

# **BYU Civil Engineering Program Assessment Manual**

CE Undergraduate Committee

2025-04-01

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# 1 Introduction

This document describes the processes and methods to assess and evaluate student outcomes in the BYU Civil Engineering program. ABET criterion 4 states:

The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the program's continuous improvement actions. Other available information may also be used to assist in the continuous improvement of the program.

This manual documents these processes and provides a record of historical assessment data. The program uses three categories of assessments:

1. Direct assessment of student outcomes in course assignment (see Chapter 2)
2. Graduation surveys and exit interviews (see Chapter 3)
3. The share of participating students who pass the Fundamentals of Engineering Examination (FE) (see Chapter 4)

## 1.1 Improvement Actions

Each summer, the CE undergraduate committee evaluates recent assessment data and recommends actions to adjust one or more of the following:

- program courses, requirements, or prerequisites
- course content or activities
- assessments or evaluations
- performance indicators or associated rubrics

The undergraduate committee documents specific actions in meeting notes stored in the department Teams folder as well as through formal program change applications with the University Registrar. When recommending changes to courses or course activities, the program committee works closely with the course instructors to design and implement the proposed actions.

Individual instructors make improvements to course activities, pedagogy, and content based on data obtained through direct experience and student evaluation comments. These are important data that may lead to recommended course and program changes, but are not a formal assessment tool.

## 2 Student Outcomes

The program assesses each of its seven student outcomes using performance indicators and associated rubrics.

### 2.1 Assessment Schedule

Each academic year, we assess and evaluate student learning outcomes based on the schedule in Table 2.1. This rolling three-year schedule allows us to assess each student outcome twice during a six-year ABET evaluation cycle.

We attempt to assess each student outcome three times: 1. At an Introductory level, ideally in a 100- or 200-level classroom setting. 2. At a Reinforcing level, ideally in a 200-or 300-level classroom setting. 3. At an Evaluation level, as close to graduation as possible.

A matrix mapping each student outcome to the courses is shown in Table 2.2.

### 2.2 SO 1 Complex Problems

An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

Table 2.1: Assessment Schedule

Outcome	2024-25		2025-26			2026-27		
	Winter	Sp/Su	Fall	Winter	Sp/Su	Fall	Winter	Sp/Su
SO1: Complex Problems						A	E	
SO2: Design			A	A	E	C		
SO3: Communications						A	E	
SO4: Ethics	Assess	Evaluate	Change					
SO5: Teamwork			A	A	E	C		
SO6: Experiments / Data	Assess	Evaluate	Change					
SO7: Acquire Knowledge			A	A	E	C		
<b>ABET</b>								
ABET Schedule					Self-study	Visit	Response	

Table 2.2

1. Complex problems	
2. Design	
3. Communication	
4. Ethics	I
5. Teamwork	I
6. Experiments and data	
7. Acquire knowledge	

## Performance Indicators

## Assessment

## 2.3 SO 2 Design

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.

## Performance Indicators

## Assessment

## 2.4 SO 3 Communication

An ability to communicate effectively with a range of audiences.

## Performance Indicators

## Assessment

## 2.5 SO 4 Ethics

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.

## Performance Indicators

We evaluate this outcome based on three performance indicators. Students should:

1. Recognize personal and professional responsibilities towards others including employees, clients, the wider profession, and the public.
2. Recognize moral and ethical dilemmas in engineering situations and make judgments to identify appropriate resolutions.
3. Consider the impacts of an engineering solution in global, economic, environmental, and societal contexts.

## Rubric

Indicator	Unsatisfactory	Developing	Meets Expectations	Exceeds expectations
Recognize responsibilities	Does not recognize or identify professional responsibilities.	Recognizes some professional responsibilities, but misses at least one.	Recognizes professional responsibilities towards all key stakeholders	Demonstrates interest in and motivation to serve society through the profession.
Make judgments	Does not identify ethical dilemmas, and or develops inappropriate resolutions	Misidentifies ethical dilemmas, and or develops inadequate resolutions.	Properly identifies ethical dilemmas and identifies appropriate resolutions.	Actively considers ethical challenges that may arise in professional contexts and seeks to mitigate them.
Consider impacts	Fails to identify impacts in any contexts.	Identifies impacts in some contexts, but fails to identify likely impacts in others.	Identifies likely impacts in a variety of contexts.	Actively seeks to consider the ethical impact of engineering situations in global, economic, environmental, and societal contexts.

## Assessment

We assess this learning outcome in three courses:

- CCE 102: Sustainable Infrastructure (Introductory)
- CE 291 R: Civil Engineering Seminar (Reinforcing)
- CE 472: Civil Engineering Capstone (Evaluation)

We evaluated this outcome most recently in Winter 2025. All graduating students take CE 472 in Winter semester. Students take CE 291 R each semester from their sophomore year onward. CCE 102 may be taken in Fall or Winter semesters, so this is approximately a 50% sample of the students in the program. CCE 102 also includes students who are in the CFM and the FM programs.

Figure 2.1 shows the share of students at each performance level for each indicator for each course, alongside the threshold of 75%. By taking CE 472, 75% of students meet the expectations for each indicator.

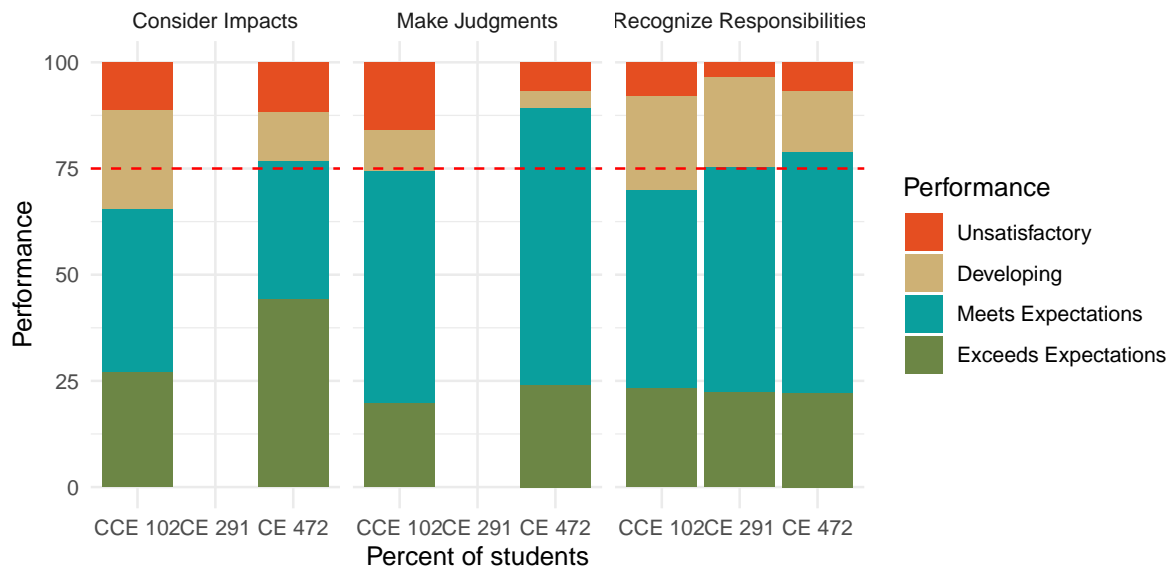


Figure 2.1: Winter 2025 Assessment of Student Outcome 4

## 2.6 SO 5 Teamwork

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.

### Performance Indicators

#### Assessment

## 2.7 SO 6 Experiments and Data

An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

## **Performance Indicators**

### **Assessment**

## **2.8 SO 7 Acquire Knowledge**

An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

## **Performance Indicators**

### **Assessment**



## **3 Exit Surveys and Interviews**

### **3.1 Exit Surveys**

Each December and April, the program sends a survey to all of our graduating students. The purposes of this survey is to collect data on the following items:

1. Student contact information for alumni tracking
2. Prospective employment or graduate school plans
3. Demographic information used to classify other student responses
4. Self-assessment of student outcomes

#### **3.1.1 Survey Questions**

#### **3.1.2 Results**

### **3.2 Exit Interviews**

Each April, the undergraduate committee samples graduating seniors and interviews them in personal conversation. The purpose of this interview is to qualitatively assess student-observed program strengths and weakness.

The CE undergraduate coordinator assigns three to four graduating seniors to each member of the committee. The committee members arrange to speak privately with each student for fifteen to twenty minutes. The student should be invited to direct the discussion, but possible questions include:

- What are the most positive learning experiences you have had?
- Have you had any less successful learning experiences?

## 4 Fundamentals of Engineering

The Fundamentals of Engineering (FE) examination provides important external evidence of our program's effectiveness in training competent civil engineering professionals. University policies prohibit us from requiring students to take the exam before graduation, but we strongly recommend that our students do so and offer an FE preparation course to help them.

We obtain the number of graduates who take and pass the exam each year directly from NCEES.