Colorado State University-Pueblo

Civil Engineering Technology

Program Education Objectives & Program Outcomes

Prepared by Sylvester A. Kalevela

May 2012 Edition

Primary Contact: Sylvester A. Kalevela sylvester.kalevela@colostate-pueblo.edu

1. Introduction

In this summary, the terminologies "program educational objectives" and "student outcomes" are used to communicate the meanings as described below. The program educational objectives and program outcomes have been articulated based on the needs of or with input from the main constituencies of the CET program. The main CET constituencies consist of students, alumni, employers, CSU-Pueblo and the professional community; including the American Society of Civil Engineers and the program accrediting agency.

The CET program is accredited by ABET. In order to maintain ABET accreditation, the program has to demonstrate that our students are trained to attain as a minimum standard competences as specified by ABET. The ABET competences are divided in two parts: (a) a generic set of student learning outcomes that are expected of all engineering technology programs, and (b) a set of student learning outcomes that apply to all civil engineering technology programs.

- Program Educational Objectives: These are broad statements that describe career objectives that graduates are expected to attain within a few years of graduation.
- Student Outcomes: Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students attain as they progress through the program. Specifically, the term "student outcomes" is used as a synonym for the term "student leaning outcomes" as defined at CSU-Pueblo.

Program Education Objectives

The objective of the Civil Engineering Technology (CET) program at Colorado State University-Pueblo is to provide an integrated educational experience so that its graduates are:

- Prepared to apply established engineering principles and standards of practice in developing solutions to civil engineering problems, and
- Prepared for successful careers in civil engineering by providing them with the ability to contribute to engineering teams in various practice areas including (a) engineering analysis and design, (b) construction planning and management, (c) experimentation, (d) technical documentation, and (e) systems operations or maintenance.

Student Outcomes (Student Learning Outcomes)

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.

2. Civil Engineering Technology Curriculum

To achieve the expected program outcomes, students are required to complete a defined academic curriculum that included the CET, Math and Science courses listed below. A matrix of the mapping for the curriculum to the expected program outcomes is provided in Table 1.

Civil Engineering Technology Courses:

CET 101: Introduction to CET
CET 102: Surveying I
CET 103: Surveying II
CET 115: Civil Drafting I
CET 116: Civil Drafting II
CET 202: Statics
CET 206: Strengths of Materials
CET 207: Construction Materials & Methods
CET 208: Concrete & Asphalt Materials
CET 222: Dynamics
CET 226: Application of Computers to Engineering Problems
CET 305: Construction Cost Estimating II
CET 315: Soil Mechanics Technology
CET 316: Structural Analysis
CET 317: Hydraulics
CET 372: Traffic Control and Analysis
CET 404: Structural Steel Design
CET 405: Reinforced Concrete Design
CET 412: Hydrology
CET 415: Water and Sewer Systems Design
CET 455: Design Seminar
CET 456: Senior Project
CET 473: Highway Design
Approved CET Electives
Approved Technical Electives

Math, Science and Computer Courses:

Required Semester Hours: **25 semester hours**

CIS 100: Intro to Word & Windows
CIS 103: PowerPoint & Web Publishing
CIS 104: Excel Spreadsheets
MATH 121: College Algebra
MATH 124: Pre-Calculus Math
MATH 126: Calculus & Analytic Geometry
CHEM 111/L: Principles of Chemistry
PHYS 201/L: Principles of Physics I/Lab

Required General Education Courses:

As listed in the CSU-Pueblo Catalog

Table 1: MAP FOR CET PROGRAM OUTCOMES AND CURRICULUM

	Students who successfully complete the CET program at CSU-Pueblo will have the ability to		CET 101	CET 102	CET 103	CET 115	CET 116	CET 202	CET 206	CET 207	CET 208	CET 222	CET 226	CET305	CET 315	CET 316	CET 317	CET 372	CET 404	CET 405	CET 412	CET 415	CET 455	CET 456	CET 473	CIS 100, 103, 104	CHEMISTRY	MATH	PHYSICS	
A	utilize principles and appropriate technology to produce drawings, reports, quantity estimates, and other documents related to civil engineering;					x	x																							
B	conduct standardized field and laboratory tests related to civil engineering;			x	x				x		x				x		x	x												
C	utilize surveying methods and equipment to perform land measurement or construction layout;			x	x																									
D	apply fundamental computational methods and elementary analytical techniques to solve civil engineering technology problems.		x										x													x		x		
E	plan and prepare documents appropriate for design and construction;					x	x																							
F	perform economic analyses and cost estimates related to design, construction, operations and maintenance of systems associated with civil engineering;													x												x				
G	select appropriate engineering materials and practices;									x	x				x				x	x						x		x		x	
H	perform standard analysis and design of elements for structures, hydraulic and hydrologic systems, construction operations, and transportation systems.							x	x		x	x			x	x	x	x	x	x	x	x	x	x	x		x	x	x	

3. Assessment of CET Program Outcomes

Assessment of student learning outcomes will take place in individual courses through a variety of methodologies including assigned homework, tests, semester exams, lab reports, oral presentations, and capstone activities. Table 2 shows a plan of assessment activities and it includes details on (i) type of assessment activity, (ii) type and method of data collection, (iii) source of data, and (iv) individuals or groups responsible for data collection and analysis. The assessment activities of student learning for courses in the program are summarized in Table 3.

Table 2: CET PROGRAM ASSESSMENT ACTIVITIES AND METHODS

Assessment Activity	Frequency of Data Collection	Data Collected Media	How Collected	From Whom Collected	Responsible for Collection	Who Evaluates Data	Frequency of Evaluation
Individual Course Outcomes	Each semester course is offered	Assessment reports	Paper & online	All faculty including adjuncts & students	Program Coordinator	Program Assessment Committee	Once per year
Civil Engineering Technology Competency	Once per year (spring semester)	Evaluation forms	Exit Exam and Senior Project	CET Program Coordinator/ Instructor	Program Coordinator	Program Assessment Committee	Once per year
Senior Exit Surveys	Each semester	Surveys	Paper and verbal	Seniors with graduation petitions	Program Coordinator	Program Assessment Committee	Once per year
FE Exam* (supplementary)	Every time ≥2 students take FE Exam	Average score for enrolled test takers	NCEES reports	NCEES	Program Coordinator/ Dept. Chair	Program Assessment Committee	Once per year
CET IAC Input	Every year	Oral Comments and/or Questionnaire	IAC Meeting Minutes, and Paper or electronically	IAC members	Program Coordinator	Program Assessment Committee	Every time survey is done
Alumni Surveys	Every three years	Surveys	Online or mailed questionnaire	Alumni within past 3 years	Program Coordinator	Program Assessment Committee	Every time survey is done
Employer Surveys	Every three years	Surveys	Online or mailed questionnaire	Employers identified by alumni	Program Coordinator	Program Assessment Committee	Every time survey is done

Legend
CET – Civil Engineering Technology
FE – Fundamentals of Engineering
IAC – Industrial Advisory Committee
NCEES – National Council of Examiners for Engineering and Surveying

Table 3: Summary of Assessment Activities for CET courses

Course	Assessment Activities		Course	Assessment Activities
CET 101	HW, EA TS, SE		CET 315	EA, HW, TS, SE, EX, RP
CET 102	HW, EA, PR,TS, SE, EX		CET 316	QZ, TS, SE
CET 103	HW, EA, PR,TS, SE, EX		CET 317	EA, QZ,TS,SE, EX
CET 115	HW, EA, PR, TS, SE		CET 372	EA, HW, TS, PR, SE
CET 116	HW, EA, PR, TS, SE		CET 404	QZ, TS, SE
CET 202	HW, TS, SE, EX		CET 405	HW, TS, SE
CET 206	HW, EA, TS, RP, SE, EX		CET 412	HW, TS, PR, SE
CET 207	HW, TS, SE		CET 415	HW, TS, SE
CET 208	HW, EA, TS, SE		CET 455	EA, PR, OR
CET 222	HW, TS, SE		CET 456	PR, RP, OR, WC
CET 226	EA, TS, SE		CET 473	HW, TS, SE
CET 305	EA, TS, PR, SE			

LEGEND:

EA – Experiential Activity
EX – Exit Exam
HW- Homework
OR – Oral Presentations
PR – Project
QZ - Quiz
RP – Report
SE – Semester Exam
TS – Test
WC – Written Communication

Evaluation of Individual Student Performance: In general, for each course, the results of assessment of student activities are evaluated, weighted and used to produce a normalized metric (a percent score). Typically, the normalized metric is the summary used to indicate **whether** and **how** an individual student meets the expected learning objectives.

Course Evaluation: The performance evaluation for each course will be based on the percent of students in the class who "*successfully complete*" the course. That is, the percent of students in the class who attain or exceed the minimum requirements for the expected learning objectives.