

CALIFORNIA STATE UNIVERSITY LONG BEACH
Core Competency Assessment Report (for Undergrad Programs)
(rev. 3/2019)

Academic Year: 2018-19

Degree Program Name: Bachelor of Science in Civil Engineering and Bachelor of Science in Construction Management

Department Name: Civil Engineering and Construction Engineering Management (CECEM)

Name of Chair: Dr. Antonella Sciortino

Campus Extension / email: Antonella.sciortino@csulb.edu

Program Assessment Coordinator: Dr. Antonella Sciortino

Campus Extension / email:

1. Which WSCUC core competency for this degree program was assessed over the past year and how is it connected to your Program Learning Outcomes (PLOs)?

Core competency: Quantitative Reasoning

Relationship to Department PLOs: The CECEM Department offers two academic programs: Bachelor of Science in Civil Engineering (BSCE) and Bachelor of Science in Construction Management (BSCM). Quantitative Reasoning is a core competency related to the following PLOs:

- Ability to identify, formulate, and solve engineering problems (PLO a, in the BSCE Program)
- Ability to create construction project cost estimates (PLO # 4 in the BSCM Program)

2. Briefly describe how these outcomes are linked to CSULB's Institutional learning outcomes (http://www.csulb.edu/divisions/aa/assessment/institutional_objective.html).

These outcomes are linked to the following CSULB's Institutional learning outcomes:

- "Well-prepared with communication, *numeracy* and critical thinking *skills* to successfully join the workforce of California and the world or to pursue advanced study"
- "Skilled in collaborative *problem-solving*, research, and creative activity"

3. Briefly describe the direct assessment used to measure this competency.

Quantitative Reasoning was assessed by using the same assessment tools (i.e. rubrics, exams, quizzes) used in the two programs to evaluate student performance indicators in a variety of courses that span from lower to upper division courses. For the purpose of this report three upper division courses, two in the Civil Engineering Program (CE 335 Fluid Mechanics, and CE 437 Engineering Hydraulics), and one in the Construction Management Program (CEM 490 Construction Project Management) were selected as examples to demonstrate the assessment procedure.

4. What were the results of the assessment? Include also a narrative about what the results suggest about the skills students possess when they graduate from your program.

PLO a in the BSCE Program

PLO a in the CE Program is related to ABET Student Outcome a :” An ability to apply knowledge of mathematics, science and engineering”. The CE 335 Fluid Mechanics, and the CE 437 Engineering Hydraulics courses were selected to demonstrate the assessment procedure for the Academic Year 2018-19. CE 335 is an upper division course usually taken in the third year and it is a pre-requisite for CE 437, an upper division course usually taken during the last year. Both courses are required in the major. The students’ performance on Quantitative Reasoning has been monitored by performing the assessment of the CE 335 and the CE 437 over two staggered semesters (Fall 2018 for CE 335 and Spring 2019 for CE 437) to determine if issues noted in the 300-level pre-requisite course were addressed and resolved in the 400-level courses. This procedure helped us to observe any improvement of the skills assessed as students’ progress toward graduation.

Three Performance Indicators (PIs) or Course Learning Outcomes (CLOs) were defined for both courses as follows:

I. P.I.1 Ability to apply mathematic knowledge to solve problems

II. P.I.2 Ability to apply scientific concepts to solve problems

III. P.I.3 Ability to apply engineering principles to solve problems

Students’ work related to each performance indicator included Midterm and Final Exams.

Answers to pertinent problems and questions were rated on a scale from 1 (Novice) to 4 (Outstanding) using rubrics developed for each course. The PLO was considered satisfactorily achieved if an average rating of 2.5 or higher was obtained for each performance indicator.

The assessment results for the CE 335 and the CE 437 courses are presented in the tables below.

Fall 2018

Performance Indicator	CE 335	
	Average	St. Deviation
Ability to apply mathematic knowledge to solve problems	2.74	0.98
Ability to apply scientific concepts to solve problems	2.39	0.92
Ability to apply engineering principles to solve problems	2.39	0.83

Spring 2019

Performance Indicator	CE 437	
	Average	St. Deviation
Ability to apply mathematic knowledge to solve problems	3.5	0.86
Ability to apply scientific concepts to solve problems	2.78	0.93
Ability to apply engineering principles to solve problems	2.81	0.92

The assessment of the CE 335 class revealed a weakness in the students’ performance on Quantitative Reasoning for P.I.2 and P.I.3 where the scores are slightly below the desired threshold. The application of scientific and engineering concepts to the solution of problems seems to pose a challenge to the students. In particular, the topics where the weaknesses were

noted, pertained to the solution of problems involving transmission of forces on structures and analysis of simple pipeline systems although the instructors spent more time on covering the fundamental concepts and on solving pertinent problems. The same topics are covered in the first portion of the CE 437 course, which deals with analysis of more complex pipeline systems. The low scores recorded in the assessment of the CE 335 pre-requisite course, were used by the instructors of the CE 437 course to revise the presentation of the material in order to enhance students' understanding. They included more real-world examples and solved more problems step by step in class. As a result, the students' performance in the CE 437 class in the same three areas of assessment shows significant improvements compared to the CE 335 course indicating the success of the strategies applied. In the future more examples and possibly hands-on activities will be added to the CE 335 course to better illustrate the scientific and engineering concepts and help students to apply them to the solution of problems.

PLO # 4 in BSCM Program

PLO #4 in the BSCM program is related to the ACCE-Student Learning Outcomes (SLO) # 4: (ACCE: American Council for Construction Education who grants the accreditation of construction management programs)

CEM 490 is selected to measure the achievement of this PLO/SLO # 4. The course has 13 Course Learning Outcomes (CLOs) in which CLO#6 is relevant to PLO#4/SLO#4 and was used to assess the Quantitative Reasoning skill of students.

Upon successful completion of the course, the student will be able to:

1. Work with other students in class on a team assigned to respond to a Design-Build proposal for a Commercial Building (**ACCE-SLO # 9**)
2. Understand Project Contract Types and Project Delivery Methods as related to Commercial Building projects (**ACCE-SLO # 12**)
3. Develop a Mission Statement (purpose) and a Preliminary Program for a Commercial Building (**ACCE-SLO # 1**)
4. Develop a Conceptual Design and 3D (BIM) Model of a Commercial Building (**ACCE-SLO # 10**)
5. Develop conceptual solutions to Sustainable Design and Construction (LEED) aspects of a Commercial Building (**ACCE-SLO # 18**)
6. Develop a Preliminary (conceptual) Cost Estimate for a Commercial Building (**ACCE-SLO # 4**)
7. Develop a Preliminary (conceptual) Schedule for a Commercial Building (**ACCE-SLO # 5**)
8. Develop a Preliminary Site Logistics and Safety Plan for a Commercial Building (**ACCE-SLO # 3**)
9. Present a Team Organization for the Design-Build project (**ACCE-SLO # 2**)
10. Formally present to the Professor and judges and class, the Teams' solutions to the Design-Build proposal (**ACCE-SLO # 2**)
11. Demonstrate effective team skills through participation in group homework, assignments, and projects (**ACCE-SLO # 9**)
12. Analyze construction documents for planning and management of construction processes (**ACCE-SLO # 7**)
13. Understand the legal implications of contract, common, and regulatory law to manage a construction project (**ACCE-SLO # 17**)

The table below shows typical assessment results for the CLO#6 (or PLO#4/SLO#4) for the course CEM 490 in Spring 2019.

CLO #	Assessment Tool	Rating (%)	Average (%)	ACCE-SLO
6	Participation	84.8	83	ACCE-SLO # 4
	Assignments	85.5		
	Term Project	82.8		
	Final Exam	77.7		

The assessment of the course learning outcomes/objectives (CLOs) was done by the following direct assessment tools: Participation, Assignments, Term Project, and Final Exam

- Participation: (84.78%) Number of attendance of students to the all session.
- Assignments: (85.49%) The sum of all assignments and quizzes to the total obtainable grades.
- Term Project: (82.79%) The evaluation of projects by one industry judge, one academic judge, and myself based on skill of presentation, site logistic plan, design/BIM, estimating, scheduling, and safety plan.
- Final Exam: (77.70%) Sum of all students' grade to the maximum obtainable grade.

Discussions:

Overall performance is satisfactory.

Improvement of preparing recap sheet and prepare the bid package as well as site logistic plan. Assign some session for site logistic plan and inviting guest lectures from industry to share their knowledge and experience.

5. How will you use the results used for improving student learning (how are you "closing the loop")?

The results of the assessment showed that early intervention in mid-level courses and continuous monitoring of the areas where weaknesses are observed can help to improve the students' performance in higher level courses.

The selection of two consecutive courses to assess, one at the 400-level and its pre-requisite at the 300-level, proved to be a successful assessment approach to evaluate the effectiveness of the proposed strategies and to "close the loop".

6. How might the strategies and results of this year's assessment inform your department's approach during the next cycle? In other words, will you duplicate this assessment method or try a different technique? If you used a rubric, will you continue to use it? Enhance calibration methods? Etc.

The assessment results of this year have shown that students' performance in the Quantitative Reasoning can be improved by strategizing the assessment approach. The selection of related courses where the low-level course is pre-requisite for a higher-level course and the consecutive assessment starting at the lower level can reveal areas of weakness at an early stage giving the instructor of the course the opportunity to intervene on selected topics and giving the course coordinator the necessary information to develop strategies to improve the students' performance in the related higher-level courses.

The approach used in the CE 335 and CE 437 will be extended to other courses in both Civil and Construction Management Programs and to the assessment of other core competencies and ABET and ACCE Student Outcomes.

The Department is in the process of reviewing the entire assessment procedure for both programs following suggestions provided by the reviewers during the 2018 ABET Accreditation visit and the ACCE Accreditation visit in 2017. This will include a revision of the assessment rubrics, which will be updated to reflect any changes implemented in the courses as a result of the assessment process.

7. Please provide an update on actions regarding your MOU if appropriate and attach the update to this report if necessary.

N/A

Please send the completed report to your College Dean and appropriate Associate Dean, Vice Provost Jody Cormack, and the Director for Program Review and Assessment Sharlene Sayegh. Please save a copy for your files. If you have any questions, please contact Sharlene at Sharlene.Sayegh@csulb.edu.