Oregon TECH

2021-22
Program Assessment Report Template
Submission Deadline: October 31, 2022
to Office of Academic Excellence

This is the template for program assessment of data collected during 2021-2022 academic year. The template ensures that programs are planning for, collecting and analyzing, and engaging with assessment data.

1.D.4 The institution's **processes** and methodologies for collecting and analyzing indicators of student achievement are transparent and are used to inform and implement strategies and allocate resources to mitigate perceived gaps in achievement and equity.
1.C.7 The institution **uses** the results of its assessment efforts to inform academic and learning-support planning and practices to continuously **improve** student learning outcomes.

NWCCU Standards were updated in Jan. 2020 and include student learning outcomes, student success and achievement measures. Student achievement including, but not limited to, persistence, completion, retention, and postgraduation success. Such indicators of student achievement should be disaggregated by race, ethnicity, age, gender, socioeconomic status, first generation college student, and any other institutionally meaningful categories that may help promote student achievement and close barriers to academic excellence and success (equity gaps).

What you Did – The Plan

Section 1 – Program Mission and Educational Objectives

A. Mission Statements

University: Oregon Institute of Technology ("Oregon Tech"), Oregon's public polytechnic university, offers innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences. To foster student and graduate success, the university provides a hands-on, project-based learning environment and emphasizes innovation, scholarship, and applied research. With a commitment to diversity and leadership development, Oregon Tech offers statewide educational opportunities and technical expertise to meet current and emerging needs of Oregonians as well as other national and international constituents (https://www.oit.edu/about/mission-statement).

Department: The mission of the Oregon Tech Civil Engineering program is to prepare students for professional practice. To be prepared to practice as professionals, engineers must be able to act responsibly and ethically, understand their limits and the limits of the tools they use, communicate effectively, work well in teams, and, amid the changing landscape of the field of civil engineering, be able to pursue graduate-level education (https://www.oit.edu/academic-excellence/assessment/reports/civil-engineering/civil-engineering).

B. Program Educational Objectives

The Program Educational Objectives (PEOs) are posted publicly on the website for the university's Office of Academic Excellence and can be found at https://www.oit.edu/academic-excellence/assessment/reports/civil-engineering/civil-engineering.

The following objectives are what the faculty expects graduates from the program to be able to accomplish a few years after the commencement of their careers and stem directly from the program mission. The alumni from the BSCE program at Oregon Tech should be able to:

- practice in civil engineering or a related field.
- pursue advanced or continuing education in civil engineering or a related field.
- act as responsible, effective, and ethical citizens.
- communicate effectively.
- collaborate effectively.

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The BSCE PEOs are extremely well aligned with the mission of the university. Table 2-1 maps the key academic points of the university mission to these BSCE program objectives. As illustrated, each of the BSCE objectives has a direct relationship with at least one academic aspect of the university mission. Transversely, each of the key academic aspects of the institutional mission has a direct relationship with at least one of the BSCE objectives. Thus, the BSCE objectives are consistent with the mission of OIT.

Table 2-1. Relationships Between BSCE Program Educational Objectives and the Institutional Mission

	Key Academic Points of University Mission			
BSCE Program Objectives	Offers innovative, professionally-focused undergraduate... degree programs in the areas of engineering…	To foster student and graduate success, the university provides a hands-on, project-based learning environment and emphasizes innovation, scholarship, and applied research	A commitment to diversity and leadership development	Offers statewide educational opportunities and technical expertise to meet current and emerging needs of Oregonians as well as other national and international constituents
Practice in civil engineering or a related field	D	D	D	D
Pursue continued or advanced education in civil engineering or a related field	D	D	I	I
Act as responsible, effective, and ethical citizens	I	D	D	D
Communicate effectively	I	D	D	D
Collaborate effectively	I	I	D	D
Relationship: D = Direct, I = Indirect				

Section 2 – Program Student Learning Outcomes

The BSCE program outcomes are listed below. These are statements of skills, abilities, and knowledge that students are expected to achieve or attain prior to graduating from the BSCE program. These outcomes are published on the university's website (https://www.oit.edu/academic-excellence/assessment/reports/civil-engineering/civil-engineering)

and in the departmental assessment reports (available at that same link). Upon graduating from the BSCE program at Oregon Tech, students should possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Section 3 – Curriculum Map

Correlations between the student outcomes and the courses within the curriculum are noted below in Tables 3-1—3-5, wherein I = introduced, R = reinforced, M = mastered.

Table 3-1. Mapping of Program Outcomes to Introductory Engineering Courses

	Program Outcomes						
Introductory Engineering Courses	Outcome 1 Problem Solving	Outcome 2 Design	Outcome 3 Communication	Outcome 4 Ethics	Outcome 5 Teamwork	Outcome 6 Experimentation	Outcome 7 New Knowledge
ENGR 101 - Introduction to Engineering I	I	I	I	I		I	I
ENGR 102 - Introduction to Engineering II			I		I	I	
ENGR 211 - Engineering Mechanics: Statics	I						
ENGR 213 - Engineering Mechanics: Strength of Materials	R	I	I			I	I
ENGR 318 - Fluid Mechanics	R					R	
CE 203 - Engineering Graphics			I				I
CE 205 - Computational Methods	I						
CE 212 - Civil Engineering Materials	R					R	
GIS 134 Geographic Information Systems			I				
GME 161 Plane Surveying I	I						

Table 3-2. Mapping of Program Outcomes to Civil Engineering Core Courses

Fundamentals and Core Courses	Program Outcomes						
	Outcome 1 Problem Solving	Outcome 2 Design	Outcome 3 Communication	Outcome 4 Ethics	Outcome 5 Teamwork	Outcome 6 Experimentation	Outcome 7 New Knowledge
CE 308 - Principles of Professional Practice		I	R	R	I		I
CE 311 - Introduction to Geotechnical Engineering	R	I				R	R
CE 312 - Earth Pressures and Foundations	R	R					
CE 331 - Structural Analysis	R						
CE 341 - Elementary Structural Design		R					R
CE 351 - Introduction to Transportation Engineering	R	R		R			
CE 354 - Traffic Engineering	R	M		R		R	R
CE 371 - Closed Conduit Design	R	M					
CE 374 - Hydrology	R	M					R
CE 442 - Advanced Reinforced Concrete Design	R	M					
CE 444 - Intermediate Steel Design	R	M					
CE 401 - Civil Engineering Project I	R	R	R	R	R		R
CE 402 - Civil Engineering Project II	M	M	M	M	M		M
CE 405 - Sustainability and Infrastructure	M	R	R	M	R		

Table 3-3. Mapping of Program Outcomes to Civil Engineering Elective Courses

Fundamentals and Core Courses	Program Outcomes						
	PSLO 1 Problem Solving	PSLO 2 Design	PSLO 3 Communication	PSLO 4 Ethics	PSLO 5 Teamwork	PSLO 6 Experimentation	PSLO 7 New Knowledge
CE 407 – Advanced Soil Mechanics	M	R					
CE 407 – GIS for Water Resources	M						R
CE 407 – Hydraulic & Hydrological Modeling	M						R
CE 407 – Seismic Engineering	M	R					
CE 407 – Traffic Impact Analysis	M	R					
CE 413 – Advanced Soils	M	R					
CE 421 – Seepage and Earth Structures	M	R					
CE 422 - Advanced Shear Strength of Soils	M	R					
CE 423 - Deep Foundations	M	R					
CE 432 - Structural Loading & Lateral Forces	M	M					R
CE 433 - Structural Matrix Analysis	M						
CE 439 - Highway Bridge Rating							
CE 447 - Masonry Design		R					
CE 448 - Timber Design		R					
CE 449 - Bridge Design	M	R					R
CE 450 - Transportation Structures	M	R					R
CE 456 - Pavement Engineering	M	M				R	
CE 457 - Transportation & Land Development	M						
CE 458 - Transportation Safety	M						
CE 468 - Travel Demand Modeling	M						
CE 473 - Groundwater	M						
CE 476 - Applied Hydraulic Design	M	M					R
CE 481 - Environmental Engineering I	M						
CE 489 - Treatment Wetlands	M	R					R

Table 3-4. Mapping of Program Outcomes to Math and Science Courses

Math and Science Courses	Program Outcomes						
	Outcome 1 Problem Solving	Outcome 2 Design	Outcome 3 Communication	Outcome 4 Ethics	Outcome 5 Teamwork	Outcome 6 Experimentation	Outcome 7 New Knowledge
CHE 221/222 General Chemistry	I					I	I
GEOL 201 Physical Geology	I						
PHY 221/222 General Physics with Calculus	I					I	I
MATH 251 Differential Calculus	I						
MATH 252 Integral Calculus	R						
MATH 254N Vector Calculus I	R						
MATH 321 Applied Differential Equations I	R						
MATH 361 Statistical Methods	R						

Table 3-5. Mapping of Program Outcomes to Communication, Humanities, and Social Science Courses

Communication, Humanities, and Social Sciences Courses	Program Outcomes						
	Outcome 1 Problem Solving	Outcome 2 Design	Outcome 3 Communication	Outcome 4 Ethics	Outcome 5 Teamwork	Outcome 6 Experimentation	Outcome 7 New Knowledge
SPE 111 Public Speaking			I				
Communication Elective			I				
WRI121/122 English Composition			I/R				I
WRI227 Technical Report Writing			R				R
COM401 Civil Engineering Project I	R		R		R		R
Humanities Electives				I			
Social Science Electives			I/R				
ANTH452 Globalization			R				

Section 4 – Assessment Cycle

Table 4-1 shows the department's most recent assessment cycle. The 2021-2022 academic year was a "loop-closing" year where follow-up assessments were conducted in areas where we had fallen short.

Table 4-1. Assessment Cycle with Targeted Courses

	2018-2019			2019-2020			2020-2021		
Outcome	**Fall**	**Winter**	**Spring**	**Fall**	**Winter**	**Spring**	**Fall**	**Winter**	**Spring**
1. Problem Solving				CE 432				CE 371	
2. Design					CE 402 CE 371				
3. Written Communication	CE 401				CE 402				
3. Oral Communication	CE 401			CE 401					
4. Professionalism	CE 401				CE 318				
5. Teamwork					CE 402			CE 402	
6. Experimentation	CE 401					ENGR 213	ENGR 318		
7. New Knowledge	CE 401						CE 401		

Section 5 – Continuous Improvement

Two outcomes failed to meet benchmarks during our 2018-2021 assessment cycles. The faculty discussed options to improve the curriculum and thus student improvement in these areas. These two outcomes were reassessed in the 2021-2022 academic year. Below are discussions of the actions, assessments, and planned future actions for these two outcomes.

Outcome 4

In the first assessment of Outcome 4, 24 students enrolled in CE 401, Civil Engineering Project I were asked to perform an ethical analysis of a situation given by the instructor. The instructor then evaluated the analyses using a rubric developed by the department. The students performed very poorly at considering the impact of engineering solutions in global, economic, environmental, and social contexts with only 8% scoring 3 or higher, and only a single person scoring a 4.

The department met and evaluated these results. It was discussed that while ethics and professionalism had been assessed for many years, this was the first time that the broader impacts were included in the assessment. The situation about which the assignment was built had been used successfully in the past, but it was concluded that the potential impact of this particular hypothetical situation in global, economic, environmental, and societal contexts was inherently small and most students chose not to explore potential impacts outside of impact to the employer, office relationships, and sometimes the project. The department decided that different situations or case studies in different courses would more favorably reveal students' abilities to achieve this outcome.

This outcome was assessed again in winter 2020 wherein 25 students were asked to write an ethics memo about a different situation in CE 308, Principles of Professional Practice. While students did show improvement on the third performance criteria, they still fell well short of the minimum acceptable performance. An evaluation of the results revealed that students were not directly prompted to consider the broader impacts on the assignment, but that nearly half of them did so without prompting.

Surveys of alumni, graduates, and employers all suggested that students did possess the ability to consider these larger impacts. As such, the faculty decided to try the assessment again in yet a different course and situation in the fall of 2021. Twenty-three students enrolled in CE 405, Sustainability and Infrastructure prepared a formal report documenting an Envision sustainability assessment for a conceptual design of a senior project. The results, summarized in Table 5-1, show that students continue to perform well recognizing and make ethical judgements, but continue to struggle to communicate that they have considered broader impacts of such judgements. The faculty met to evaluate these discouraging results. The faculty remain confident that students do possess the ability to consider the broader impacts, but that students have not been able to communicate that clearly in a way that satisfies the way this outcome is assessed.

Some ideas to improve performance of this outcome include

- Assessing the different parts of this outcome separately, i.e. using one assignment to assess ethical and professional responsibilities and a separate assignment to assess informed judgement considering broader impacts.
- Rewriting the rubric so as to better capture the students' ability to communicate their ability to consider broader impacts.
- Assessing the outcome in ANTH 452, Globalization where consideration of broader impacts is both implicitly and explicitly expected.
- Changing the minimal acceptable performance level to 100% of students scoring 2 ("Some Proficiency"). This was suggested because with their limited real-world experience, even having some proficiency is better than having no proficiency when considering these difficult broader impacts.

The faculty will spend considerable time discussing Outcome 4 at their department retreat during convocation in 2022 and determine a plan to move forward. Clearly, there is work to be done in this area. The faculty look forward to gathering evidence to support their confidence that students do possess these abilities.

Table 5-1. Third Assessment of Outcome 4

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Recognition - Students can recognize decisions requiring ethical judgements in engineering situations	A formal report documenting an Envision sustainability assessment for a conceptual design of a senior project.	1 to 4 according to rubric	75% scoring 3 or higher	100% ≥ 3 25% = 4
Judgement - Makes and supports plausible ethical decisions				100% ≥ 3 25% = 4
Impact - Considers the impact of engineering solutions in global, economic, environmental, and societal contexts				0% ≥ 3 0% = 4

Outcome 6

For over ten years, the experimentation outcome (previously Outcome b) has been assessed in ENGR 213, Engineering Mechanics: Strengths of Materials and ENGR 318, Engineering Mechanics: Fluids. This cycle was no different when assessing Outcome 6. The first assessment was completed in spring 2019 with 13 BSCE students enrolled in ENGR 213. This initial assessment was extremely successful.

The following term, Outcome 6 was assessed in ENGR 318 with 35 students. This course was being taught by a new faculty member who was teaching a full load for the first time in fall 2020 and only their second time teaching this lab. As a result, much more emphasis was inadvertently placed on the development and execution of the experiment than on the analysis and results.

The results of this assessment revealed that students demonstrated superior performance in variable identification, standards identification, equipment preparation, appropriate sampling, and experimentation methods. Each team of students developed an experimental procedure that should have accomplished the stated objectives of the lab, but there was only some proficiency demonstrated in many teams' abilities to analyze the collected data and come to demonstrable conclusions.

The department evaluated these results and it was decided that for future offerings, early in the term faculty would provide more structured experiments to allow students to focus on drawing meaningful conclusions from the data. As the term would progress, the experiments would have less structure allowing students to develop their own methods and means of analysis.

This improvement plan was implemented the next time ENGR 318 was offered in fall 2021. Twenty students were assessed for their abilities to "analyze and interpret data" and "arrive at a defendable result." The results of this assessment are summarized in the Table 5-2. Performance improved significantly and the department decided to implement this scaffolded structure approach to experimental labs in the future. No further action was required during this cycle.

Table 5-2. Follow-Up Assessment for Outcome 6

Performance Criteria	Assessment Methods	Measurement Scale	Minimum Acceptable Performance	Results
Data Analysis and Interpretation	Faculty assessment of a Flow Through a Venturi Meter Laboratory Report	1 to 4 according to rubric	75% scoring 3 or higher	100% ≥ 3 60% = 4
Arrives at Defendable Result				100% ≥ 3 100% = 4

Program Assessment Report Feedback

2020-21 Assessment Report

Program:

Department Chair:

Program Assessment Report Author:

Rubric Measure	Well Developed, Progressing or Not included.
Program mission is aligned to University Mission	
Educational Objectives Wording is Actionable	
PSLO's are justified by Professional Standards	
PSLO'S are aligned to ISLO	
Curriculum Map: Scaffolding indicates Foundational, Practice, and Capstone Assessments by course	
Assessment Cycle is three years to cover all PSLO and ISLO	
Actions taken by programs on assessment during each year of the cycle are specified	
During collection year, courses/assignments are specified that align to PSLO at FP&C levels	
Rubric: Criteria for grading the assignment is described (appendix)	
Sample: Number of samples reviewed is specified	
Reliability: Reviewer and locations of the assignment are specified	
Performance Targets of acceptability are indicated	
Results include: Graduation, Retention, Persistence, DFWI, Post Grad Success, Equity Gaps, PSLO, ISLO	
Interpretation: Current results are compared against performance targets	
Interpretation: Current results are compared against previous 3 years of data	
Interpretation: Current results are compared against University data	
Action drivers: Items not meeting performance targets have actions planned	
Action drivers: Additional action plans for overall department improvement are indicated	
Action plans: Specifics of accountability and timelines are indicated	
Action plans: Actions are linked to budgetary decisions	
Faculty discuss trends in the data	

Faculty discuss previous action plan success given new data	
Faculty discuss the assessment process and make any improvements necessary	