

Colorado State University – Pueblo Academic Program Assessment Report for AY 2014-2015

Program: Bachelor of Science in Civil Engineering Technology (BSCET)

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Assessment contributors (other faculty involved in this program's assessment): Dr. M.D. Islam, Dr Sylvester Kalevela and adjunct professors

Listed below are the CET student learning objectives:

Generic Engineering Technology student learning outcomes: Students who complete the CET program at CSU-Pueblo will have the ability to:

- a. apply knowledge, techniques, skills, and tools of the civil engineering discipline to engineering technology activities,
- b. select and apply a knowledge of mathematics, science, engineering, and technology to civil engineering technology problems,
- c. conduct standard tests and measurements; analyze and interpret experimental data; and apply experimental results to improve processes,
- d. design systems, components, or processes for civil engineering technology problems,
- e. **function effectively as a members or leaders on a technical team**, **
- f. identify, analyze, and solve broadly-defined engineering technology problems,
- g. **communicate effectively regarding subjects related to engineering technology activities**, **
- h. demonstrate a disposition to engage in self-directed continuing professional development,
- i. demonstrate an understanding of professional and ethical responsibilities,
- j. demonstrate an understanding of the impact of engineering technology solutions to society, and
- k. demonstrate commitment to quality, timeliness, and continuous improvement.

Civil Engineering Technology Student learning outcomes: In order to enable graduates to attain the CET program educational objectives, CET students are trained to acquire specific skills and the ability to:

- A. utilize principles and appropriate technology to produce drawings, reports, quantity estimates, and other documents related to civil engineering;
- B. conduct standardized field and laboratory tests related to civil engineering;
- C. utilize surveying methods and equipment to perform land measurement or construction layout;

D. apply fundamental computational methods and elementary analytical techniques to solve civil engineering technology problems.

E. plan and prepare documents appropriate for design and construction;

F. perform economic analyses and cost estimates related to design, construction, operations and maintenance of systems associated with civil engineering;

G. select appropriate engineering materials and practices; and

H. perform standard analysis and design of elements for structures, hydraulic and hydrologic systems, construction operations, and transportation systems. **

** Indicates learning outcomes assessed during the 2015/2016 cycle.

Please describe the 2015-2016 assessment activities for the program in Part I. Use Column H to describe improvements planned for 2015-2016 based on the assessment process. In Part II, please describe activities engaged in during 2015-2016 designed to close-the-loop (improve the program) based on assessment activities and the information gathered in 2014-2015. Thank you.

I. Program student learning outcomes (SLOs) assessed in this cycle, processes, results, and recommendations.

A. Which of the program SLOs were assessed during this cycle? Please include the outcome(s) verbatim from the assessment plan.	B. When was this SLO last assessed? Please indicate the semester and year.	C. What method was used for assessing the SLO? Please include a copy of any rubrics used in the assessment process.	D. Who was assessed? Please fully describe the student group(s) and the number of students or artifacts involved.	E. What is the expected achievement level and how many or what proportion of students should be at it?	F. What were the results of the assessment?	G. What were the department's conclusions about student performance?	H. What changes/improvements to the <u>program</u> are planned based on this assessment?
e. Function effectively as members or leaders of a technical team	Fall 2015 and Spring 2016	In Spring 2016, 7 laboratory tests were conducted in CET 315 course. Students were divided into groups with 3-4 members in each group.	Students enrolled in CET 315, CET 455 & CET 456	Seventy five (75) percent of students achieve an overall score of 70 % in each of the courses.	They performed the laboratory tests in group and wrote professional technical report individually.	While conducting the laboratory tests in group, they learned the skills required to work and to lead a group.	A comprehensive rubric which is common to all laboratory courses which have required follow up writings is needed. The CET faculty team needs to develop in the 2016-2017 cycle.

g. Communicate effectively regarding subjects related to engineering technology	Fall 2015 & Spring 2016	<p>Oral Presentation and Technical Design in CET 455 Senior Seminar, Final Project CET 456</p> <p>And'</p> <p>CET 315, CET 206</p>	Students enrolled in the CET 455 and CET 456 courses	Seventy five (75) percent of students achieve an overall score of 70 % in each of the courses.	<p>Eighty five (79) percent of the students achieved an overall score of 70 percent or better.</p> <p>A total of 14 students out of 20 utilized this opportunity in CET 2016 course. In other course, CET 315, 7 out of 11 students participated and each of them.</p>	<p>The student projects all reflected an understanding of the impact of engineering technology solutions to society. All projects this year were based in the Pueblo county area and were completed in collaboration with the municipal agency engineer(s).</p>	<p>The department was fortunate to have Dr. Sylvester Kalevela instruct the seminar course. While Dr. Kalevela acted as the dean, he was able to work with the seniors in the two senior capstone courses.</p> <p>The projects proved have students presentation ability between 70% and 95% based on a standard rubric.</p> <p>Projects prove student to 40% and 80% on design solution. Only students scored less than 60 % on a standard rubric.</p>
E. Plan and Prepare appropriate to design and construction	Fall 2015 & Spring 2016	Technical Design in CET 455 and Final Project CET 456	Students enrolled in the CET 455 and CET 456 courses	Seventy five (75) percent of students achieve an overall score of 70 % in each of the courses.	<p>One hundred (79) percent of the students doing a project of this nature achieved a score of 70% or better.</p>	<p>All projects this year were based in the Pueblo county area and were completed in collaboration with the municipal agency engineer(s).</p>	<p>The CET department staff consisted 1 fulltime tenure track faculty, 1 visiting faculty, 2 part time tenured faculty and 7 adjunct faculty. The faculty team held 6 (PE) Professional Engineers, 2 (PLS) Professional Surveyors, and 1 Professional Architect which provided a tremendous resource for design of civil engineering projects.</p>

Comments: Evaluation of Generic Engineering Technology student learning outcome items “e & g” and Civil Engineering Technology student learning outcome item “E” were used for the 2015-2016 academic year as per the CET Assessment Plan. The CET program continues to be impacted by a low number of full time faculty within the department. Last academic year experienced the passing of a faculty mid year with this academic year securing a visiting professor to fill the void. The CET department was fortunate to have a high number of licensed local practicing professionals covering the courses as during the transition however collection of data is hindered by the inconsistency of faculty. The assessment of the CET 455 and CET 456 courses seem to yield valid results with consistency in the assessment rubric. The spring 2016 semester also offered and FE preparation course which has not been offered for a couple of academic years due to the faculty situation. The course proved to have an increased number of seniors taking the FE exam with what seems to be favorable passing rates. Since many of the students are taking or have taken the exam in the month prior to this report the results are still pending a few students have reported successful completion. Results of this information will be tallied and is shown below.

CET 475: EIT Preparation Course Statics

Exam	Topics	80+ %	80-60%	60-40%	40-%
Exam 1	Comprehensive*	20%	70%	10%	-
Exam 2	Transportation and Surveying	-	70%	10%	20%
Exam 3	Construction, Ethics, and Computer	60%	40%	-	-
Exam 4	Statics, Strength and Materials	-	20%	70%	10%
Exam 5	Concrete and Steel Design	-	60%	40%	-
Exam 6	Geotech, Fluid and Water Resources	-	80%	20	-
Exam 7	Math and Statistics	60%	20%	10%	-

*The environmental engineering such as water treatment, waste management, air pollution, and water pollution was discarded.

This batch of students have excellent general level knowledge such as ethics, computer, construction, math, and statistics. This is depicted from Exam 3; 60% students scored above 80%.

On the other hand, 70% of the students ranges 40-60% of the score in statics and strength of materials.

The department chair reports while the lack of consistent full time faculty continues to make data collection ambiguous and effort to retain successful adjunct faculty and recruit new full time faculty seems to be extremely promising.

II. Follow-up (closing the loop) on results and activities from previous assessment cycles. In this section, please describe actions taken during this cycle that were based on, or implemented to address, the results of assessment from previous cycles.

A. What SLO(s) did you address? Please include the outcome(s) verbatim from the assessment plan.	B. When was this SLO last assessed? Please indicate the semester and year.	C. What were the recommendations for change from the previous assessment?	D. Were the recommendations for change acted upon? If not, why?	E. What were the results of the changes? If the changes were not effective, what are the next steps or the new recommendations?
j. demonstrate an understanding of the impact of engineering technology solutions to society	Fall 2014 & Spring 2015	The department chair strongly encouraged the dean to plan for a full-time tenure track professor to lead this course for future years.	Difficulty in obtaining valid reliable data was apparent in the previous cycle of evaluation. The inconsistency of full-time faculty was a problem. The department chair made a strong effort to retain previous successful adjunct faculty and strengthen their knowledge of the role and mission of program. A full-time visiting professor with emphasis in structural design and geotechnical analysis was hired during the summer of 2015.	While the number of adjunct faculty remained high a strong effort was made to retain previous success adjunct faculty was made. Preliminary results show consistency in the use of consistent assessment tools. The results of the this Student Learning Outcome proved to be equal or slightly lower than the previous year. However the results are within the expectations. This evaluator feels confident with the results and consistency of the assessment.
H. perform standard analysis and design of elements for structures,	Fall 2014 & Spring 2015	The department chair strongly encouraged the dean to plan for a full-time tenure track professor to	Difficulty in obtaining valid reliable data was apparent in the previous cycle of evaluation. The inconsistency	While the number of adjunct faculty remained high a strong effort was made to retain previous success adjunct faculty was made. Preliminary results show consistency

hydraulic and hydrologic systems, construction operations, and transportation systems.		lead this course for future years.	of full-time faculty was a problem. The department chair made a strong effort to retain previous successful adjunct faculty and strengthen their knowledge of the role and mission of program. A full-time visiting professor with emphasis in structural design and geotechnical analysis was hired during the summer of 2015.	in the use of consistent assessment tools. The results of the this Student Learning Outcome proved to be equal or slightly lower than the previous year. However the results are within the expectations. This evaluator feels confident with the results and consistence of the assessment. The CET department faculty consisted 1 fulltime tenure track faculty, 1 visiting faculty, 2 part time tenured faculty and 7 adjunct faculty. The faculty team held 6 (PE) Professional Engineers, 2 (PLS) Professional Surveyors, and 1 Professional Architect which provided a tremendous resource for design of civil engineering projects. While securing faculty is a priority recent efforts by administration show definite improvement.
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Comments:

Two rubrics were used consistently in the assessment of senior projects yielding valid assessment of the student presentation and technical design competence. The availability of practicing professionals to the CET students through the adjunct and community partners has shown strong ability to perform standard analysis and design of civil engineering projects. The CET senior students were also offered an FE preparation course as an elective during the spring 2016 semester. While this course is not mandatory for all seniors it was taken advantage of by more than 80% of the senior class. The CET program does not require all graduates to take the FE exam it is encouraged the following results of this course demonstrate the student's preparedness of the major subjects of the CE graduate. The following results were reported at the completion of the FE prep course:

CET 475: EIT Preparation Course Statistics

Exam	Topics	80+ %	80-60%	60-40%	40-%
Exam 1	Comprehensive*	20%	70%	10%	-
Exam 2	Transportation and Surveying	-	70%	10%	20%
Exam 3	Construction, Ethics, and Computer	60%	40%	-	-
Exam 4	Statics, Strength and Materials	-	20%	70%	10%
Exam 5	Concrete and Steel Design	-	60%	40%	-
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Evaluation Criteria/Rubric

The following scale is typically followed. Depending on the class performance, this scale is very often modified.

Points	Letter Grade
94-100	A
90-93	A-
87-89	B+
84-86	B
80-83	B-
77-79	C+
74-76	C
70-73	C-
67-69	D+
64-66	D
60-63	D-
Below 60	F

The point distribution is as follows:

Assignments	Percentage of Total Grade
Quiz	≈ 15
Homework	≈ 15
Hourly Exam	≈ 25
Lab Reports	≈ 10
Attendance	≈ 5
Class Participation	≈ 5
Final Exam	≈ 25
Total	100

While grading quiz/exams/HW, the following rubric is followed:

Points	Criteria
100%	If students could identify the concept, used all proper formulation, solved correctly, and showed the results clearly.
90%	If students could identify the concept, used all proper formulation, solved correctly, but did not show results clearly or quoted wrong units.
75%	If students could identify the concept, used all proper formulation, solved with calculation mistakes.
50%	If students could identify the concept, and used few proper formulations.
25%	If students could partially identify the concept.
10%	If students could not do anything but attempted.
0%	If students did not attempt it.

Additional Comments:

The following items are either in progress or to be completed within the next few months prior to the beginning of academic year 2016-2017. These items are as per the three year assessment plan cycles.

1. Data continues to be collected for students based performance as noted in report.
2. A CET advisory committee meeting was held during the fall semester of the 2015.
3. Administration of Senior exit exam will take place in July 2016.
4. CET faculty will meet to analyze and plan for areas of improvement in August of 2016.
5. Department chair will update 3 and 6 year cycle information in August of 2016.

CET Senior Project Oral Presentation Rubric

Student Learning Outcome: An ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.

Source of Evidence: Oral presentation of CET Senior Design Project

Decision Criteria: 75% of Project teams to receive a score of 15 or better

TEAM #2

	4-Outstanding	3-Acceptable	2-Developing	1 - Unacceptable
Presentation Materials Score: <u>3</u>	<ul style="list-style-type: none"> The presentation layout is neat and attractive, and is supported by graphics that are relevant to the discussion topic. Presentation text is easily legible by the audience. The graphics are easy to view or read, and help the audience to understand the material. The presentation is free of grammatical mistakes and typographical errors. 	<ul style="list-style-type: none"> The presentation layout is neat and attractive, and is supported by graphics that are relevant to the discussion topic. Most of the presentation text is easily legible by the audience. Most of the graphics are easy to view, and help the audience to understand the material The presentation has one or two grammatical mistakes or typographical errors. 	<ul style="list-style-type: none"> The presentation layout is slightly disorganized. A significant number of graphics are not clear or not relevant to the topic. Most of the text cannot be read by the audience There are two or more grammatical mistakes or typographical errors in the presentation. 	<ul style="list-style-type: none"> The presentation layout is not organized graphics are not relevant to the discussion topic. Presentation text is not easily legible by the audience. Graphics are hard to view Presentation has many grammatical mistakes or typographical errors.
Technical Information Score: <u>4</u>	<ul style="list-style-type: none"> Appropriate level of relevant detail is provided to enable the audience to form independent opinion regarding the subject matter. Presenters were well prepared to answer questions and to provide clarification on difficult parts of the material. 	<ul style="list-style-type: none"> Relevant detail is provided to enable the audience to form independent opinion regarding the subject matter. Presenters adequately prepared to answer questions and clarify difficult parts of the material 	<ul style="list-style-type: none"> Presentation difficulty to understand due to occasional lack of adequate information or inordinately too much detail. Presenters were marginally prepared and not able to answer questions about fundamental elements of the project. 	<ul style="list-style-type: none"> Presentation lacks the necessary technical detail and the audience cannot understand the technical aspects of the project. Presenters did not answer expected questions.
Design Solution Score: <u>4</u>	<ul style="list-style-type: none"> The presenters provided a logical project design process. Presenters clearly stated the design assumptions and governing constraints. All design assumptions were appropriate. Design alternatives were presented and the value of the selected design solution is apparent. 	<ul style="list-style-type: none"> The presenters provided a logical project design process. Presenters stated the design assumptions and governing constraints. Most design assumptions were appropriate. Design alternatives were presented and the value of the selected design solution is supported. 	<ul style="list-style-type: none"> Presenters did not provide a consistent logical design process. Presenters stated some design assumptions but did not articulate adequately support them. Most design assumptions were not properly articulated. The design alternatives presented did not merit consideration. 	<ul style="list-style-type: none"> The presentation does not provide a logical project design process. Design assumptions and governing constraints not clearly stated. No alternative design solutions were presented.
Interaction with Audience Score: <u>3</u>	<ul style="list-style-type: none"> The presenters drew interest from the audience and engaged the audience during the entire presentation period. Presenters allowed the audience to ask questions 	<ul style="list-style-type: none"> The presenters drew interest from the audience and engaged the audience during most of the presentation period. Presenters allowed the audience to ask questions 	<ul style="list-style-type: none"> The presenters lost the audience interest during a significant amount of time. Presenters lost contact with audience during the presentation 	<ul style="list-style-type: none"> Presenters did not engage the audience. Presenters did not allow the audience to ask questions
Professional Etiquette Score: <u>3</u>	<ul style="list-style-type: none"> Presenters were dressed well and appropriately for the occasion Presenters were very considerate in their responses to questions. Presentation was started and concluded within the expected time limits. Presenters exhibited high level of team coordination. 	<ul style="list-style-type: none"> Presenters were dressed well and appropriately for the occasion. Some presenters had body language or speech that could be improved. Presentation conducted in a timely manner but had a rough start or end. Presenters exhibited good team coordination. 	<ul style="list-style-type: none"> Presenters were dressed well and appropriately for the occasion. Some presenters' body language or speech needs significant improvement. Presenters exhibited unpreparedness and did not conclude within the expected time limit. Evidence of lack of teamwork during the presentation. 	<ul style="list-style-type: none"> Presenters were not dressed well or appropriately for the occasion Presenters were not considerate in their responses to questions. The presentation was not completed within the expected time limits. Presenters exhibited poor team coordination.
Total Score <u>17</u>				

3 students

TEAM # 2

CET SENIOR PROJECT
EVALUATION OF TECHNICAL DESIGN

Legend for Scale: 5- Strongly Agree; 4-Agree, 3-Neutral, 2-Disagree, 1-Strongly Disagree

Source of Evidence: Design Report, Oral Presentation and Peer Evaluation

Decision Criteria: 75% of students receive a score of 30 or better

<u>Technical Design Quality</u>	5	4	3	2	1	Score
1. Appropriate design standards and methodologies have been used.	X					5
2. Design assumptions and constraints have been clearly identified and are appropriate.	X					5
3. Calculations are complete and accurate.		X				4
4. Significant and/or innovative project components, materials, and methods have been adequately described.	X					5
5. Sustainability concepts have been considered and global/societal impacts adequately discussed.	X					5
6. Cost estimate includes all major components of work and is appropriate.			X			3
7. Plans or drawings are well organized and easily navigable with appropriate placement of details, sections, notes, etc.	X					5
8. The project employs innovative concepts and/or includes design components that required independent research outside the scope of the undergraduate curriculum.	X					5
<u>Teamwork and Cooperation:</u> Teamwork was clearly evident and had a major positive impact on the project.				X		2
<u>Overall Project Evaluation:</u> Project scope and quality significantly exceeds desired expectations for a CET capstone project.	X					5
Total						44

Comments