STUDENT OUTCOMES ASSESSMENT PLAN (SOAP)

Civil Engineering Program

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I. BACKGROUND

The Civil Engineering Program (CE Program or Program) at Lyles College of Engineering (LCOE), California State University, Fresno (or Fresno State), is an accredited program by the Accreditation Board for Engineering and Technology (ABET). The Program was recently visited by ABET, November 2-4, 2012, and is currently awaiting the Final Statement from ABET which will likely arrive in late February or early March, 2013. This SOAP details amongst others the Mission (**Section II**), Program Education Objectives or PEOs (**Section III**), Student Outcomes or SOs (**Section IV**), Curriculum (**Section V**), Constituents (Section **VI**), and Assessment Tools and Plans (**Section VII**), of the Program. A few of the aforementioned components have been reformulated or updated per Program Audit Form[1] provided by ABET during the recent November 2012 visit.

II. PROGRAM MISSION STATEMENT

The mission statement of the Program is as follows:

> *The mission of the Civil Engineering Program is to provide the high quality education required for students to fully develop their professional qualities and skills as civil engineering, and to develop their personal potential to the greatest extent possible to serve the Central Valley and society at large.*

The mission statement has been adopted since the 2008-2009 AY, and its message is consistent to that of the Fresno State's.

III. PROGRAM EDUCATIONS OBJECTIVES

The Program Educations Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the Program is preparing graduates to achieve, and they are

a. **Technical Aptitude**: Be employed as engineers with the ability to use their technical knowledge, design, and problem solving skills for effective professional practice throughout their careers;
b. **Life-Long Development**: Exercise capabilities for life-long learning as a mean to enhance their technical and professional skills, to continuously enrich themselves and benefit the communities they are serving and beyond,
c. **Collaborative Spirit**: Develop interpersonal and collaborative skills that function well amongst a diverse group of professionals for a productive career; and
d. **Professional Advancement**: Advance and support the engineering profession through participation of professional societies, civic groups, and educational institutions; and/or establish a distinctive record of professional achievements.

These PEOs replace the previous version of PEOs, and highlight the key traits the graduates of the Program should achieve three to five years of graduation.

[1] 'Program Audit Form for 2012-2013 Visits' was an exit summary provided by ABET Team during the Nov. 2 – 4, 2012 visit. The PAV summarizes the visit team's initial assessment of the Civil Engineering Program.

IV. STUDENT OUTCOMES

The Program requires that students completing a Bachelor of Science in Civil Engineering (BSCE) degree to acquire the skills necessary to succeed in the engineering profession. The Student Outcomes (SOs), which are the skill sets describing what students are expected to know and are capable of doing by the time of graduation, as identified by the Program are[2]

(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 with 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 SOs replace the previous version of SOs (twenty outcomes), and the change was prompted by the recent ABET visit, November 2012.

Table 1 shows how the SOs (**Section IV**) best match the PEOs (**Section III**).

[2] The (a) through (k) student outcomes are taken directly ABET's *Criteria for Accrediting Engineering Program 2012-2013 Accreditation Cycle*.

Table 1. Mapping of SOs (Section IV) to PEOs (Section III)

Student Outcomes	Program Educational Objectives			
	Technical Aptitude	Life-Long Development	Collaborative Spirit	Professional Advancement
(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 with 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.	●			

V. CURRICULUM

The curriculum leading to the BSCE degree requires 130 semester units (see Fig. 1), and is organized into: (a) mathematics and basic sciences (33/130 units); (b) engineering core, technical/design electives (67/130 units); and (c) General Education (G.E.) (30/130 units).

Bachelor of Science Degree in Civil Engineering (B.S.C.E.)
2012 – 2013

Major requirements	**(67 units)**
CE 20, 85, 121L, 123, 123L, 124, 128, 129, 130, 132, 133, 142, 142L, 150, 180A, 180B, 185	(38 units)
GME 15, 15L	(3 units)
GME 66 or ME 26	(3 units)
ECE 91 and CE 110	(6 units)
CE 161	(2 units)
ME 112	(3 units)
Technical Area Courses	(12 units)

Select mandatory technical area courses in one or more of the following groups subject to the Design Courses statement below.

Environmental and Water Resources:	CE 140, 141, 144, 146
General Professional:	CE 161, 190, 191T
Geotechnical:	CE 125, 134
Structures:	CE 131, 136, 137
Geomatics:	GME 151, 173
Transportation:	CE 151, 152, 153

Design Courses: at least 9 units of technical area courses must be selected from the following

CE 125, 134, 136, 141, 144, 146, 151

Other requirements **(63 units)**

--- General Education ---
Select one course from each of the G.E. areas: Area A1, A2, B2, C1, D1, D2, D3.
The following courses are required to satisfy both G.E. and major requirements: MATH 75 [B4], CHEM 3A [B1], PHIL 1 or 10 [C2], CE 121 [IB], PHIL 120 [IC], PLSI 120 [M/I]

--- Additional requirements ---
MATH 81, EES 1; MATH 76, 77; PHYS 4A, 4AL, 4B

Total (130 units)

Note: Engineering majors are exempt from G.E. Area A3, third course Area C, Area E, and Area ID.

Advising Notes

1. Courses in mathematics, the physical sciences, or engineering taken CR/NC are not counted toward fulfillment of degree requirements in civil engineering.
2. The Upper-Division Writing Skills requirement can be met by passing the university examination or by completing a "W" course with a letter grade of C or better no sooner than the term in which 60 units of coursework are completed.
3. All civil engineering students must consult with their academic adviser at least once each year.

Figure 1. Civil Engineering Program, Fresno State.

Table 2 below shows the correlations between the Curriculum of the Program (**Section V**) to SOs (**Section IV**).

Table 2 (1 of 3) – Mapping of CE Curriculum to Student Outcomes

H = High
M = Medium
L = Low

Student Outcomes	Math & Basic Sciences	General Education	GME15, L – Engineering Surveying & Laboratory	GME 66 – Computer Aided Mapping (or ME66 – Engineering Graphic)	ECE 91 – Electrical Circuit	ME112 – Engineering Mechanics: Dynamics	CE20 – Engineering Mechanics: Statics	CE85 – Introduction to CE	CE110 – Computer Applications in CE	CE121,L – Mechanics of Materials & Laboratory	CE123,L – Soil Engineering & Laboratory	CE124 – Concrete Laboratory
(a) Apply knowledge of math, science, & engineering	**H**		**H**	**L**	**H**	**H**	**H**	**M**	**M**	**H**	**H**	**M**
(b) Design/conduct experiment, & analyze/interpret data	**H**									**M**	**H**	**H**
(c) Design system, component, or proceed to meet needs	**L**									**M**	**L**	
(d) Function on multi-disciplinary team	**M**		**H**	**L**	**L**	**L**	**L**	**H**		**L**	**L**	**L**
(e) Identify, formulate, & solve problems			**H**	**M**	**M**	**M**	**M**		**M**	**H**	**M**	
(f) Understand professional and ethical responsibilities		**L**						**M**				
(g) Communicate effectively	**M**	**H**	**M**	**L**	**L**	**L**			**L**	**L**	**L**	**M**
(h) Receive board education to understand the impact of solutions		**H**								**L**		
(i) Need for life-long learning								**M**		**L**	**L**	
(j) Knowledge of contemporary issues		**H**						**M**				
(k) Use technique, skills, & tools for engineering practice			**M**	**H**				**L**	**H**			

Table 2 (2 of 3) – Mapping of CE Curriculum to Student Outcomes												
H = High **M** = Medium **L** = Low **Student Outcomes**	CE128 – Civil Engineering Hydraulics	CE129 – Engineering Hydraulics Laboratory	CE130 – Theory of Structures	CE132 – Reinforced Concrete Design	CE133 – Steel Design	CE142,L – Environmental Engineering & Laboratory	CE150 – Transportation Planning & Design	CE161 – Construction Engineering	CE180A – Project Design	CE180B - Senior Project	CE185 – Civil Engineering Practice	CE125 – Geotechnical Engineering (Design Elec.)
(a) Apply knowledge of math, science, & engineering	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**L**	**H**
(b) Design/conduct experiment, & analyze/interpret data		**H**					**M**					
(c) Design system, component, or proceed to meet needs	**M**			**M**	**H**	**H**	**H**					**H**
(d) Function on multi-disciplinary team		**L**	**M**	**L**	**L**	**L**	**L**		**H**	**H**		**L**
(e) Identify, formulate, & solve problems	**M**	**M**	**M**	**H**	**M**	**M**	**M**		**H**	**H**		**M**
(f) Understand professional and ethical responsibilities								**M**	**M**	**M**	**H**	
(g) Communicate effectively	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**H**	**H**	**L**	**L**
(h) Receive board education to understand the impact of solutions									**L**	**L**		
(i) Need for life-long learning			**L**	**L**	**L**	**L**		**L**				**L**
(j) Knowledge of contemporary issues	**L**			**L**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**
(k) Use technique, skills, & tools for engineering practice		**M**		**L**								

Table 2 (3 of 3) – Mapping of CE Curriculum to Student Outcomes

H = High
M = Medium
L = Low

Student Outcomes	CE131 – Immediate Theory of Structures (Tech. Elec.)	CE134 – Foundation Engineering (Design Elec.)	CE136 – Design of Timber Structures (Design Elec.)	CE137 – Seismic Analysis of Building Structures (Tech. Elec.)	CE140 – Hydrology (Tech. Elec.)	CE141 – Water Resource Engineering (Design Elec.)	CE144 – Design of Water Quality Control Process (Design Elec.)	CE146 – Urban Storm Water Management (Design Elec.)	CE151 – Pavement Design (Design Elec.)	CE152 – Transportation Materials (Tech. Elec.)	CE153 – Traffic Operation and Controls (Tech. Elec.)
(a) Apply knowledge of math, science, & engineering	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
(b) Design/conduct experiment, & analyze/interpret data											
(c) Design system, component, or proceed to meet needs		**H**	**H**			**H**	**H**	**H**	**H**		**H**
(d) Function on multi-disciplinary team					**L**						
(e) Identify, formulate, & solve problems	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**
(f) Understand professional and ethical responsibilities										**L**	
(g) Communicate effectively		**L**	**L**	**L**		**L**	**L**	**L**	**L**	**L**	**L**
(h) Receive board education to understand the impact of solutions											
(i) Need for life-long learning	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
(j) Knowledge of contemporary issues		**L**	**L**	**L**						**L**	
(k) Use technique, skills, & tools for engineering practice										**M**	

Notes:
Total required units for B.S.C.E. = 130 units (100%)
- **(a) Math & Basic Sciences = 33 units (25.4 %)**
- **(b) General Education = 30 units (23.1%)**
- **(c) Engineering Core & Electives = 67 units (51.5%)**

VI. CONSTITUENTS

The constituents of the CE Program include employers, alumni, engineering practitioners, advisory board, faculty members and students. The majorities of the constituents reside in California's Central Valley and represent a diverse group of different ethnicities, economic and educational background.

The employers of the CE graduates include a wide range of entities from governmental agencies to private engineering consulting firms. The majority are located in the Central Valley. Employers include engineering design firms, consulting firms, and construction companies and contractors. The engineering firms vary in size form firms with 3 or 4 registered professional engineers to large ones owned by local engineers (some of them alumni of the CE Program) and large national and international firms with offices in the Central Valley. Also a large number of local or state agencies employ the graduates of the CE Program such as FHWA, EPA, California Department of Transportation, California Department of Water Resources, Fresno County, City of Fresno, City of Clovis, California Department of Forestry, Fresno Metropolitan Flood Control District, and many others.

The majority of the CE alumni stay in the Central Valley from where they came originally. The alumni constitute an important part of the professional engineer workforce in the local area with many of them holding positions of relevance and leadership both in the private industry and in local, state, or federal agencies.

The advisory board is made of practicing engineers with prominent professional positions in a diverse group of offices in the area. They represent the private and public sections; they represent small and large entities; some are alumni of the CE Program while others graduated from institutions other than Fresno State. Also, they represent different technical specialties within Civil Engineering.

VII. ASSESSMENT TOOLS AND PLANS

This section details the proposed assessment tools and plans for SOs (**Section IV**) for AY 2013/14 to 2018/19 (the next onsite WASC Review is scheduled to be in Spring 2015; and the next ABET review is anticipated to be 2018-2019 AY).

The proposed assessment tools are classified into two categories: ***direct*** and ***indirect*** assessment tools. The ***direct*** assessment tools include (a) culminating experience, (b) EIT certification at-time-of-graduation, and (c) Body-of-Knowledge score. The ***indirect*** assessment tools include (d) student course evaluation survey, (e) Junior/Senior survey, and (f) exit interviews. These assessment tools are explained further as follows:

(a) *Culminating experience:* Completing a senior design project is the culminating experience for undergraduates in the CE Program curriculum. The senior project experience spans over two semesters. CE180A (2 units) is the first course in the senior design project sequence. The emphasis of CE180A is on design project proposal, project

identification, design team formation (i.e., multi-disciplinary), and preliminary development of design alternatives and validations. CE180B is the second course in the senior design project sequence. The emphasis of CE180B is placed on the completion of a major design project initiated in CE180A. Each student in CE180B is paired and supervised by a faculty and a practitioner mentor throughout the entire design process. The deliverables for students in CE180B include progress reports, final project reports, design drawings, and presentations. An oral presentation scoring rubric for CE180B is presented in Fig. 2.

(b) *EIT certification at-time-of-graduation*: The "Engineer-in-Training" (EIT) is a professional designation from *National Council of Examiners for Engineering and Surveying* (NCEES) used in the US to designate a person who has passed the 8-hour Fundamentals of Engineering (FE) examination – typically from an ABET accredited engineering program or equivalent. The California licensure Board of Engineers, Surveyors, and Geologists, permits students to take the FE exam prior to their final year. Passage of the FE exam (i.e., EIT certification) qualifies a candidate, as required by the California law, towards becoming licensed as a professional engineer (PE). Even though the Program does not require its students to pass the exam to graduate, passing the exam does signal achievement of certain technical competence by the students. Fig. 3 shows the percentage of graduating senior passing the exam in the last five years.

(c) *Body-of-Knowledge score*: The Body of knowledge (BOK) or more accurately the *Civil Engineering Body of Knowledge for the 21st Century* is a written document published by the American Society of Civil Engineers (ASCE) highlighting the desired knowledge, skills, and attributes to be possessed by a practitioner in civil engineering. The aspiration of BOK is an improved engineering education and tougher requirement for licensure. The BOK is assessed by incorporating or embedding key question(s) in the final examination of selected courses in the CE Program. By correctly answering key question(s), students demonstrate the attainment of specific outcomes in BOK[3], most of which are consistent with ABET Outcomes. Table 3 shows the nature of the key questions and results of selected courses for BOK assessment.

(d) *Student course evaluation survey*: A Student Course Evaluation is a survey developed and used by the CE Program to gauge the attainment of specific SOs. The rating system developed by the faculty is used to gauge the student satisfaction, which indirectly indicates the knowledge gained in a course. Fig. 4 shows a sample student course evaluation (a CE150 course evaluation is presented herein). Please note that the sample course evaluation, i.e., Fig. 4, employed the previous version of SOs (twenty SOs). This form of student course evaluation and its rating system will be updated to reflect the new (a) to (k) SOs.

(e) *Junior/senior survey*: A Junior/Senior Survey is an opinion survey, similar to the one used for Student Course Evaluation (see Fig. 4), to gauge the attainment of specific SOs.

[3] ASCE, Civil Engineering Body of Knowledge for the 21st Century (2nd Edition), 2008

The survey represents a simple mean of gauging how satisfied students are with the Program as they progress through ranks and as they gain more understanding of engineering the profession or practice. Table 4 shows, for the last ABET review cycle, from 2006 to 2012, students' satisfaction with the CE Program when it showed they gained favorable of the Program as seniors. Again, this survey will be updated to reflect the newly adopted SOs [from (a) to (k)].

(f) *Exit interviews*: The exit interview is an opinion survey of graduating students to gauge the attainment of specific SOs. The survey is a snap-shot of opinions of graduating students regarding the established SOs. This survey was used for the first time in Spring 2012. Fig. 5 shows a sample of the said survey.

Senior Design
Evaluation of Oral Presentation

Date: _____ Title: _____

Group Members: _____ _____ _____

_____ _____ _____

_____ _____ _____

Title of Presentation (0 to 3 points) _____

Introduction of Presenter (0 to 3 points) _____

Outline of Presentation (0 to 4 points) _____

Voice

Clear (0 to 5 points) _____

Loud (0 to 5 points) _____

Delivery

Enthusiastic (0 to 5 points) _____

Eye Contact with Audience (0 to 5 points) _____

Visual Materials

Quantity (0 to 5 points) _____

Quality (0 to 5 points) _____

Organization of Presentation

Logical Progression (0 to 10 points) _____

Team Coordination (0 to 5 points) _____

Contents

Completeness (0 to1 5 points) _____

Technically Correct (0 to 20 points) _____

Timing

Effective Use of Time (0 to 5 points) _____

Addressing of Questions (0 to 5 points) _____

Comments

SCORE _____ Points
(Maximum: 100 Points)

GENERAL COMMENTS ON SENIOR DESIGN PROCEDURE (Use the reverse page if necessary)

Fig. 2. Sample oral presentation rubric for CE180B (Fall 2012 semester).

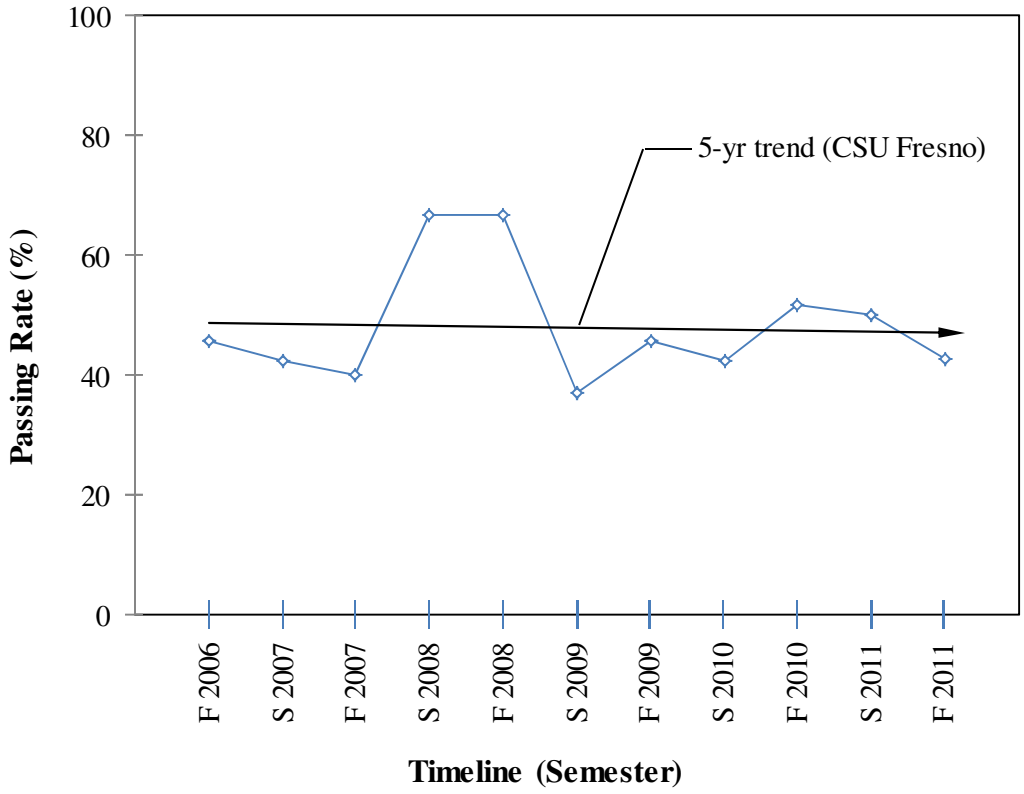

Fig. 3. Number of graduating seniors passing the EIT exam.

Table 3. Body-of-Knowledge assessment

Course Number/Title	Nature of BOK Questions	Assessment technique	Timeline		
			Fall 2007	Fall 2009	Fall 2011
CE 85: Introduction to Civil Engineering	Ethics in professional practice	One question in final	94.0%	-N/A-	-N/A-
CE 20: Engineering Mechanics: Statics	Static equilibrium and applications	Final exam	71.0%	72.0%	70.6%
CE 123: Soil Engineering	Soil classification	One problem in final	72.0%	74.8%	89.7%
CE 128: Civil Engineering Hydraulics	Application of Bernoulli's principle in fluid dynamics	One problem in final	52.0%	57.0%	-N/A-
CE 130: Theory of Structures	Shear and bending moment in beams and frames	One problem in final	63.2%	63.9%	64.9%
CE 142: Environmental Engineering	Mass balance & alkalinity	Average of two problems in final	56.3%	78.2%	74.4%
CE 150: Transportation Planning and Design	Profile calculations for vertical curve design	One problem in final	67.0%	65.0%	68.0%
CE 132: Reinforced Concrete Design	Reinforced concrete columns under uniaxial bending	One problem in final	-N/A-	-N/A-	67.8%

Course: *CE 150* (Spring 2006)
Transportation Planning and Design
Course Type: *Two 50 min lecture/week, and one 2-hour and 50-min lab/week*
Assessment techniques: *Homework; quizzes & exams; individual & team design project/term paper*
Specific Course Outcomes:

- *Students will acquire the fundamental knowledge of transportation engineering, especially land transportation in highway and street systems*
- *Students will know how to do the geometric design of roadways, streets, intersections, and roundabouts*
- *Students will know how to mitigate the negative impact of transportation activities on the environment*
- *Students will know how to analyze and design for highway, freeway, and intersection capacity*
- *Students will acquire a basic knowledge of statistical analysis of traffic data*

SO (Abbreviated description of relevant SOs pertaining to the course under evaluation is provided)	Course Rating (0 to 5)		
	Faculty Expectation	Student Evaluation	Difference
Q1. *Apply knowledge of math, science and engineering*	5.00	4.64	–0.36
Q2	-N/A-		
Q3			
Q4. *Provide solutions to engineering problems*	5.00	4.64	–0.36
Q5. *Interdisciplinary team work*	4.50	4.64	+0.14
Q6. *Work in ethnically diverse & multicultural team*	4.50	4.64	+0.14
Q7. *Apply engineering approach in addressing CE problems*	4.00	4.77	+0.77
Q8. *Abide by ASCE canons and code of ethics*	4.00	4.77	+0.77
Q9	-N/A-		
Q10			
Q11. *Writing communication skill*	4.50	4.41	–0.09
Q12. *Drawing/graphic communication skill*	4.50	4.36	–0.14
Q13. *Discern the interaction between CE projects & global/societal issues*	4.50	4.32	–0.18
Q14	-N/A-		
Q15			
Q16			
Q17. *Apply modern technique, skill, and tools*	4.50	4.36	–0.14
Q18	-N/A-		
Q19. *Apply critical analysis and decision making*	4.50	4.55	+0.05
Q20	-N/A-		
Average	**4.50**	**4.53**	**+0.03**

Instructor's notes/summary:

1. Overall, students give higher rating (4.53) than faculty expectation (4.50)
2. Maximum positive difference of this course = +0.77 (Q7 and Q8)
3. Maximum negative difference of this course = –0.36 (Q1 and Q4)
4. None of the expected SOs has a negative difference of greater than –1.00, which is a criterion for the level of acceptable performance. If any of the measured SOs generates a difference of less than –1.00, then the course could trigger a possible review (the 1st time) by the respective course instructor. If similar SOs incur a difference of less than –1.00 the next time (the 2nd time or beyond), then it could trigger a re-evaluation and/or revision of the course content/delivery and/or re-evaluation of the faculty expectation of the course, as part of the continuous monitoring/improvement process.

Fig. 4. Sample student course survey

Table 4. Junior/Senior Surveys

SO	Spring 2008					Spring 2010					Spring 2012				
	Juniors		Seniors			Juniors		Seniors			Juniors		Seniors		
	Average Rating (1)	Average SD	Average Rating (2)	Average SD	Change (2) – (1)	Average Rating (3)	Average SD	Average Rating (4)	Average SD	Change (4) – (3)	Average Rating (5)	Average SD	Average Rating (6)	Average SD	Change (6) – (5)
Q1	4.39	0.89	4.51	0.77	+0.12	4.59	0.71	4.65	0.82	+0.05	4.72	0.11	4.65	0.17	–0.08
Q2	4.08	1.00	3.99	0.92	–0.09	4.36	0.80	4.30	0.86	–0.06	4.06	0.44	4.02	0.28	–0.04
Q3	3.85	1.12	3.72	0.82	–0.13	4.49	0.78	4.52	0.84	+0.02	4.34	0.26	4.22	0.32	–0.12
Q4	4.27	0.84	4.63	0.80	+0.36	4.34	0.72	4.55	0.82	+0.20	4.45	0.13	4.39	0.09	–0.06
Q5	3.74	1.02	4.14	0.83	+0.40	4.05	0.96	4.25	0.88	+0.20	3.72	0.68	4.34	0.30	+0.62
Q6	4.23	0.87	4.44	0.85	+0.21	4.52	0.85	4.50	0.89	–0.02	4.22	0.13	4.40	0.14	+0.18
Q7	4.19	0.88	4.34	0.81	+0.15	4.33	0.84	4.45	0.77	+0.11	4.52	0.10	4.54	0.04	+0.03
Q8	3.82	0.93	4.13	0.90	+0.31	3.69	0.85	4.00	0.85	+0.31	3.66	0.12	3.97	0.28	+0.30
Q9	3.43	1.02	4.26	0.88	+0.83	4.23	0.70	4.24	0.90	+0.01	3.25	0.27	3.95	0.42	+0.70
Q10	3.33	1.01	4.35	0.73	+1.02	4.01	0.83	4.45	0.86	+0.44	2.92	0.28	3.84	0.49	+0.92
Q11	3.68	1.09	4.38	0.92	+0.70	3.79	0.84	3.99	0.79	+0.20	3.38	0.21	4.04	0.21	+0.67
Q12	3.76	1.08	4.30	0.87	+0.44	4.23	0.89	4.44	0.78	+0.21	4.04	0.31	4.25	0.11	+0.21
Q13	3.76	1.09	3.98	0.90	+0.22	3.45	0.76	3.96	0.81	+0.52	3.62	0.25	3.83	0.26	+0.20
Q14	4.09	1.04	4.53	0.88	+0.44	4.17	0.70	4.35	0.90	+0.17	4.14	0.07	4.19	0.16	+0.05
Q15	3.96	0.98	4.40	0.98	+0.44	4.29	0.77	4.45	0.77	+0.15	3.93	0.15	4.08	0.11	+0.16
Q16	3.90	0.94	4.28	0.86	+0.38	3.69	0.65	4.02	0.82	+0.33	3.71	0.21	3.85	0.35	+0.15
Q17	4.03	0.95	4.13	0.86	+0.10	4.07	0.87	4.45	0.80	+0.39	4.31	0.07	4.36	0.16	+0.05
Q18	4.18	0.88	3.96	0.90	–0.22	4.21	0.78	4.39	0.84	+0.18	4.10	0.16	4.23	0.17	+0.13
Q19	4.11	0.77	4.53	0.79	+0.42	4.40	0.90	4.55	0.85	+0.15	4.27	0.05	4.32	0.15	+0.06
Q20	4.06	0.99	4.11	0.83	+0.05	4.21	0.80	4.55	0.87	+0.34	4.47	0.15	4.41	0.08	–0.06
Overall Average Change =					+0.31	Overall Average Change =				+0.20	Overall Average Change =				+0.20

Lyles College of Engineering
Civil Engineering Program
Graduating Student Feedback

Date_____ Graduation: Spring [ ] Fall [ ] Summer [ ] Year:_____

Did you complete your senior project CE 180B: Yes[ ] No [ ]

Have you taken the EIT Exam? Yes [ ] No [ ]

Have you passed the EIT Exam? Yes [ ] No [ ]

Do you have a full-time job as civil engineer? Yes [ ] No [ ]

Do you have a full-time job offer? Yes [ ] No [ ]

Did you have any promising interviews for full-time work?

Yes [ ] No [ ]

If you had a job offer, what is the starting salary? [_____]

What was the best thing you remember about the CE Program?

What is the worst thing you remember about the CE Program?

Any recommendations or suggestions to improve the CE Program

PLEASE COMPLETE THE NEXT SECTION THAT IS TO BE USED FOR ABET

Fig. 5. Sample exit interview survey

	How important is the objective as a goal of a BS in Civil Engineering?						How satisfied are you with the CE Department meeting this particular objective?					
	Very Important	Important	Moderately Important	Limited Importance	Not Important	Not Applicable	Very Satisfied	Satisfied	Moderately Satisfied	Limited Satisfied	Not Satisfied	Not Applicable
a. Students should be able to identify design problem and set the project objective												
b. Students should be able to the information needed for an engineering project and gather that information in a timely fashion												
c. Students should be able to develop design alternatives and criteria necessary to select the best one												
d. Students should be able to develop a work plan for the design process: identifying tasks and responsibility and preparing a work schedule												
e. Students should have the ability to describe the interactions among the different technical aspects of a project												
f. Students should be able to discuss the social, political, regulatory, and legal issues of a project												
g. Students should have the ability to communicate graphically, verbally, in writing, and in public speaking												
h. Students should be able to work effectively as part of an interdisciplinary team												
i. Students should be able to work effectively in culturally diverse environments												
j. Students should be aware of contemporary issues												
k. The ability to use the techniques, skills, and modern engineering tools for engineering practice												
l. The ability for critical thinking												
Additional comments:												

Fig. 5 (Cont'd). Sample of exit interview survey

The timetable of Table 5 shows when the proposed assessments will be carried out

Table 5. Assessment plan

	Type	Technique	Timeline (Year)[2]							Frequency
			2013	2014	2015	2016	2017	2018	2019	
SOs[1]	*"Direct"*	Culminating Experience (CE180A and CE180B)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	Semester
		EIT Certification at Time of Graduation	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	Semester
		Body of Knowledge (BOK) Score		✓(F)		✓(F)		✓(F)		Biennial
	"Indirect"	Student Course Evaluation Survey		✓(S)		✓(S)		✓(S)		Biennial
		Junior/Senior Survey		✓(S)		✓(S)		✓(S)		Biennial
		Exit Interviews	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	✓(F)(S)	Semester

NOTES:

1 The SOs are as defined in Section IV
2 (F) = Fall semester & (S) = Spring semester

VIII OTHER

The Program also conducts Alumni survey. The survey targets those graduated within one-to-three year period only. Therefore, for the ABET review period of 2006-2012, two such surveys were conducted: one ending in 2009, and the other ending in 2012 (just right before ABET visit). The survey is designed to primarily gauge the graduates' opinion on PEOs. There are however questions in the survey that pertain to SOs. Fig. 6 shows a sample of such survey; Question 10 in this survey relates to SOs. Table 5 shows the results of Question 10 of the survey of the last two periods.

IX CONTINUOUS IMPROVEMENT

The curriculum of the CE Program is designed to ensure the fulfillment of the mission, program educational objectives (PEOs), and student outcomes (SOs). To provide the highest of quality for its consumers (the students) the Program continues to undergo rigorous, comprehensive, and periodic internal as well as external reviews. Its quality is evident by it continued ABET accreditation.

Suggestions for changes and/or improvement to the Program often initiated at the programmatic level (Chair and faculty members). They are then presented to the advisory board for discussion and consensus building, before formal adoption and implementation. This SOAP provides the template showing how the entire process is executed; including what, how, and when each step is

taking place. This *continuous improvement* strategy has allowed the Program to function effectively and timely manner in addressing the changing needs of the civil engineering profession and for its students, and it will continue to do for a long time to come (A complete continuous improvement loop is presented in Fig. 7).

Alumni Survey

CSU Fresno
Lyles College of Engineering

1. When did you graduate from CSU-Fresno? (month. year) _____

2. Current job title: _____
Current Salary (optional)_____
Name and Address (optional)_____
_____
_____

3. Current employer: _____

4. In what field do you work?
_____ Industry
_____ Government
_____ Private Practice/consulting
_____ Education
_____ Construction
_____ Other: _____

5. Indicate your present employment status:
_____ Employed full-time
_____ Full-time graduate student
_____ Temporarily not employed
Reason: _____
_____ Working in another field
Reason:_____
Do you intend to return to your field?
___ Yes ____ No ____ Not sure
_____ Other, please explain:_____

6. Please rank your professional success level:
_____ Very successful
_____ Successful
_____ Average
_____ Unsuccessful
Please explain briefly: _____
_____
_____

7. As you compare yourself to other beginning professionals in your field, how do you rate the quality of your educational preparation in Civil Engineering?
_____ Far higher than average
_____ Higher than average
_____ Average
_____ Lower than average
_____ Far lower than average

8. Please rank the overall quality of your General Education coursework (arts, humanities, and social science courses).
___ Excellent ___ Good ___ Average ___ Poor

9. Using the following scale, please rate the following items relative to your education at the College of Engineering.

	weak ----> strong 1	2	3	4	5
a. Overall quality of your education					
b. Overall quality of your laboratory coursework					
c. Support, assistance, and general help from the CECS					
d. Support, assistance and general help you received from faculty outside the CECS					
e. How confident and prepared you felt in handling professional tasks when you left CSU-Fresno					
f. How confident and prepared you feel in handling professional tasks now					
g. If you participated in the co-op or internship program, please rate the overall quality of your experience					

Fig. 6. Sample alumni survey.

10. Using the following scale, please indicate the degree to which your education provided you with the ability to:

	weak ----> strong 1	2	3	4	5
i. Apply knowledge of math, science and engineering					
ii. Design and conduct experiments					
iii. Design a system, component or process to meet desired needs					
iv. Function on multi-disciplinary teams					
v. Identify, formulate, and solve technical problems					
vi. Understand professional and ethical responsibility					
vii. Communicate effectively (written and oral)					
viii. Understand the impact of your practice in a global context					
ix. Continue self-learning and continuing education					
x. Understand and be aware of contemporary issues					
xi. Use the techniques, skills, and modern technology tools necessary for your practice					
xii. Work independently					

11. Do you think that any aspects of your program of study at CSU-Fresno should be modified?

____ yes ____ no

If yes, explain:

12. What changes do you foresee in your field in the next ten years? How might CSU-Fresno address these changes?

13. Please identify the areas in your program of study that contributed **LEAST** to your professional development. Such areas might include a specific course or specific course content, specific lab or field experience, specific instructional equipment, etc. Please explain.

14. To follow up on question 14, please identify the areas in your program of study that contributed **MOST** to your professional development.

Fig. 6 (Cont'd). Sample alumni survey.

Table 5. Summary of Alumni Survey: Period 2007-09 and 2010-12

Question 10	Period 2007-09		Period 2010-12	
	Average Rating	Standard Deviation	Average Rating	Standard Deviation
i. Apply knowledge of math, science and engineering	3.81	0.51	4.22	0.64
ii. Design and conduct experiments	3.67	0.91	3.81	0.86
iii. Design a system, component or process to meet desired needs	3.95	0.67	3.78	0.76
iv. Function on multi-disciplinary teams	4.05	0.67	3.75	0.73
v. Identify, formulate, and solve technical problems	4.14	0.65	3.86	0.68
vi. Understand professional and ethical responsibility	4.00	0.71	3.83	0.85
vii. Communicate effectively (written and oral)	4.00	0.63	3.86	0.72
viii. Understand the impact of your practice in a global context	3.71	0.85	3.28	0.61
ix. Continue self-learning and continuing education	3.90	0.62	3.83	0.70
x. Understand and be aware of contemporary issues	3.62	0.80	3.72	0.66
xi. Use the techniques, skills, and modern technology tools necessary for your practice	4.00	0.63	3.83	0.74
xii. Work independently	3.81	0.60	4.04	0.67

Note:
A rating of 3.5/5.0 scale is deemed satisfactory by the Program.

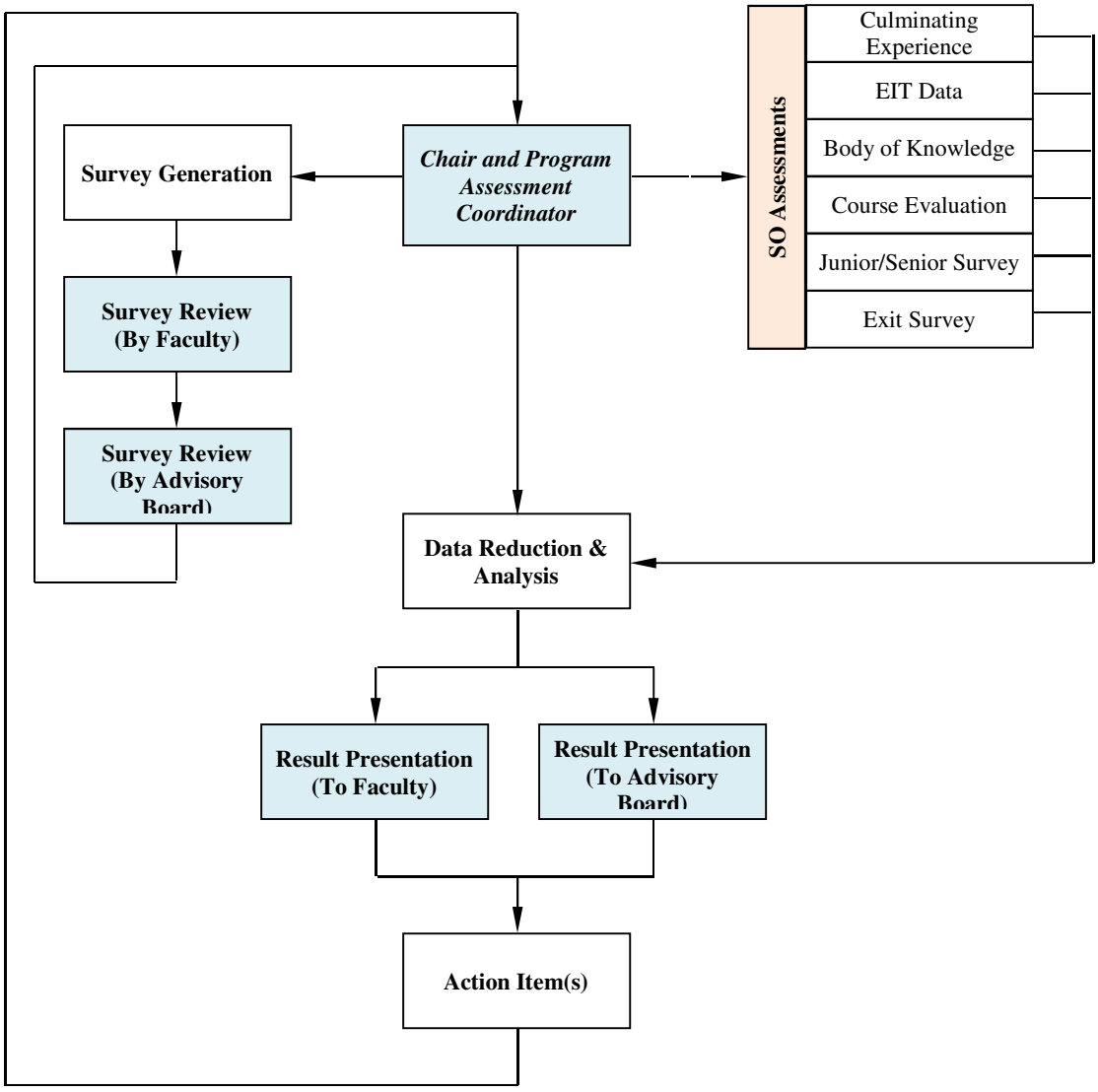

Fig. 7. Student outcomes assessment and continuous improvement loop.