Civil Engineering Technology
Student Assessment Plan
Updated April 2018

The student outcomes of the BSCET Program of CSU-Pueblo are adopted the same with the student outcomes ABET Engineering Technology Accreditation Commission. There are eleven (11) General Student Outcomes and eight (8) Program Specific Outcomes. Each outcome has been mapped to the engineering technology courses as depicted in **Exhibits 1 and 2.**

As part of continuous improvement measurement, the assessment of student general outcomes will be conducted on a three-year cycle starting from Academic Year (AY) 2017-2018 as shown in **Table 1.** This means the assessment cycle will be started in the fall of 2017 and end up in the spring of 2020. At the first AY of the cycle, Student General Outcomes (a), (b), and (c) assessment will be conducted. In the following AY, Student General Outcomes (d), (e), (f), and (g) will be assessed. In the final AY of the cycle, the last four Student General Outcomes (h), (i), (j), and (k) will be assessed. Then all the Student General Outcomes assessment will be completed in a three-year cycle. After that this process will be repeated from AY 2020-2021.

Table 2. Assessment Cycle for AY 2017-2018 to AY 2022-2023 for General Student Outcomes

Student Outcome	2017-2018	2018-2019	2019-2010	2020-2021	2021-2022	2022-2023
a. An ability to select and apply the knowledge, techniques, skills and modern tools of the discipline to broadly-defined engineering technology activities	X			X		
b. An ability to select and apply a knowledge of mathematics, science, engineering and technology to engineering technology problems that require the application of principles and applied procedures or methodologies	X			X		
c. An ability to conduct standard tests and measurements; to conduct, analyze and interpret experiments; and to apply experimental results to improve processes	X			X		
d. An ability to design systems, components, or processes for broadly defined engineering technology problems appropriate to program educational objectives		X			X	
e. An ability to function effectively as a member or leader on a technical team		X			X	
f. An ability to identify, analyze and solve broadly-defined engineering technology problems		X			X	
g. 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		X			X	
h. An understanding of the need for and ability to engage in self-directed continuing professional development			X			X
i. An understanding of and commitment to address professional and ethical responsibilities including a respect for diversity			X			X
j. A knowledge of the impact of engineering technology solutions in a societal and global context			X			X
k. A commitment to quality, timeliness, and continuous improvement			X			X

The assessment of Specific Student Outcomes will also be conducted on a three-year cycle starting from Academic Year (AY) 2017-2018 as shown in **Table 3.** This means the assessment cycle will be started in the fall of 2017 and end up in the spring of 2020. At the first AY of the cycle, Student Specific Outcomes (a), and (b) assessment will be conducted. In the following AY, Student Specific Outcomes (c), (d), and (e) will be assessed. In the final AY of the cycle, the last four Student Specific Outcomes (f), (g), and (h) will be assessed. Then all the Student Specific Outcomes assessment will be completed in a three-year cycle. After that this process will be repeated from AY 2020-2021.

Table 3. Assessment Cycle for AY 2017-2018 to AY 2022-2023 for Specific Student Outcomes

Student Outcome	2017-2018	2018-2019	2019-2010	2020-2021	2021-2022	2022-2023
a. Utilize principles, hardware, and software that are appropriate 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		
c. Utilize surveying methods appropriate for land measurement and/or construction layout;		X			X	
d. Apply fundamental computational methods and elementary analytical techniques in sub-disciplines related to civil engineering.		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, and;			X			X
h. Perform standard analysis and design in at least three sub-disciplines related to civil engineering.			X			X

The performance indicators to be used in judging the student performance on the student outcomes are listed in **Table 4** and **Table 5**, for general outcomes and specific outcomes respectively.

Table 4. Performance Indicators to be used for General Outcomes

Student Outcomes	Performance Indicators
a. An ability to select and apply the knowledge, techniques, skills and modern tools of the discipline to broadly-defined engineering technology activities	Problem statement shows understanding of the problem Solution procedure and methods are defined. Problem solution is appropriate and within reasonable constraints
b. An ability to select and apply a knowledge of mathematics, science, engineering and technology to engineering technology problems that require the application of principles and applied procedures or methodologies	Chooses a mathematical model of a system or process appropriate for required accuracy Applies mathematical principles to achieve analytical or numerical solution to model equations Examines approaches to solving an engineering technology problem to choose the more effective approach
c. An ability to conduct standard tests and measurements; to conduct, analyze and interpret experiments; and to apply experimental results to improve processes	Observes good lab practice and operates instrumentation with ease Determines data that are appropriate to collect and selects appropriate equipment, protocols, etc. for measuring the appropriate variables to get required data Uses appropriate tools to analyze data and verifies and validates experimental results including the use of statistics to account for possible experimental error
d. An ability to design systems, components, or processes for broadly defined engineering technology problems appropriate to program educational objectives	Produces a clear and unambiguous needs statement in project Identifies constraints on the design problem, and establishes criteria for acceptability and desirability of solutions Carries solution through to the most economic/desirable solution and justifies the approach
e. An ability to function effectively as a member or leader on a technical team	Recognize participant roles in a team setting Integrate input from all team members and makes decision Improves communications among teammates and ask for feedback
f. An ability to identify, analyze and solve broadly-defined engineering technology problems	Problem statement shows understanding of the problem Solution procedure and methods are defined. Problem solution is appropriate and within reasonable constraints
g. 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	Writing conforms to appropriate technical style Appropriate usage of graphics Grammar and editorial aspects Oral: body language and clarity of speech
h. An understanding of the need for and ability to engage in self-directed continuing professional development	Expresses an awareness that education is continuous after graduation Able to find information relevant to problem without guidance
i. An understanding of and commitment to address professional and ethical responsibilities including a respect for diversity	Knows code of ethics for the discipline Able to evaluate the ethical dimensions of a problem in the discipline
j. A knowledge of the impact of engineering technology solutions in a societal and global context	Identifies the current critical issues confronting the discipline Evaluates alternative engineering technology solutions
k. A commitment to quality, timeliness, and continuous improvement	Identifies the quality requirements associated with an engineering technology problem Expresses an awareness that education is continuous after graduation

The listed performance indicators will be used in different courses and assignments to measure the achievement of general student outcomes. The performance indicators, their educational strategies, and methods of assessments are listed in Tables 4a to 4k.

An ability to select and apply the knowledge, techniques, skills and modern tools

Table 4a. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(a): An ability to select and apply the knowledge, techniques, skills and modern tools…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Problem statement shows understanding of the problem	CET 102, 103, 202, 208, 305, 315, 317, 372, 404, 405, 412, 415, 455, 456, 473, 475	HW, Quiz, Exam, Final Exam
Solution procedure and methods are defined.	CET 102, 103, 202, 208, 305, 315, 317, 372, 404, 405, 412, 415, 455, 456, 473, 475	HW, Quiz, Exam, Final Exam
Problem solution is appropriate and within reasonable constraints	CET 102, 103, 202, 208, 305, 315, 317, 372, 404, 405, 412, 415, 455, 456, 473, 475	HW, Quiz, Exam, Final Exam

Table 4b. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(b): An ability to select and apply a knowledge of mathematics, science…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Chooses a mathematical model of a system or process appropriate for required accuracy	CET 102, 103, 115, 116, 202, 206, 207, 208, 222, 226, 305, 315, 316, 317, 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam
Applies mathematical principles to achieve analytical or numerical solution to model equations	CET 102, 103, 115, 116, 202, 206, 207, 208, 222, 226, 305, 315, 316, 317, 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam
Examines approaches to solving an engineering technology problem to choose the more effective approach	CET 102, 103, 115, 116, 202, 206, 207, 208, 222, 226, 305, 315, 316, 317, 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam

Table 4c. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(c): An ability to conduct standard tests and measurements….

Performance Indicators	Educational Strategies	Method(s) of Assessment
Observes good lab practice and operates instrumentation with ease	CET 102, 103, 208, 315, 317	Lab Testing, Field Testing
Determines data that are appropriate to collect and selects appropriate equipment, protocols, etc. for measuring the appropriate variables to get required data experimental results including the use of statistics to account for possible experimental error	CET 102, 103, 208, 315, 317	Lab Report, Survey Report
Uses appropriate tools to analyze data and verifies and validates experimental results including the use of statistics to account for possible experimental error	CET 102, 103, 208, 315, 317	Lab Report, Survey Report

Table 4d. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(d): An ability to design systems, components, or processes…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Produces a clear and unambiguous needs statement in project	CET 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Identifies constraints on the design problem, and establishes criteria for acceptability and desirability of solutions	CET 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Carries solution through to the most economic/desirable solution and justifies the approach	CET 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project

Table 4e. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(e): An ability to function effectively as a member or leader…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Recognize participant roles in a team setting	CET 101, 102, 208, 305, 315, 317, 412, 455, 456	Instructor Survey, Peer Evaluation, Interviews
Integrate input from all team members and makes decision	CET 101, 102, 208, 305, 315, 317, 412, 455, 456	Instructor Survey, Peer Evaluation, Interviews
Improves communications among teammates and ask for feedback	CET 101, 102, 208, 305, 315, 317, 412, 455, 456	Instructor Survey, Peer Evaluation, Interviews

Table 4f. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(f): An ability to identify, analyze and solve broadly-defined….

Performance Indicators	Educational Strategies	Method(s) of Assessment
Problem statement shows understanding of the problem	CET 103, 372, 404, 405, 412, 455, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Solution procedure and methods are defined.	CET 103, 372, 404, 405, 412, 455, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Problem solution is appropriate and within reasonable constraints	CET 103, 372, 404, 405, 412, 455, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project

Table 4g. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(g): An ability to apply written, oral, and graphical…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Writing conforms to appropriate technical style	CET 103, 116, 206, 207, 208, 305, 315, 317, 412, 415, 455, 456, 473	Lab Report, Semester Project Report
Appropriate usage of graphics	CET 103, 116, 206, 207, 208, 305, 315, 317, 412, 415, 455, 456, 473	Lab Report, Semester Project Report, Power-point slides
Grammar and editorial aspects	CET 103, 116, 206, 207, 208, 305, 315, 317, 412, 415, 455, 456, 473	Lab Report, Semester Project Report, Power-point slides
Oral: body language and clarity of speech	CET 103, 116, 206, 207, 208, 305, 315, 317, 412, 415, 455, 456, 473	Lab Report, Semester Project Report, Oral presentation

Table 4h. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(h): An understanding of the need for and ability to engage in self….

Performance Indicators	Educational Strategies	Method(s) of Assessment
Expresses an awareness that education is continuous after graduation	CET 101, 208, 315, 455, 475 Student Organizations, Off-class presentation	Exams, Organizational Activity, Off-class activity such as EIT licensure, presentation, etc.
Able to find information relevant to problem without guidance	CET 101, 208, 315, 455, 475 Student Organizations, Off-class presentation	Exams, Organizational Activity, Off-class activity such as EIT licensure, presentation, etc.

Table 4i. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(i): An understanding of and commitment to address professional….

Performance Indicators	Educational Strategies	Method(s) of Assessment
Knows code of ethics for the discipline	CET 101, 102, 208, 315, 455, 456, 475. Student Organizations	Exams, Organizational Activity
Able to evaluate the ethical dimensions of a problem in the discipline	CET 101, 102, 208, 315, 455, 456, 475, Student Organizations	Exams, Organizational Activity

Table 4j. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(j): A knowledge of the impact of engineering technology solutions…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Identifies the current critical issues confronting the discipline	CET 102, 207, 208, 315, 317, 412, 455, Student Organizations, Scholarly Activities	Exams, Organizational Activity, Research Presentation
Evaluates alternative engineering technology solutions	CET 102, 207, 208, 315, 317, 412, 455, Scholarly Activities	Exams, Research Presentation

Table 4k. Relating Performance Indicators with Courses or Assignments to be used for General Outcomes-(k): A commitment to quality, timeliness, and continuous improvement…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Identifies the quality requirements associated with an engineering technology problem	CET 101, 102, 115, 208, 315, 317, 405, 412, 415, 455	HW, Quiz, Exam, Final Exam, Semester Project
Expresses an awareness that education is continuous after graduation	CET 101, 102, 115, 208, 315, 317, 405, 412, 415, 455	HW, Quiz, Exam, Final Exam, Semester Project

Table 5. Performance Indicators to be used for Specific Outcomes

Student Outcomes	Performance Indicators
a. Utilize principles, hardware, and software that are appropriate to produce drawings, reports, quantity estimates, and other documents related to civil engineering;	Selects appropriate techniques and tools for a specific engineering technology task and compares results with results from alternative tools or techniques Uses computer-based and other resources effectively in assignments and projects
b. Conduct standardized field and laboratory tests related to civil engineering;	Observes good lab practice and operates instrumentation with ease Determines data that are appropriate to collect and selects appropriate equipment, protocols, etc. for measuring the appropriate variables to get required data Uses appropriate tools to analyze data and verifies and validates experimental results including the use of statistics to account for possible experimental error
c. Utilize surveying methods appropriate for land measurement and/or construction layout;	Ability to choose the right surveying tools Able to use survey tools and interpret results
d. Apply fundamental computational methods and elementary analytical techniques in sub-disciplines related to civil engineering.	Problem statement shows understanding of the problem Solution procedure and methods are defined. Problem solution is appropriate and within reasonable constraints
e. Plan and prepare documents appropriate for design and construction;	Identifies construction documents and layouts Develop construction documents and update capacity
f. Perform economic analyses and cost estimates related to design, construction, operations and maintenance of systems associated with civil engineering;	Have knowledge in engineering economics Cost estimate skills in design, construction, operations and maintenance
g. Select appropriate engineering materials and practices, and;	Knowledge of material behaviors Design aspects of materials
h. Perform standard analysis and design in at least three sub-disciplines related to civil engineering.	Problem statement shows understanding of the problem Solution procedure and methods are defined. Problem solution is appropriate and within reasonable constraints

The listed performance indicators will be used in different courses and assignments to measure the achievement of the specific outcomes. The performance indicators, their educational strategies, and methods of assessments are listed in Tables 5a to 5h.

Table 5a. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(a): Utilize principles, hardware, and software that…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Selects appropriate techniques and tools for a specific engineering technology task and compares results with results from alternative tools or techniques	CET 102, 103, 115, 116, 207, 208, 315, 317, 404, 405, 473	HW, Exam, Semester Project
Uses computer-based and other resources effectively in assignments and projects	CET 102, 103, 115, 116, 207, 208, 315, 317, 404, 405, 473	HW, Exam, Semester Project

Table 5b. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(b): Conduct standardized field and laboratory tests related..

Performance Indicators	Educational Strategies	Method(s) of Assessment
Observes good lab practice and operates instrumentation with ease	CET 206, 206, 315, 317	Lab Testing, Field Testing
Determines data that are appropriate to collect and selects appropriate equipment, protocols, etc. for measuring the appropriate variables to get required data	CET 206, 206, 315, 317	Lab Report
Uses appropriate tools to analyze data and verifies and validates experimental results including the use of statistics to account for possible experimental error	CET 206, 206, 315, 317	Lab Report

Table 5c. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(c): Utilize surveying methods appropriate for land measurement…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Ability to choose the right surveying tools	CET 102, 103, 473	Field Testing
Able to use survey tools and interpret results	CET 102, 103, 473	Field Testing, Survey Report

Table 5d. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(d): Apply fundamental computational methods and elementary…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Problem statement shows understanding of the problem	CET 103, 202, 208, 315, 372, 404, 405, 412, 415, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Solution procedure and methods are defined.	CET 103, 202, 208, 315, 372, 404, 405, 412, 415, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Problem solution is appropriate and within reasonable constraints	CET 103, 202, 208, 315, 372, 404, 405, 412, 415, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project

Table 5e. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(e): Plan and prepare documents appropriate for design…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Identifies construction documents and layouts	CET 103, 115, 116, 207, 305	HW, Exam
Develop construction documents and update capacity	CET 103, 115, 116, 207, 305	Report Writing/Developing

Table 5f. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(f): Perform economic analyses and cost estimates…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Have knowledge in engineering economics	CET 305	HW, Quiz, Exam, Final Exam, Semester Project
Cost estimate skills in design, construction, operations and maintenance	CET 305	HW, Quiz, Exam, Final Exam, Semester Project

Table 5g. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(g): Select appropriate engineering materials and practices..

Performance Indicators	Educational Strategies	Method(s) of Assessment
Knowledge of material behaviors	CET 206, 207, 208, 305, 315, 404, 405, 412	HW, Quiz, Exam, Final Exam, Lab Testing
Design aspects of materials	CET 206, 207, 208, 305, 315, 404, 405, 412	HW, Quiz, Exam, Final Exam, Lab Report

Table 5h. Relating Performance Indicators with Courses or Assignments to be used for Specific Outcomes-(h): Perform standard analysis and design…

Performance Indicators	Educational Strategies	Method(s) of Assessment
Problem statement shows understanding of the problem	CET 316, 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Solution procedure and methods are defined.	CET 316, 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project
Problem solution is appropriate and within reasonable constraints	CET 316, 372, 404, 405, 412, 415, 456, 473, 475	HW, Quiz, Exam, Final Exam, Semester Project

The rubric to evaluate students' work is presented in **Table 6**. Four criteria are generally used to make the evaluation simple and effective.

Table 6. Grading Rubric for Different Performance Indicators

Good	Fair	Poor	Unable
100%	75%	50%	0%
100%	75%	50%	0%
100%	75%	50%	0%
100%	75%	50%	0%

A sample assessment of a student outcome is shown in **Table 7**.

Table 7. Assessment of Student General Outcome (Y) or Student Specific Outcome (Z)

Performance Indicators	Educational Strategies	Random Sample	Semester	Target and Result
• Problem statement shows understanding of the problem • Solution procedure and methods are defined. • Problem solution is appropriate and within reasonable constraints	CET xxx, CET xyz	One or more of: Homework, Quiz, Presentation, Lab Testing, Field Testing, Oral Interview, Online Survey, etc.		-75% will attain 75% - AB% attained CD%