
- CIVL 175: Transportation Planning, Surveying & Graphics
- PHYS 204A: Mechanics

Sophomore Year

Fall Semester (16-17 units)
- GE Area A1: Oral Communication
- CIVL 211: Statics
- MATH Effective: MATH 220, 233 or 236

Spring Semester (16-17 units)
- GE Area C: Arts and Humanities
- CIVL 311: Strength of Materials
- PHYS 204B: Electricity and Magnetism

Junior Year

Fall Semester (17 units)
- GE Area D: Behavioral and Social Sciences
- CIVL 313: Structural Analysis
- MATH 260: Elementary Differential Equations

Spring Semester (14-15 units)
- Free Elective (To achieve 128 total units)
- CIVL 411: Soil Mechanics and Foundations
- Science Electives: Select from list of four

Senior Year

Fall Semester (17 units)
- GE UD Pathway: Area C: Geosciences
- CIVL 415: Reinforced Concrete Design
- MECH 332: Thermodynamics

Spring Semester (15-16 units)
- GE UD Pathway: Area D: See list of courses
- CIVL 411: Water Resources Engineering
- POLS 155: American Government

Key:
- Course Number
- Course Title
- Course Credit
- Course Description
- Prerequisite
- Recommended

*Select from GE courses that are also classified as Writing Intensive (2 courses), U.S. Diversity (1 course), and Global Cultures (1 course).
TABLE 2.2 DISTRIBUTION OF LEARNING OUTCOMES IN THE MAJOR

<table>
<thead>
<tr>
<th>Course</th>
<th>Sem. Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 120</td>
<td>Diff. Calculus</td>
</tr>
<tr>
<td>MATH 121</td>
<td>Integ. Calculus</td>
</tr>
<tr>
<td>MATH selection</td>
<td>one course</td>
</tr>
<tr>
<td>MATH 260</td>
<td>Diff. Equations</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>Chemistry</td>
</tr>
<tr>
<td>PHYS 204A</td>
<td>Mechanics</td>
</tr>
<tr>
<td>PHYS 204B</td>
<td>Elec. &amp; Magnet.</td>
</tr>
<tr>
<td>Science selection</td>
<td>one course</td>
</tr>
<tr>
<td>MECH 210</td>
<td>Materials Eng.</td>
</tr>
<tr>
<td>MECH 320</td>
<td>Dynamics</td>
</tr>
<tr>
<td>MECH 322</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>CIVL 101</td>
<td>Intro. to Civil Eng.</td>
</tr>
<tr>
<td>CIVL 110</td>
<td>Surveying</td>
</tr>
<tr>
<td>CIVL 140</td>
<td>Trans. Pl., Surv. Gr.</td>
</tr>
<tr>
<td>CIVL 175</td>
<td>Env. Proc. Engr.</td>
</tr>
<tr>
<td>CIVL 205</td>
<td>Computer Apps.</td>
</tr>
<tr>
<td>CIVL 311</td>
<td>Statics</td>
</tr>
<tr>
<td>CIVL 302</td>
<td>Engr. Risk &amp; Econ.</td>
</tr>
<tr>
<td>CIVL 311</td>
<td>Strength of Mat.</td>
</tr>
<tr>
<td>CIVL 313</td>
<td>Stress Mech.</td>
</tr>
<tr>
<td>CIVL 321</td>
<td>Fluid Mech.</td>
</tr>
<tr>
<td>CIVL 411</td>
<td>Soil &amp; Foundations</td>
</tr>
<tr>
<td>CIVL 415</td>
<td>Refr. Concrete</td>
</tr>
<tr>
<td>CIVL 431</td>
<td>Envir. Engr.</td>
</tr>
<tr>
<td>CIVL 441</td>
<td>Transp. Engr.</td>
</tr>
<tr>
<td>CIVL 481</td>
<td>Water Res. Engr.</td>
</tr>
<tr>
<td>CIVL 495</td>
<td>Prof. Issues in Engr.</td>
</tr>
<tr>
<td>CIVL 500</td>
<td>Capstone Des. Project</td>
</tr>
<tr>
<td>CIVL 584C</td>
<td>Capstone Des. Selection</td>
</tr>
</tbody>
</table>

MAJOR REQUIRED COURSES, 87-99 UNITS

- a) ENGINEERING SELECTED ELECTIVE Couses, 3-6 UNITS (Does not include Capstone Design Selection)

<table>
<thead>
<tr>
<th>Course</th>
<th>Sem. Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVL 551</td>
<td>Foundations Engr.</td>
</tr>
<tr>
<td>CIVL 554</td>
<td>Steel Design</td>
</tr>
<tr>
<td>CIVL 556</td>
<td>Timber Design</td>
</tr>
<tr>
<td>CIVL 558</td>
<td>Civ. &amp; Wind Engr.</td>
</tr>
<tr>
<td>CIVL 562</td>
<td>Civ. 562</td>
</tr>
<tr>
<td>CIVL 567</td>
<td>Civ. 562</td>
</tr>
<tr>
<td>CIVL 571</td>
<td>Civ. 571</td>
</tr>
<tr>
<td>CIVL 581</td>
<td>Civ. 581</td>
</tr>
<tr>
<td>CIVL 582</td>
<td>Civ. 582</td>
</tr>
<tr>
<td>CIVL 585</td>
<td>Civ. 585</td>
</tr>
<tr>
<td>CIVL 592</td>
<td>Civ. 592</td>
</tr>
<tr>
<td>MECH 318</td>
<td>Heat Transfer</td>
</tr>
</tbody>
</table>

- b) TECHNICAL SELECTED ELECTIVE Couses, 6-3 UNITS

Select from department approved list

The metric chosen as the assessment measure varies by course: from a score on a particular assignment, to an aggregate score on multiple assignments, to an overall course grade. In all cases, the metric is a natural component of the course rather than an artificial element interjected solely for assessment purposes. Consequently, the metric is an integrated component of teaching and learning (i.e., embedded assessment). Furthermore, the applicable metric is, in all cases, comprised primarily of the learning outcome for which the metric is intended. This ensures that a student will
only be able to meet the specified standard score if they have achieved proficiency in the targeted learning outcome.

2.4 Collection of Embedded Assessment Data

At the beginning of each semester, instructors of courses having proposed modifications to assessment practices submit the modifications for review by the chair and, ultimately, the entire faculty. The purpose of this review is to verify that the assessment criteria are adequately defined and distributed for assessment of student success at attaining the specified outcome(s).

Near the end of each semester, an evaluation template is provided to each instructor for courses in which students are assessed (Appendix B: Sample Assessment Summary – Data Collection). Keeping with the essential requirement that the assessment process must be useful, manageable, and sustainable, the template is designed to provide a clear and complete assessment summary while minimizing additional workload for the instructor.

The template was designed to incorporate and summarize all of the different metrics identified for assessment for each assessed course. To use the template, each instructor simply enters the number of students who have achieved the standard (i.e., the achievement level representing minimally acceptable proficiency) associated with the learning outcome, and the number of students who have not achieved the standard. The template then automatically determines whether the results indicate acceptable or unacceptable overall achievement of the programmatic goal for the specified learning outcome (e.g., at least 90% of CE majors will meet the standard, which varies for different outcomes). Instructors are also prompted to make optional notes about the assessment experience in that particular course, including suggestions for possible changes to the assessment process. Following submission of individual course results, the assessment coordinator compiles an overall summary of that semester’s assessment.

2.5 Other Direct Measures of Assessment

Several other methods of assessment have been employed in order to provide additional, supplemental information regarding program effectiveness. While most of these methods are indirect measures, one direct measure, student performance on the Fundamentals of Engineering (FE) examination, has been used, although in the past with mixed results as discussed below.

The National Council of Examiners for Engineering and Surveying (NCEES) provides summary data, by university and major, for all students who are first-time examinees. The data consist of the number of students taking and passing the examination (also reported as a percentage pass rate). The mean pass rate is also presented for all ABET-accredited universities. Consequently, a comparison between the pass rates for Chico CIVL majors as compared to national norms would, seemingly, provide valuable reflection on program performance.

However, several factors limit the value of this information, the most significant being that students frequently sit for the examination prior to completing all of the subject matter coursework on which they will be tested. They are, in fact, encouraged by the program faculty to take the exam early in order to improve their chances of passing the test prior to graduation. These early test-takers can have a relatively high failure rate, although they may ultimately pass the exam in a subsequent attempt.
A pass rate based on a student’s final attempt, that is after all prerequisite coursework has been completed, would be a valuable direct measure of overall program effectiveness. However, the NCEES does not attempt to make this distinction. Consequently, the reported pass rate for CIVL majors at Chico State will suffer a degree of bias towards the low end, due to the small number of students taking the test and the variable number of students who might be taking the exam early.

As a possibly more representative enhancement, the CIVL department is collecting, via the senior survey (see Section 2.6), the number of students who have taken and who have passed the FE examination by the time of graduation. This survey is now administered online. The results of this direct measure of assessment will be reported in future program improvement reports (PIRs).

2.6 Indirect Measures of Assessment

The CIVL department employs indirect measures of student assessment in the graduating senior survey, which consists of two parts: a portion common to all majors in the College of Engineering, Computer Science, and Construction Management, plus a smaller, major-specific portion. The college portion, due to its greater complexity, is not significantly changed from semester to semester. The CIVL portion, being shorter and simpler, is easily changed to gather a variety of information. The graduating senior survey was first initiated in 1995, the current college portion of the survey dates from 2002, and the current version of the major-specific CIVL survey currently being implemented in the 2015-2016 academic year is shown in Appendix C.

A significant portion of the graduating senior survey consists of questions designed to gauge student satisfaction with various aspects of their curricular, co-curricular, and extra-curricular experiences. A five-point rating scale is used, with “worst” to “best” responses ranging from “1” to “5” respectively. The Department has set “3.50” as a desirable minimum mean response – i.e., a score below 3.50 will trigger an evaluation as to probable causes and, if appropriate, consideration of potential remedies.

3.0. Program Mission and Educational Objectives

3.1 Program Mission and Educational Objectives

The civil engineering program mission and educational objectives are reviewed periodically and updated as necessary, based upon input from the Civil Engineering faculty and the Professional Advisory Board after review of the alumni and employer surveys discussed below. The current statement approved by the faculty and the PAB is shown in Table 3.1. It was posted on the Department’s website on May 12, 2016 and can be found at the following link: http://www.csuchico.edu/ce/menu_about/menu_educational_mission.shtml The statement will also be published in the 2016-2017 University Catalog.
TABLE 3.1 PROGRAM MISSION AND EDUCATIONAL OBJECTIVES

<table>
<thead>
<tr>
<th>Civil Engineering Program Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>The civil engineering program has two comprehensive objectives:</td>
</tr>
<tr>
<td>1. Prepare graduates for immediate entry into a variety of professional careers.</td>
</tr>
<tr>
<td>2. Provide a solid undergraduate foundation in general principles enabling continued education at advanced levels.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Civil Engineering Program Educational Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Civil Engineering Program Educational Objectives are established jointly by the civil engineering faculty and the Department’s Professional Advisory Board (PAB).</td>
</tr>
<tr>
<td>The following program educational objectives describe the expected professional accomplishments of graduates within 5 years of graduation.</td>
</tr>
<tr>
<td>1. <strong>Objective 1:</strong> Secure a professional position in civil engineering and become a licensed engineer.</td>
</tr>
<tr>
<td>2. <strong>Objective 2:</strong> Attend graduate school in civil engineering or a related discipline to achieve a graduate degree in a specialty area.</td>
</tr>
<tr>
<td>3. <strong>Objective 3:</strong> Engage in lifelong learning through professional development.</td>
</tr>
<tr>
<td>4. <strong>Objective 4:</strong> Assume management or leadership roles in their respective organization.</td>
</tr>
<tr>
<td>5. <strong>Objective 5:</strong> Contribute to society through involvement in service activity.</td>
</tr>
</tbody>
</table>

3.2 Alumni Survey

The civil engineering alumni survey was revised by the Department and the PAB in May 2016 and is shown in Appendix D. Alumni are to be surveyed on a four-year graduation cycle with surveys administered every year online using Survey Monkey. Summaries of alumni surveys will be posted on the Department’s website. The next survey will be administered in October 2016.

The alumni survey is administered in such a way as to gather information correlated by the time duration subsequent to degree. Consequently, the responses from recent graduates will be viewed separately – from alumni transitioning from entry-level positions, to more responsible positions, to senior positions.

3.3 Employer Survey

The civil engineering employer survey was revised by the Department and the PAB in May 2016 and is shown in Appendix E. The survey will be administered every 2 years online using Survey Monkey with the results posted on the Department’s website. The content of this survey instrument is designed to complement the information solicited by the alumni survey. The next employer survey will be administered in October 2016.
3.4 Professional Advisory Board

The Civil Engineering Professional Advisory Board (PAB) was established in 1990 and currently meets at least two times per year. PAB members are key employers of CSU, Chico graduates, and thus the PAB is a major program constituency. Demographics of the PAB membership have varied over the years, but diversity has been a pervasive characteristic. While the PAB normally numbers between 15 and 20 members, an individual member may be male or female; younger or older; novice to veteran; practicing engineer or educator; active or retired; a CSU, Chico CIVL graduate or not. While most members are from the northern California region, some represent more distant reaches. The board is autonomous from the department although they welcome guidance and suggested tasks from the faculty.

While the PAB reflects a variety of interests, all members share a strong commitment to program assessment and improvement and, as a result, the PAB is one of the most valuable assessment means available to the department. Among other things, the board has also assisted with curriculum design, assessment, development of program educational objectives, senior design projects, constituent outreach, fundraising, and advocacy. The board is invaluable at reviewing the program’s educational goals and objectives, and the survey instruments used for alumni and employer feedback. They also regularly review and evaluate the Program Improvement Plan and all companion editions of the Program Improvement Report. A major role of the PAB is also reviewing alumni and employer surveys.

3.5 Engineering Accreditation Commission of ABET

The Engineering Accreditation Commission of ABET is the accepted national standard for accreditation of engineering programs. An accreditation review is a valuable catalyst for faculty self-reflection on program effectiveness. Following completion of an accreditation review, ABET provides statements regarding program strengths and inadequacies. Inadequacies are divided into three categories: a deficiency indicates that a particular accreditation criterion is not satisfied; a weakness indicates that a criterion is currently satisfied but will deteriorate without remedial action; and a concern indicates a criterion is currently satisfied but that positive action is needed to ensure future compliance.

Consequently, the ABET findings provide valuable targets for program improvement. All inadequacies, regardless of category, must be positively addressed prior to the subsequent accreditation review. Since the specific details of an ABET accreditation evaluation are a confidential communication between ABET and the educational institution, these details are redacted from the Program Improvement Report before it is made available publicly. However, these details are used internally by the program to help with continued evolution and improvement.
4.0 Analysis, Interpretation, and Application of Assessment Findings

4.1 Historical Findings

The breadth of assessment measures employed provides valuable guidance for modifications and improvements to the Civil Engineering program. These activities are compiled in annual Program Improvement Reports, commencing with the 2003-2004 assessment cycle. These reports are archived at:

http://www.csuchico.edu/ce/bs_civil_engineering/program_assessment.shtml

4.2 Assessment Process

All measures of programmatic assessment, both direct and indirect, are administered according to the protocols described previously. As they are available, assessment data are compiled and summarized under the direction of the department chair. This effort culminates over the summer recess for all data collected from the preceding academic year.

Two groups, the CIVL program faculty and the Professional Advisory Board, currently review these summaries. The faculty reviews the assessment findings at a dedicated meeting early in the fall semester, draws conclusions, and suggests possible actions based on the findings. Data summaries and the faculty determinations are then documented in the Program Improvement Report (PIR), which is completed annually under the direction of the department chair prior to the fall meeting of the Professional Advisory Board.

Based on its review of the PIR, the Professional Advisory Board may make additional recommendations to the program faculty. Since the board will generally meet subsequent to the completion of that year’s PIR, any board findings will normally be documented in the subsequent year’s PIR.

5.0 Summary and Path Forward

This program improvement plan will be reviewed on an annual basis by the Department and the PAB and updated as needed.
APPENDIX A: Direct Assessment Measures

Civil Engineering – Direct Program Assessment
Updated Spring 2015

Direct Program Assessment
Key features:
1. Identified elements of selected courses are used to measure, on average, student proficiency at attaining learning outcomes.
2. The measure of outcome assessment varies as appropriate to the course and to the outcome.
3. Faculty meet at least once each academic year to review assessment summaries from the previous semester(s).
4. Programmatic changes are considered as applicable.
5. The effectiveness of the assessment is also evaluated and modified as warranted.

Notes:
• Although the assessment is embedded in selected courses, it is not solely the responsibility of these courses to provide
  the identified outcome; rather, it is a responsibility of the program (i.e., collectively, of all prior courses for which each outcome
  is a component).
• This assessment plan has all three critical assessment characteristics: it is useful; it is manageable; it is sustainable.

Assessment Components:
Metric - The measure of student proficiency (e.g., a quantitative or qualitative measure of achievement on an assignment or test question that emphasizes the target outcome).
Rubric - Evaluative conclusions versus corresponding descriptions of achievement level (e.g., highest score represents mastery).
Standard - Evaluative result that represents minimally acceptable achievement of proficiency.
If the standard for any outcome is not consistently attained, the CE faculty will consider possible means of strengthening the academic program in support of the outcome.
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Course</th>
<th>Description</th>
<th>Metric</th>
<th>Rubric</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a: ability to apply knowledge of mathematics, science, and engineering, including:</strong></td>
<td>MATH 260 Differential Equations</td>
<td>This course is the final of four lower-division mathematics courses required in the CE program. Student success in this course is a measure of cumulative knowledge and ability in mathematics.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
</tr>
<tr>
<td><strong>a1: mathematics through differential equations</strong></td>
<td>PHYS 204A Mechanics</td>
<td>This course is the first of two lower-division physics courses required in the CE program and is the more applicable of these two courses to the CE major. Student success in this course is a measure of cumulative knowledge and ability in mechanics.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
</tr>
<tr>
<td><strong>a2: calculus-based physics</strong></td>
<td>CHEM 111 Chemistry</td>
<td>This course is the lower-division chemistry course required in the CE program. Student success in this course is a measure of cumulative knowledge and ability in Chemistry.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
</tr>
<tr>
<td><strong>a3: chemistry</strong></td>
<td>CIVL 175 Bio. Proc. in Envir. Engr.</td>
<td>This course is the lower-division biology course required in the CE program. Student success in this course is a measure of cumulative knowledge and ability in biology.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
</tr>
<tr>
<td><strong>a4: biology</strong></td>
<td>CIVL 415 Reinforced Concrete Design</td>
<td>This course provides an assessment of student proficiency in a technical area appropriate to civil engineering - structural and geotechnical engineering.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
</tr>
<tr>
<td><strong>a5: at least four technical areas appropriate to civil engineering</strong></td>
<td>CIVL 431 Environmental Engineering</td>
<td>This course provides an assessment of student proficiency in a technical area appropriate to civil engineering - environmental engineering.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
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<td></td>
<td>CIVL 441 Transportation Engineering</td>
<td>This course provides an assessment of student proficiency in a technical area appropriate to civil engineering - transportation and traffic engineering.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
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<td>CIVL 461 Water Resource Engineering</td>
<td>This course provides an assessment of student proficiency in a technical area appropriate to civil engineering - water resource engineering.</td>
<td>Student proficiency is measured by the final grade in this course.</td>
<td>Proficiency is demonstrated by obtaining a course grade of C- or better.</td>
<td>At least 80% of CE majors will obtain the minimally acceptable course grade.</td>
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<td>Outcome</td>
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<td>b: ability to design and conduct civil engineering experiments, as well as to analyze and interpret the resulting data</td>
<td>CIVL 415 Reinforced Concrete Design</td>
<td>The course includes a three hour laboratory which requires students to conduct laboratory exercises relating to concrete aggregates, cement, concrete and steel reinforcing. In addition, each student group is required to test, analyze, and predict performance of two reinforced concrete beams. The steel must be tension tested, the concrete must be compression tested, and the resulting strengths must be used to predict beam performance. The project is to be presented in a formal design report.</td>
<td>Student proficiency is measured by a score on the experimental results related to the bond tests.</td>
<td>Project lab report is evaluated on a 30 point basis. Typically, 27 to 30 points would represent mastery, 24 points above adequate proficiency, and 21 points adequate proficiency and below 21 points would be indicative that the student lacks proficiency.</td>
<td>The minimally acceptable achievement of proficiency is 21 points on a particular design report. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 441 Transportation Engineering</td>
<td>The focus of this course is more on the ability to analyze and interpreted data than on the design of experiments. The laboratory projects require that a fixed procedure be followed in collecting data.</td>
<td>The laboratory reports on the topics of traffic spot speed studies, traffic volumes studies, and traffic accident studies.</td>
<td>Each report is given the score between 0 and 15. Considered in the scoring is report format, neatness, the accuracy and thoroughness of results, a discussion of relevance and accuracy, and students' conclusions. An appendix must be included.</td>
<td>Each student is required to complete all three reports. A student must receive a score 11 or better on a minimum of two of the reports. At least 90% of CE Majors will meet the standard.</td>
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<td>c: ability to design a system, component, or process to meet desired needs in more than one civil engineering context and within realistic constraints</td>
<td>CIVL 461 Water Resource Engineering</td>
<td>This course emphasizes the design and analysis of several components related to water resources engineering. Some examples include: 1) Sizing a sewer based on population, peaking factors, slope, and cleanout velocities. 2) Selecting the number of pumps and stages for a pumped pipeline considering the duty point and power. Once selected, design intake elevation based on NPSH requirements. 3) Sizing a storm sewer based on municipal codes for return periods and IDF curves.</td>
<td>Proficiency is measured by a score on the problem in which the student designs one of the specific components mentioned.</td>
<td>The problem is evaluated on a 10 point basis. Typically, 9 to 10 points would represent mastery, 8 points above adequate proficiency, and 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>The minimally acceptable achievement of proficiency is 7 points. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 5##C Capstone Design Selection</td>
<td>These capstone design courses are focused on a culminating design project that are often based on real-world projects. Students work in groups to write a final design report and make a final oral presentation.</td>
<td>Proficiency is measured on the grade of the final design report.</td>
<td>Proficiency is demonstrated by obtaining a grade of 70% or better on the final design report.</td>
<td>At least 90% of CE majors will obtain the minimally acceptable grade.</td>
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<td>d: ability to function on multi-disciplinary teams</td>
<td>CIVL 495 Professional Issues in Engineering</td>
<td>Students work on multi-disciplinary teams to research a case study in engineering and society. Each team is required to submit a written report as a team and to make an oral presentation where each team member is required to talk for the same amount of time (approximately 15 minutes).</td>
<td>Each student on a team is evaluated on their presentation in class.</td>
<td>The students are rated as excellent, very good, acceptable, and poor.</td>
<td>A score of &quot;acceptable&quot; (70) is the minimally acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 595 Capstone Design Project</td>
<td>A team approach is utilized for the proposed study based upon an RFP calling for the design, analyze, and/or testing for the design. This is followed by a contract, progress report, change orders, a draft report, and final report. A presentation is made by the team with each member speaking on a point within the report for an approximate 5-7 minutes each.</td>
<td>Each student is evaluated on their presentation individually and in a team approach.</td>
<td>The students and team are evaluated on a 10 point basis. A score of 9 to 10 represents mastery, a score 8 represents above adequate proficiency, 7 points represent adequate proficiency, and a score below 7 is indicative of a lack of proficiency.</td>
<td>A score of adequate for the individual and as a team is the minimum acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td>e: ability to identify, formulate, and solve engineering problems</td>
<td>CIVL 441 Transportation Engineering</td>
<td>The student is required to prepare a formal proposal that leads to a formal design study report. In evaluating alternatives for final recommendation, the student must propose design criteria/constraints and evaluate each alternative based on the criteria.</td>
<td>The measure of proficiency is the student's formulation and solution of a design problem.</td>
<td>The evaluation of this concept is not easily made quantitative. The instructor provides comments and feedback to the student on problem formulation and evaluation in the proposal review and in evaluating the final design project.</td>
<td>A clear process must be presented by the student that includes the steps: establishment of design criteria and constraints, development of alternatives, evaluation of alternatives, a final recommendation based on the process. At least 90% of CE Majors will meet the standard.</td>
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<td>f: understanding of professional and ethical responsibility, including the importance of professional licensure</td>
<td>CIVL 495 Professional Issues in Engineering</td>
<td>Students are required to submit weekly memos on class readings. Each week a particular reading assignment focuses on a selected outcome.</td>
<td>The measure of proficiency is the student's score on a memo assignment. Each assignment is based on the particular outcome to be assessed.</td>
<td>Memos are evaluated on a 10 point basis. Generally, 9 to 10 points would represent mastery, 8 points above adequate proficiency, 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>A score of 7 on a particular memo assignment would be the minimally acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td>g: ability to communicate effectively</td>
<td>CIVL 595 Capstone Design Project</td>
<td>Communication through writing is certainly a major theme of course. Special attention is given to writing e-mails, ordinary business correspondence, press releases, feasibility studies, proposals, and contract language.</td>
<td>Student proficiency is measured by scores on individual assignments listed above.</td>
<td>Possible scores are as follows: ordinary business correspondence-10 points, general correspondence-20 points, proposal-20 points, contract-10 points, design/analyze/feasibility study-30 points.</td>
<td>A score of 70% of the possible score on at least 3 of the 5 items. At least 90% of CE Majors will meet the standard.</td>
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<td>Outcome Course</td>
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<td><strong>h: broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</strong></td>
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<td>CIVL 431 Environmental Engineering</td>
<td>Students are required to perform a lifecycle analysis of wastewater treatment systems, including a calculation of the carbon footprint of a treatment plant using both mechanized and natural systems.</td>
<td>Student proficiency is measured by the score on a particular assignment, which may be a test question or a laboratory exercise.</td>
<td>Tests or lab exercises are evaluated on a 10 point basis: &gt;9 points represents mastery; 8-9 points above adequate proficiency; 7-8 points adequate proficiency; and &lt; 7 points inadequate proficiency</td>
<td>A score of 7 on an assignment is the minimally acceptable proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 495 Professional Issues in Engineering</td>
<td>Students are required to submit weekly memos on class readings. Each week a particular reading assignment focuses on a selected outcome.</td>
<td>The measure of proficiency is the student's score on a memo assignment. Each assignment is based on the particular outcome to be assessed.</td>
<td>Memos are evaluated on a 10 point basis. Generally, 9 to 10 points would represent mastery, 8 points above adequate proficiency, 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>A score of 7 on a particular memo assignment would be the minimally acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td><strong>i: recognition of the need for, and an ability to, engage in lifelong learning</strong></td>
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<td>CIVL 495 Professional Issues in Engineering</td>
<td>Students are required to submit weekly memos on class readings. Each week a particular reading assignment focuses on a selected outcome.</td>
<td>The measure of proficiency is the student's score on a memo assignment. Each assignment is based on the particular outcome to be assessed.</td>
<td>Memos are evaluated on a 10 point basis. Generally, 9 to 10 points would represent mastery, 8 points above adequate proficiency, 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>A score of 7 on a particular memo assignment would be the minimally acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td><strong>j: knowledge of contemporary issues</strong></td>
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<td>CIVL 495 Professional Issues in Engineering</td>
<td>Students are required to submit weekly memos on class readings. Each week a particular reading assignment focuses on a selected outcome.</td>
<td>The measure of proficiency is the student's score on a memo assignment. Each assignment is based on the particular outcome to be assessed.</td>
<td>Memos are evaluated on a 10 point basis. Generally, 9 to 10 points would represent mastery, 8 points above adequate proficiency, 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>A score of 7 on a particular memo assignment would be the minimally acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 595 Capstone Design Project</td>
<td>Students are required to research a legal topic; law, ordinance, statute, regulation, judicial decision, or the like. Included should be the dates of the issue, purpose, who issued it, who enforces the issue, economic and non-economic consequences, who benefits, who is harmed, and is it effective.</td>
<td>The measurement of proficiency is based upon the extent of the research and the presentation.</td>
<td>The presentation is based upon a 10 point scale. A 9-10 represents mastery, a 8 is above adequate, a 7 is adequate, and below 7 is indicative of the fact that the student lacks proficiency.</td>
<td>A score of 7 on a particular presentation would be the minimal acceptable achievement level of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td><strong>k</strong>: ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>CIVL 461 Water Resource Engineering</td>
<td>Students are required to use both computer skills and field techniques in this course. Students perform stream gaging in Big Chico Creek using an Acoustic Doppler Velocimeter (ADV) to measure point velocities. They need to choose the stream cross section and select the number of sampling points (spacing). Then take this data into Excel and apply the USGS midsection method to determine the volumetric flow rate.</td>
<td>Student proficiency is measured by the score on this assignment.</td>
<td>The problem is evaluated on a 10 point basis. Typically, 9 to 10 points would represent mastery, 8 points above adequate proficiency, and 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>The minimally acceptable achievement of proficiency is 7 points. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 5##C Capstone Design Selection</td>
<td>These capstone design courses are focused on a culminating design project based on realistic civil engineering projects. The design project requires use of modern software tools, analysis techniques, and/or lab testing procedures.</td>
<td>Proficiency is measured by the percent score in a section of the final design report that requires the use of techniques, skills, or modern engineering tools.</td>
<td>This section of the design report is evaluated on a percentage basis of the number of points available for that section. Typically, &gt;90% would represent mastery, 80-90% represents above adequate proficiency, 70-80% represents proficiency, and &lt;70% indicates lack of proficiency.</td>
<td>The minimally acceptable achievement of proficiency is 70%. At least 90% of CE majors will meet the standard.</td>
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<td><strong>l</strong>: understanding of basic concepts in management, business, public policy, and leadership</td>
<td>CIVL 495 Professional Issues in Engineering</td>
<td>Students are required to submit weekly memos on class readings. Each week a particular reading assignment focuses on a selected outcome.</td>
<td>The measure of proficiency is the student's score on a memo assignment. Each assignment is based on the particular outcome to be assessed.</td>
<td>Memos are evaluated on a 10 point basis. Generally, 9 to 10 points would represent mastery, 8 points above adequate proficiency, 7 points adequate proficiency, and below 7 points would be indicative that the student lacks proficiency.</td>
<td>A score of 7 on a particular memo assignment would be the minimally acceptable achievement of proficiency. At least 90% of CE Majors will meet the standard.</td>
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<td>CIVL 595 Capstone Design Project</td>
<td>Organizations and operations of a consulting civil engineering company business is formally covered in class. Leadership is covered related to motivation and protection of employees in a consulting business. A text chapter on leadership is assigned.</td>
<td>Students are required to write a service contract with budget, workscope and protections related to professional liability.</td>
<td>Contract is evaluated on a 10 point scale. Leadership is evaluated during the overall presentation.</td>
<td>A score of 70% is required on the contract and on the presentation in relation to leadership. At least 90% of CE Majors will meet the standard.</td>
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APPENDIX B: Sample Assessment Summary – Data Collection

CIVL Program Outcome Assessment Summary V3

Outcome: g: ability to communicate effectively
Semester: Fall 2014
Major: CIVL
Course: CIVL 500C Capstone Design Selection
Instructor: Oakley

Description: These capstone design courses are focused on a culminating design project that are often based on real-world projects. Students work in groups to write a final design report and make a final oral presentation.

Metric: Proficiency is measured on the grade of the final oral report.

Rubric: Proficiency is demonstrated by obtaining a grade of 70% or better on the final oral presentation.

Standard: At least 90% of CE majors will obtain the minimally acceptable grade.

Minimally acceptable achievement (the Standard): 70
Number of students achieving the Standard: 9
Number of students failing the Standard: 1
Percentage of students achieving the Standard: 90.0%

Acceptable

Comments related to student performance at achieving this outcome measurement.
Eight out of nine students achieved the outcome. The only one who didn’t missed the class presentations.

Comments related to the suitability of this outcome measurement.
Adequate for this design class.

Suggestions for possible changes to this outcome measurement.

Enter information in the yellow fields. Do not change the file name. Return to Mills.
APPENDIX C: Graduating Senior Survey Instrument

CIVL Major-Specific Survey Questions
Note: This revised major-specific survey was implemented Fall 2015.

ECC Graduating Senior Survey

CIVL Supplemental Questions

Please mark the level of preparation that was provided by your education at CSU, Chico for each of the following areas.

(1) Very Unprepared (2) Unprepared (3) Neutral (4) Prepared (5) Very Prepared

CIVL Q1 1. Land Surveying
CIVL Q2 2. Land Development
CIVL Q3 3. Construction
CIVL Q4 4. Structures
CIVL Q5 5. Geotechnical
CIVL Q6 6. Transportation
CIVL Q7 7. Environmental
CIVL Q8 8. Water Resources
CIVL Q9 9. Management
CIVL Q10 10. Education
CIVL Q11 11. Comprehensive Design
CIVL Q12 12. Other Engineering Related
CIVL Q13 13. Non-Engineering Related

Please mark the level of preparation that was provided by your education at CSU, Chico for each of the following CE program goals.

CIVL Q14 14. BSCE graduates will be effective engineers.
CIVL Q15 15. They will be effective problem solvers.
CIVL Q16 16. They will be educated in engineering sciences.
CIVL Q17 17. They will be able to utilize a variety of engineering tools and techniques to enhance their professional abilities.
CIVL Q18  18. They will be familiar with applicable regulatory and professional issues.

CIVL Q19  19. They will be effective technical writers.

CIVL Q20  20. They will be effective oral communicators.

CIVL Q21  21. They will be able to function effectively in multi-disciplinary teams.

CIVL Q22  22. They will appreciate good citizenship, community service, and ethical conduct.

CIVL Q23  23. They will be aware of the impact of their designs on humankind and the environment.
APPENDIX D: Alumni Survey
CSU, Chico, Department of Civil Engineering

Introduction
A vital measure of our academic program is the success of our graduates. Please help us assess the preparation provided by our program by completing the following survey. The response you provide will be combined with those from other alumni to produce summary data, while individual response will be treated as confidential.

Please keep us informed of your contact information using the Alumni Information Form at http://www.csuchico.edu/ce - click on the Alumni and Friends tab. To assist with our program accreditation, please return this electronic survey as soon as possible.

Thank you for your assistance and we look forward to hearing back from you.
Chair, Department of Civil Engineering

Questions (they will be scroll down answers for most questions)

1. Contact information
   a. Name
   b. Title
   c. Company
   d. Email
   e. Phone number
   f. Registered engineer

2. Year you received your
   a. BSCE
   b. MS
   c. PhD
   d. EIT
   e. PE
   f. Other

3. Years in current position
   a. 1-5
   b. 6-10
   c. 11-20
   d. >20

4. Number of employees you supervise.
   a. 0-2
   b. 3-5
   c. 6-10
   d. >10

5. Employer
   a. Name
   b. Address
   c. Supervisor name
   d. Title
   e. Email
6. Indicate the number of professional conferences, workshops, etc. you participate in per year.
   a. 0
   b. 1
   c. 2-4
   d. >5

7. Are you a member of a professional organization (e.g., ASCE, APWA, ULI, etc.)
   a. Yes
   b. No

8. Are you a member of a community organization (e.g., Rotary, Lions Club, etc.)
   a. Yes
   b. No

9. How often do you make professional presentations?
   a. Seldom
   b. Monthly
   c. Yearly

10. Please mark the level of preparation that was provided by your education at CSU, Chico in the following areas (1 = not very prepared, 5 = very prepared) answer the ones that are applicable
    a. Land surveying and/or development
    b. Construction
    c. Structures
    d. Geotechnical
    e. Transportation
    f. Water resources
    g. Environmental
    h. Other

11. Please mark the level of preparation that was provided at CSU-Chico in terms of the following goals (1 = not well prepared and 5 = very well prepared). Answer only the questions that are applicable
    a. Problem solving
    b. Capable of using a variety of tools
    c. Familiar with regulatory and professional issues
    d. Technical writing
    e. Oral communication
    f. Effectiveness in working in teams
    g. Appreciate citizenship, community service, and ethical conduct
    h. Aware of the impacts of their work on humankind and the environment

12. Please comment on how the Department could improve its program.
13. Please forward this survey to other alumni you know so they can also give the Department important feedback.
APPENDIX E: Employer Survey
CSU, Chico Department of Civil Engineering

Introduction
A vital measure of our academic program is the success of our graduates. Our records indicate that you supervise one or more of graduates for our Civil Engineering program. Please help us assess the preparation provided by our program by completing the following survey. The response you provide will be combined with those from other employers to produce summary data, while individual response will be treated as confidential.

If you are not the appropriate person to complete this survey, please forward to the person who can complete the survey. Multiple responses are acceptable, but only if the responses are from supervisors of different graduates.

Please encourage your Chico State graduates to keep us informed of their contact information using the Alumni Information Form at http://www.csuchico.edu/ce - click on the Alumni and Friends tab. To assist with our program accreditation, please return this electronic survey as soon as possible.

Thank you for your assistance and we look forward to hearing back from you.
Chair, Department of Civil Engineering

Questions (they will be scroll down answers for most questions)
1. Contact information
   a. Name
   b. Current position
   c. Company
   d. Email
   e. Phone number
   f. Registered engineer
   g. CSU graduate
2. Nature of employment
   a. Government
   b. Construction
   c. Consulting
   d. Education
   e. Other
3. Years in current position
   a. 1-5
   b. 5-10
   c. More than 1
4. Approximate number of CSU-Chico grads your supervise
   a. 1-5
   b. 6-10
   c. 11-20
   d. Over 20
5. How many CSU, Chico grads are in management positions?
   a. None
   b. 1-5
   c. >5
6. Does your organization have an internship program?
   a. Yes
   b. No
7. Does your organization have a rotation program?
   a. Yes
   b. No
8. Does your program provide support for professional development?
   a. Yes
   b. No
9. Does your organization encourage employees to seek their PE license?
   a. Yes
   b. No
10. Please mark the level of preparation demonstrated by our grads in the following areas (1 = not very prepared, 5 = very prepared) answer the ones that are applicable
    a. Land surveying and/or development
    b. Construction
    c. Structures
    d. Geotechnical
    e. Transportation
    f. Water resources
    g. Environmental
    h. Other
11. Please mark the level of preparation demonstrated by our graduates that you supervise in terms of the following goals (1 = not well prepared and 5 = very well prepared). Answer only the questions that are applicable
    a. Problem solving
    b. Capable of using a variety of tools
    c. Familiar with regulatory and professional issues
    d. Technical writing
    e. Oral communication
    f. Effectiveness in working in teams
    g. Appreciate citizenship, community service, and ethical conduct
    h. Aware of the impacts of their work on humankind and the environment
12. Please comment on how the Department of Civil Engineering could improve its program.