

**Institutional Effectiveness**  
**2023-2024**

**Program:** Civil Engineering BSCE

**College and Department:** College of Engineering, Civil & Environmental Engineering BS

**Contact:** Dr. Ben Mohr

**Mission:**

The mission of the civil engineering program is to offer the strong academic content necessary to produce well-educated graduates who become innovative and productive members of society. Graduates will possess both the problem-solving skills and the fundamentals of critical thinking and analysis that are crucial for success within the framework of the civil and environmental engineering profession.

**Attach Curriculum Map (Educational Programs Only):**

Degree maps are attached for four degree paths:

1. BS in Civil Engineering
2. BS in Civil Engineering, Construction Engineering and Management concentration
3. BS in Civil Engineering, Environmental Engineering concentration
4. BS in Civil Engineering, Geological Engineering concentration

Attached Files: See Appendix 1

**SLO1: Identify, Formulate, and Solve Engineering Problems**

**Define Outcome:**

Students should demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

**Assessment Methods:**

1. Final Exam Component Grades - "Complex Engineering Problems"
  - a. CEE 3320
  - b. CEE 3413
  - c. CEE 3500
  - d. CEE 3610
  - e. CEE 4800
2. Senior Exit Surveys
  - a. Survey question - (1a) - "Identify"
  - b. Survey question - (1b) - "Formulate"
  - c. Survey question - (1c) - "Solve"

Attached Files: See Appendix 2

## Criteria for Success (Thresholds for Assessment Methods):

1. Final Exam Component Grades - "Complex Engineering Problems"
  - a. Acceptable; Average  $\geq 70$
  - b. Excellent; Average  $\geq 80$
2. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

## Link to 'Tech Tomorrow' Strategic Plan:

2.A Technology Infused Programs, 2.B Research, Scholar, Intellect, and Creativity

## Results and Analysis:

ABET 1. an ability to identify, formulate, and solve complex engineering problems by applying											
	2019-20		2020-21		2021-22		2022-23		2023-24		
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	
<b>Final Exam Component Grades - "Complex Engineering Problems"</b>											
CEE 3320			81.4	74.7	75.8	74.7		72.1		72.8	
CEE 3413			80.9	73.3	80.8	*	77.0	94.4	77.0	66.9	
CEE 3500 (added 2021-22)					91.1	78.0	87.0	84.0	85.9	81.8	
CEE 3610			78.0	77.1	85.0	79.2	78.0	78.8	84.4	87.0	
CEE 4800			88.8	87.3	83.6	88.0	83.0	69.5	81.3	72.9	
<b>Senior Exit Surveys</b>											
Survey question - (1a) - "Identify"	3.83	3.68	3.64	3.45	3.83	3.72	3.73	3.72	3.58	3.89	
Survey question - (1b) - "Formulate"	3.75	3.63	3.55	3.45	3.65	3.64	3.77	3.59	3.58	3.89	
Survey question - (1c) - "Solve"	3.63	3.68	3.61	3.36	3.83	3.59	3.70	3.66	3.50	3.93	
<b>Co-op Employer Survey - Number of Co-op Reports Returned</b>											
"Identifies, formulates and solves complex engineering problems"		4	1	1	1	1	1	0	Discontinued - insufficient data points		
		3.46	3.20	3.20	Ignored ?	3.20	3.20	---	Discontinued - insufficient data points		

## Use of Results to Improve Outcomes:

Based on the assessment metrics for AY 2023-24 in conjunction with previously defined thresholds, no official actions are required. Regardless, the CEE ABET did initiate discussion regarding ABET SO1/IE SLO1 looking at solving complex engineering problems. During AY2022-23, the committee decided to not to take any action but to carefully watch this metric in AY2023-24. In this past academic year, some courses that were "red" previously appeared to resolve, while other courses fell into "red". Now that results are available for AY2023-24, the committee will meet again to investigate what, if any, changes are required to address this outcome.

Additionally, for this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

## SLO2: Apply Engineering Design to Produce Solutions That Meet Specified Needs

### Define Outcome:

Students should demonstrate 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.

### Assessment Methods:

1. CEE 4950 Senior Design Course Components
  - a. Mentor Grade on Final Report - Engineering Design
  - b. Faculty Grade on Final Report - Engineering Design
  - c. Assessment of Needs - CEE 4950 Ch 2 "Beyond the Numbers"
2. Senior Exit Surveys
  - a. Single survey question covers "Apply engineering design"
  - b. Single survey question covers "consideration of..."
  - c. Single survey question covers "...factors"

Attached Files: See Appendix 2

### Criteria for Success (Thresholds for Assessment Methods):

1. CEE 4950 Senior Design Course Components
  - a. Acceptable; Average  $\geq 70$
  - b. Excellent; Average  $\geq 80$
2. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

### Link to 'Tech Tomorrow' Strategic Plan:

2.A Technology Infused Programs, 2.B Research, Scholar, Intellect, and Creativity

### Results and Analysis:

ABET 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											
	2019-20		2020-21		2021-22		2022-23		2023-24		
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	
<b>CEE 4950 Senior Design Course Components</b>											
Avg Grade on Final Technical Chapter from Mentors	87.6	COVID	86.7	89.3	93.0	92.9	86.7	91.2	81.3	92.9	
Avg Grade on Final Technical Chapter from Faculty	85.2	COVID	86.6	86.0	87.0	87.2	84.0	84.9	75.1	85.2	
Avg Grade on Final "Beyond the Numbers" Chapter	92.0	COVID	91.2	81.1	77.7	89.4	75.7	88.9	86.6	82.6	
<b>Senior Exit Surveys</b>											
Survey question 2a: Apply engineering design	3.58	3.65	3.48	3.55	3.70	3.56	3.80	3.56	3.54	3.89	
Survey question 2b: Consider public health, safety, and welfare	3.71	3.72	3.67	3.73	3.74	3.74	3.73	3.63	3.58	3.89	
Survey question 2c: Consider global, cultural, social...	3.50	3.48	3.39	3.55	3.61	3.38	3.53	3.38	3.33	3.74	
<b>Co-op Employer Survey - Number of Co-op Employer Responses</b>											
"Considers public health, safety, and welfare..."		4	1	1	1	1	1	0	Discontinued - insufficient data points		
		3.00	3.20	3.20	3.20	3.20	3.20	---	Discontinued - insufficient data points		

**Use of Results to Improve Outcomes:**

Based on the assessment metrics for AY 2023-24 in conjunction with previously defined thresholds, no actions are required.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

**SLO3: Communicate Effectively****Define Outcome:**

Students should demonstrate an ability to communicate effectively with a range of audiences.

**Assessment Methods:**

1. CEE 4950 Senior Design Course Components
  - a. CEE 4950 Senior Design - Written Report (Technical Writing)
  - b. CEE 4950 Senior Design - Oral Presentation (Presentation Skills)
  - c. CEE 4950 Senior Design - Oral Presentation (Quality of Slides)
  - d. CEE 4950 Senior Design - Poster Presentation
2. Senior Exit Surveys
  - a. Single survey question covers (3) - Writing
  - b. Single survey question covers (3) - Oral

Attached Files: See Appendix 2

**Criteria for Success (Thresholds for Assessment Methods):**

1. CEE 4950 Senior Design Course Components
  - a. Acceptable; Average  $\geq 70$
  - b. Excellent; Average  $\geq 80$
2. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

**Link to 'Tech Tomorrow' Strategic Plan:**

2.A Technology Infused Programs

## Results and Analysis:

ABET 3. an ability to communicate effectively with a range of audiences											
	2019-20		2020-21		2021-22		2022-23		2023-24		
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	
<b>CEE 4950 Senior Design Course Components</b>											
Avg Technical Writing Grade on Final Written Report	87.6	COVID	95.1	83.3	90.1	90.0	84.7	82.3	76.5	86.5	
Avg Presentation Skills Grade on Final Oral Presentation	93.3	COVID	95.6	91.5	95.4	92.4	95.6	92.0	95.8	92.8	
Avg Quality of Slides Grade on Final Oral Presentation	95.2	COVID	93.6	91.0	95.2	91.7	95.9	91.6	93.9	92.0	
Avg Grade on Poster Presentation	90.1	COVID	COVID	91.6	93.2	95.0	93.2	93.6	90.2	94.1	
<b>Senior Exit Surveys</b>											
Survey question 3a: communicate in writing	3.38	3.48	3.58	3.27	3.57	3.44	3.77	3.47	3.33	3.74	
Survey question 3b: communicate orally	3.50	3.36	3.48	3.45	3.65	3.51	3.70	3.41	3.54	3.78	
<b>Co-op Employer Survey - Number of Co-op Students</b>											
"Produces effect written communications..."		4	1	1	1	1	1	0	Discontinued - insufficient data points		
"Delivers effective oral presentations..."		3.20	3.20	4.00	3.20	3.20	No Reponse	---	Discontinued - insufficient data points		
		3.60	2.40	4.00	No response	3.20	No Reponse	---	Discontinued - insufficient data points		

## Use of Results to Improve Outcomes:

Based on the assessment metrics for AY2023-24 in conjunction with previously defined thresholds, no actions are required.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed

## SLO4: Recognize Ethical and Professional Responsibilities and Make Informed Judgments

### Define Outcome:

Students should demonstrate 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.

### Assessment Methods:

1. FE Exam Ratio Scores
  - a. Ethics & Business Practices
2. Instructional Outcome Survey Question(s)
  - a. CEE 4920 Professionalism and Ethics
3. Senior Exit Surveys
  - a. Single survey question covers "ethical and professional responsibilities..."
  - b. Single survey question covers "make informed judgments..."

Attached Files: See Appendix 2

### Criteria for Success (Thresholds for Assessment Methods):

1. FE Exam Ratio Scores
  - a. Acceptable; Ratio Score  $\geq 0.80$

- b. Excellent; Ratio Score  $\geq 0.90$
- 2. Instructional Outcome Survey Question(s)
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$
- 3. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

**Link to 'Tech Tomorrow' Strategic Plan:**

1.A Experiential Learning, 2.A Technology Infused Programs

**Results and Analysis:**

**ABET 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**

	2016-17		2017-18		2018-19		2019-20		2020-21		2021-22		2022-23		2023-24	
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr
<b>FE Exam Ratio Scores</b>																
Ethics & Professional Practice	0.81	1.01	1.01	0.96	1.01	1.06	0.84	COVID	0.92	0.90	0.99	1.03	1.06	1.04	0.93	0.91
<b>Instructional Outcome Survey Question(s)</b>																
CEE 4920 Professionalism and Ethics	3.67	3.74	3.79	3.62	3.62	3.79	3.35	COVID	3.66	3.44	3.69	3.60	3.68	3.79	3.72	3.66
<b>Senior Exit Surveys</b>																
Survey question 4a: recognize ethical and professional responsibilities						3.57	3.57	3.54	3.76	3.45	3.78	3.62	3.77	3.69	3.58	3.89
Survey question 4b: make informed judgements, considering...						3.50	3.57	3.44	3.48	3.36	3.57	3.51	3.70	3.56	3.50	3.89
<b>Co-op Employer Survey - Number of Co-op Students</b>							4	1	1	1	1	1	0	Discontinued - insufficient data points		
"Recognizes professional and ethical responsibilities"							3.40	4.00	3.20	3.20	3.20	3.20	---	Discontinued - insufficient data points		
"Displays an understanding...impact of engineering (including global, cultural...)"							3.46	3.20	2.40	No response	3.20	3.20	---	Discontinued - insufficient data points		
<b>From Instructional Outcome Survey</b>																
<i>This course required that I read, discuss and learn pertinent material relating to professionalism and professional ethics.</i>															3.67	3.68
<i>I developed greater appreciation for the importance of prevention of sexual harassment and other forms of discrimination in the university and work place.</i>															3.67	3.54
<i>I developed a better understanding of the importance of engineering licensure and the benefits afforded by licensure.</i>															3.78	3.68
<i>I developed a better understanding of the benefits afforded by membership in a professional society such as ASCE.</i>															3.72	3.63
<i>I know how to locate and apply the Rules of the Tennessee State Board of Architectural and Engineering Examiners.</i>															3.67	3.64
<i>I am now more aware of the demands for truthfulness, ethics and professionalism imposed upon me by law and society.</i>															3.72	3.71
<i>I know how to identify and evaluate ethical situations and how to locate and apply some of the necessary resources to resolve them.</i>															3.67	3.71
<i>I know how to access and apply the codes of ethics pertinent to the engineering profession.</i>															3.78	3.63
<i>I developed greater understanding of professional body of knowledge expectations and how that influences the design of engineering curricula and the need for life-long learning.</i>															3.78	3.72

**Use of Results to Improve Outcomes:**

Based on the assessment metrics for AY2023-24 in conjunction with previously defined thresholds, no actions are required.

While no actions are required, the CEE ABET committee did include expanded Instructional Outcome Survey results. Previously, the average survey results were included (and still continue to be). Moving forward, the committee and department will track responses to individual questions on the survey to elucidate if there are any differences between the questions, which cover a wide variety of aspects regarding SLO4.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

## **SLO5: Teamwork**

### **Define Outcome:**

Students should demonstrate 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.

### **Assessment Methods:**

1. CEE 4920 Professionalism and Ethics Course Components
  - a. CEE 4920 Professionalism and Ethics - Leadership Assignment
2. CEE 4950 Senior Design Course Components
  - a. CEE 4950 Senior Design - Leadership paper
  - b. CEE 4950 Senior Design - Management paper
  - c. CEE 4950 Senior Design - Project Mgmt (MS Project)
  - d. CEE 4950 Senior Design - Peer Eval
3. Instructional Outcome Survey Question(s)
  - a. CEE 4950 Senior Design
4. Senior Exit Surveys
  - a. Single survey question covers leadership
  - b. Single survey question covers collaborative and inclusive environment
  - c. Single survey question covers "establish goals, plan tasks, and meet objectives"

Attached Files: See Appendix 2

### **Criteria for Success (Thresholds for Assessment Methods):**

1. CEE 4920 Professionalism and Ethics Course Components
  - a. Acceptable; Average  $\geq 70$
  - b. Excellent; Average  $\geq 80$
2. CEE 4950 Senior Design Course Components
  - a. Acceptable; Average  $\geq 70$
  - b. Excellent; Average  $\geq 80$
3. Instructional Outcome Survey Question(s)
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$
4. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

### **Link to 'Tech Tomorrow' Strategic Plan:**

2.A Technology Infused Programs

## Results and Analysis:

ABET 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																
	2016-17		2017-18		2018-19		2019-20		2020-21		2021-22		2022-23		2023-24	
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr
<b>CEE 4920 Professionalism and Ethics Course Components</b>																
Average Grade on Leadership Assignment									Tested 2021-22, Official 2022-23	95.6	86.0	92.1	94.4	73.0	89.7	
<b>CEE 4950 Senior Design Course Components</b>																
Average Grade on Leadership Paper	73.6	85.0	79.7	77.0	92.6	75.0	95.0	COVID	85.0	92.5	---	96.5	Discontinued - moved to CEE 4920			
Average Grade on Management Paper	72.8	91.0	85.7	79.0	77.0	88.0	93.0	COVID	81.6	91.3	---	92.1	Discontinued - included in other metrics			
Average Faculty Grade on Final Project Management Chapter							80.0	COVID	91.2	91.8	92.0	96.0	83.9	91.4	88.0	88.8
Average Grade on Final Peer Eval	88.0	91.0	77.3	92.0	81.6	95.0	94.7	COVID	93.3	89.9	94.3	90.0	91.9	94.1	89.5	92.3
<b>Instructional Outcome Survey Question(s)</b>																
CEE 4950 Senior Design	3.60	3.77	3.54	3.88	3.40	3.69	3.69	COVID	3.55	3.78	3.82	3.48	3.43	3.64	3.43	3.75
<b>Senior Exit Surveys</b>																
Survey question 5a: function on team, provide leadership					3.36	3.46	3.52	3.61	3.73	3.87	3.59	3.77	3.63	3.46	3.78	
Survey question 5b: function on team, create collaborative/inclusive environment					3.46	3.58	3.50	3.55	3.55	3.65	3.51	3.70	3.66	3.50	3.74	
Survey question 5c: function on team, establish goals, plan tasks, meet objectives					3.50	3.67	3.48	3.58	3.36	3.65	3.54	3.83	3.63	3.46	3.78	
<b>Co-op Employer Survey - Number of Co-op Students</b>																
"Works effectively with other employees"							4	1	1	1	1	1	0	Discontinued - insufficient data points		
"Establishes goals, plans tasks, meets objectives"							3.40	3.20	4.00	3.20	3.20	3.20	---	Discontinued - insufficient data points		
<b>From Instructional Outcome Survey</b>																
<i>I have a better understanding of creating a collaborative and inclusive environment by attending meetings, by contributing constructively, and by listening and giving value to input from others.</i>																
															3.46	3.70
<i>I have a better understanding of leadership based on 1) watching my group members exhibit leadership in our team meetings and/or 2) taking a leadership role during our team meetings.</i>																
															3.38	3.74
<i>I know that management involves establishing goals, planning tasks, and meeting objectives and that a Gantt chart is one way to organize and track such activities.</i>																
															3.46	3.81

### Use of Results to Improve Outcomes:

Based on the assessment metrics for AY2023-24 in conjunction with previously defined thresholds, no actions are required.

While no actions are required, the CEE ABET committee did include expanded Instructional Outcome Survey results. Previously, the average survey results were included (and still continue to be). Moving forward, the committee and department will track responses to individual questions on the survey to elucidate if there are any differences between the questions, which cover a wide variety of aspects regarding SLO5.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

### SLO6: Experiment, Interpret Data, and Use Engineering Judgment

#### Define Outcome:

Students should demonstrate an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

#### Assessment Methods:

1. Average Course Component Grades
  - a. "Develop and Conduct" - Introduction and Methodology
    - i. CEE 3030
    - ii. CEE 3040
    - iii. CEE 3120
    - iv. CEE 3430



b. "Analyze and Interpret" - Results and Discussion

- i. CEE 3030
- ii. CEE 3040
- iii. CEE 3120
- iv. CEE 3430

c. "Use Eng. Judgment" - Conclusions

- i. CEE 3030
- ii. CEE 3040
- iii. CEE 3120
- iv. CEE 3430

2. Senior Exit Surveys

- a. Single survey question covers "develop and conduct"
- b. Single survey question covers "analyze and interpret"
- c. Single survey question covers "draw conclusions"

Attached Files: See Appendix 2

**Criteria for Success (Thresholds for Assessment Methods):**

- 1. Average Course Component Grades
  - a. Acceptable; Average  $\geq 70$
  - b. Excellent; Average  $\geq 80$
- 2. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

**Link to 'Tech Tomorrow' Strategic Plan:**

2.A Technology Infused Programs

**Results and Analysis:**

		2019-20		2020-21		2021-22		2022-23**		2023-24	
		Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr
<b>Average Course Component Grades</b>											
<b>"Develop and Conduct" - Introduction and Methodology</b>											
CEE 3030				4.0	86.0	77.0	84.0	*	89.4	91.6	89.8
CEE 3040		3.6	3.3	3.9	3.7	3.6	3.6	85.0	94.4	93.0	94.8
CEE 3120			3.6	3.7	3.8	90.0	88.0	87.9	92.2	96.0	
CEE 3430		3.5	3.1	3.7	88.3	94.0	97.0	99.0	94.4	92.0	94.8
<b>"Analyze and Interpret" - Results and Discussion</b>											
CEE 3030				3.58	68.0	72.0	75.0	*	85.9	88.2	84.6
CEE 3040		3.20	2.80	2.75	3.42	2.90	3.56	58.8	81.0	89.0	87.5
CEE 3120			3.49	3.55	3.50	86.0	81.0	82.8	87.7	93.8	
CEE 3430		3.86	3.82	3.40	89.9	91.4	90.0	84.0	81.0	79.5	87.5
<b>"Use Eng. Judgment" - Conclusions</b>											
CEE 3030				3.57	70.0	71.0	71.0	*	72.1	70.7	83.0
CEE 3040		3.20	3.24	3.13	3.42	3.37	3.37	63.8	76.0	87.0	82.7
CEE 3120			3.39	3.55	3.34	83.0	84.0	85.4	92.5	93.3	
CEE 3430		3.81	3.68	3.72	90.2	94.3	80.0	86.0	76.0	90.0	82.7
<b>Senior Exit Surveys</b>											
Survey question 6a: experiments, develop and conduct		3.50	3.38	3.45	3.45	3.57	3.46	3.67	3.50	3.42	3.78
Survey question 6b: experiments, analyze/interpret data		3.67	3.56	3.73	3.64	3.70	3.59	3.77	3.66	3.67	3.89
Survey question 6c: experiments, draw conclusions		3.75	3.60	3.64	3.36	3.61	3.64	3.77	3.69	3.63	3.96
<b>Co-op Employer Survey - Number of Co-op Students</b>											
"Uses engineering judgement to draw conclusions"			4	1	1	1	1	1	0	Discontinued - insufficient data points	
			3.4	3.2	3.2	3.2	No Reponse	3.20	---	Discontinued - insufficient data points	
<b>Notes</b>											
* Fall 2022 - Faculty member was on medical leave for part of the semester so data were not available											
** Beginning 2022-23 all gradew were converted from a 4-point scale to a 100-point scale											

**Use of Results to Improve Outcomes:**

Based on the assessment metrics for AY2023-24 in conjunction with previously defined thresholds, no actions are required.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

**SLO7: Ability to Acquire and Apply New Knowledge****Define Outcome:**

Students should demonstrate an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Assessment Methods:**

1. Specific Course Assignment
  - a. CEE 4800 Project - Report - Technical Summary - "Acquire"
  - b. CEE 4800 Project - Resource - Technical Content - "Apply"
2. Senior Exit Surveys
  - a. Single survey question covers "acquire"
  - b. Single survey question covers "apply"

Attached Files: See Appendix 2

**Criteria for Success (Thresholds for Assessment Methods):**

1. Specific Course Assignment
  - a. Acceptable;
  - b. Excellent;
2. Senior Exit Surveys
  - a. Acceptable; Average  $\geq 2.50$
  - b. Excellent; Average  $\geq 2.75$

**Link to 'Tech Tomorrow' Strategic Plan:**

1.A Experiential Learning, 2.A Technology Infused Programs, 2.B Research, Scholar, Intellect, and Creativity

## Results and Analysis:

ABET 7. an ability to <b>acquire</b> and <b>apply</b> new knowledge as needed, using appropriate learning strategies											
	2019-20		2020-21		2021-22		2022-23		2023-24		
	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	Fall	Spr	
<b>Specific Course Assignment</b>											
CEE 4800 Project - Report - Technical Summary - "Acquire"		88.3	82.2	86.7	78.0	81.0	83.0	*	88.0	*	
CEE 4800 Project - Resource - Technical Content - "Apply"		83.9	82.5	85.0	89.0	83.0	85.7	*	89.0	*	
<b>Senior Exit Surveys</b>											
Survey question 7a: acquire new knowledge	3.67	3.56	3.61	3.36	3.57	3.62	3.73	3.66	3.54	3.89	
Survey question 7b: apply new knowledge	3.75	3.52	3.61	3.55	3.70	3.64	3.73	3.69	3.54	3.89	
<b>Co-op Employer Survey - Number of Co-op Students</b>											
"Displays an ability to acquire and apply new knowledge"		4	1	1	1	1	1	0	Discontinued - insufficient data points		
"Displays an ability to acquire and apply new knowledge"		3.60	4.00	3.20	3.20	3.20	3.20	---	Discontinued - insufficient data points		
* Change in faculty course assignments mean this metric will only be available in Fall semesters starting 2022-23											

## Use of Results to Improve Outcomes:

Based on the assessment metrics for AY2023-24 in conjunction with previously defined thresholds, no actions are required.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

## Summative Evaluation:

Based on the assessment metrics for AY2023-24 in conjunction with previously defined thresholds, no actions are required. Regardless, the CEE ABET did initiate discussion regarding ABET SO1/IE SLO1 looking at solving complex engineering problems. During AY2022-23, the committee decided to not to take any action but to carefully watch this metric in AY2023-24. In this past academic year, some courses that were "red" previously appeared to resolve, while other courses fell into "red". Now that results are available for AY2023-24, the committee will meet again to investigate what, if any, changes are required to address this outcome.

## Assessment Plan Changes:

While no actions are required, the CEE ABET committee did include expanded Instructional Outcome Survey results for SLO4 and SLO5. Previously, the average survey results were included (and still continue to be). Moving forward, the committee and department will track responses to individual questions on the survey to elucidate if there are any differences between the questions, which cover a wide variety of aspects.

For this outcome and all others, the use of co-op employer surveys were dropped from the list of assessment methods. Over the past several years, the number of students participating in co-op along with the respective employer responses have been very small, with some semesters having no responses. Therefore, this assessment has been removed.

**List of Appendices:**

Appendix 1: Civil Engineering BSCE Curriculum Map

Appendix 2: Assessment Methods

## Appendix 1: Civil Engineering BSCE Curriculum Map



**College of Engineering**

TENNESSEE TECH

Degree Map	
CATALOG YEAR: 2022-2023	Degree: BSCE
MAJOR: Civil Engineering Concentration: Construction Engineering and Management	

*The major map illustrates one path to completing your major, based on faculty members' advice on course sequence and course schedule. This document provides general direction.*

Course	Cr. Hrs.	Course	Cr. Hrs.
<b>FIRST YEAR</b>			
Semester: Fall		Semester: Spring	
Total Credit Hours: 16 (17)		Total Credit Hours: 17	
ENGL 1010 Writing Composition I	3	ENGL 1020 Writing Composition II	3
CEE 1020 Connections to CEE <sup>1</sup>	1	Humanities/Fine Arts Elective	3
MATH 1910 Calculus I	4	MATH 1920 Calculus II	4
CHEM 1110 Chemistry I	4	CHEM 1120 Chemistry II <sup>2</sup>	4
ENGR 1110 Engineering Graphics	2	Social/Behavioral Science Elective	3
Humanities/Fine Arts Elective	3		
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SOPHOMORE YEAR</b>			
Semester: Fall		Semester: Spring	
Total Credit Hours: 16		Total Credit Hours: 18	
ENGL 2130, 2230, or 2330 Literature	3	COMM 2025 or PC 2500 Communication	3
MATH 2110 Calculus III	4	MATH 2120 Differential Equations	3
PHYS 2110 Physics I	4	CEE 3110 Mechanics of Materials	3
CEE 2110 Statics	3	CEE 3500 Construction Engineering	3
CEE (ENGR) 3710 Engineering Economics	2	CEE 3600 Surveying	3
		ME 2330 Dynamics	3
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>JUNIOR YEAR</b>			
Semester: Fall		Semester: Spring	
Total Credit Hours: 16		Total Credit Hours: 15	
CEE 3320 Structural Mechanics	3	CEE 3030 Civil Engineering Materials	3
CEE 3413 Environmental Engineering	3	CEE 3420 Hydraulics	3
CEE 3415 or ME 3720 Fluid Mechanics	3	CEE 4310 Steel Design	3
CEE 3610 Transportation Engineering	3	GEOL 3210 Geology for Engineers	3
CEE Lab Elective <sup>3</sup>	1	CEM Elective <sup>4</sup>	3
BMGT 3510 Management and Org Behavior	3		
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SENIOR YEAR</b>			
Semester: Fall		Semester: Spring	
Total Credit Hours: 15 or 16		Total Credit Hours: 15 or 16	
CEE (ENGR) 3720 or MATH 3470 Statistics	2 or 3	CEE 4950 Senior Design	3
CEE 4320 Concrete Design	3	CEE Lab Elective <sup>3</sup>	1
CEE 4800 Geotechnical Engineering	3	CEM Elective <sup>4</sup>	3
CEE 4920 Professionalism and Ethics	1	CEM Elective <sup>4</sup>	3
CEE 4940 Fundamentals of CEE	0	Social/Behavioral Science Elective	3
CEM Elective <sup>4</sup>	3	Technical Elective <sup>5</sup>	2 or 3
CEM Elective <sup>4</sup>	3		

**Note:**

1. Optional course for first semester freshman only
2. Students select either CHEM 1120 or PHYS 2120; CHEM 1120 preferred
3. CEE Lab Elective: CEE 3040 (P: CEE 3030), CEE 3120 (P: CEE 3110), or CEE 3430 (C: CEE 3413)
4. Construction Engineering and Management Elective: CEE 4500-4599, ENGR (CEE) 4510, ACCT 3720, BMGT 3630, BMGT 4410, BMGT 4520. At least 3 of 5 courses must be CEE (ENGR) courses.
5. Technical Elective: ENGR 1120, ECE 2850, ME 3210, or CHE 3010 (*fall only*)



# College of Engineering

TENNESSEE TECH

Degree Map		
<b>CATALOG YEAR:</b> 2022-2023	<b>Degree:</b> BSCE	<b>MAJOR:</b> Civil Engineering <i>Concentration: Geological Engineering</i>

The major map illustrates one path to completing your major, based on faculty members' advice on course sequence and course schedule. This document provides general direction.

Course	Cr. Hrs.	Course	Cr. Hrs.
<b>FIRST YEAR</b>			
Semester: Fall Total Credit Hours: 16 (17)		Semester: Spring Total Credit Hours: 17 or 18	
ENGL 1010 Writing Composition I	3	ENGL 1020 Writing Composition II	3
CEE 1020 Connections to CEE <sup>1</sup>	1	Humanities/Fine Arts Elective	3
MATH 1910 Calculus I	4	MATH 1920 Calculus II	4
CHEM 1110 Chemistry I	4	CHEM 1120 Chemistry II	4
ENGR 1110 Engineering Graphics	2	GEOL 1040 or GEOL 3210	3 or 4
Humanities/Fine Arts Elective	3		
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SOPHOMORE YEAR</b>			
Semester: Fall Total Credit Hours: 17		Semester: Spring Total Credit Hours: 18	
ENGL 2130, 2230, or 2330 Literature	3	COMM 2025 or PC 2500 Communication	3
MATH 2110 Calculus III	4	MATH 2120 Differential Equations	3
PHYS 2110 Physics I	4	CEE 3413 Environmental Engineering	3
CEE 2110 Statics	3	CEE 3110 Mechanics of Materials	3
Social/Behavioral Science Elective	3	ME 2330 Dynamics	3
		GEOL 2500 Geological Fundamentals	3
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>JUNIOR YEAR</b>			
Semester: Fall Total Credit Hours: 17		Semester: Spring Total Credit Hours: 16	
CEE (ENGR) 3710 Engineering Economics	2	CEE 3500 Construction Engineering	3
CEE 3600 Surveying	3	CEE 3610 Transportation Engineering	3
CEE 3415 or ME 3720	3	CEE 3420 Hydraulics	3
CEE 3320 Structural Mechanics	3	CEE 3040 Geotechnical Engineering Lab	1
CEE 3030 Civil Engineering Materials	3	CEE 4800 Geotechnical Engineering	3
GEOL Elective <sup>2</sup>	3	GEOL Elective <sup>2</sup>	3
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SENIOR YEAR</b>			
Semester: Fall Total Credit Hours: 12		Semester: Spring Total Credit Hours: 15	
CEE 4310 or CEE 4320	3	CEE (ENGR) 3720 or MATH 3470 Statistics	2
CEE 4920 Professionalism and Ethics	1	CEE 4810 Foundation Engineering	3
CEE 4940 Fundamentals of CEE	0	CEE 4950 Senior Design	3
Technical Elective <sup>3</sup>	2	CEE Lab Elective <sup>5</sup>	1
CEE Elective <sup>4</sup>	3	CEE Elective <sup>4</sup>	3
GEOL Elective <sup>2</sup>	3	Social/Behavioral Science Elective	3

**Notes:**

- Optional course for first semester freshman only
- GEOL Elective: GEOL 3110, 3120, 3200, 3230, 3750, or any 4000-level GEOL course
- Technical Elective: ENGR 1120, ECE 2850, ME 3210, or CHE 3010
- CEE Elective: Any 4000 level CEE course
- CEE Lab Elective: CEE 3120 or CEE 3430; CEE 3430 preferred





# College of Engineering

TENNESSEE TECH

Degree Map		
<b>CATALOG YEAR:</b> 2022-2023	<b>Degree:</b> BSCE	<b>MAJOR:</b> Civil Engineering

The major map illustrates one path to completing your major, based on faculty members' advice on course sequence and course schedule. This document provides general direction.

Course	Cr. Hrs.	Course	Cr. Hrs.
<b>FIRST YEAR</b>			
Semester: Fall Total Credit Hours: 16 (17)		Semester: Spring Total Credit Hours: 17	
ENGL 1010 Writing Composition I	3	ENGL 1020 Writing Composition II	3
CEE 1020 Connections to CEE <sup>1</sup>	1	Humanities/Fine Arts Elective	3
MATH 1910 Calculus I	4	MATH 1920 Calculus II	4
CHEM 1110 Chemistry I	4	CHEM 1120 Chemistry II <sup>2</sup>	4
ENGR 1110 Engineering Graphics	2	Social/Behavioral Science Elective	3
Humanities/Fine Arts Elective	3		
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SOPHOMORE YEAR</b>			
Semester: Fall Total Credit Hours: 17		Semester: Spring Total Credit Hours: 17	
ENGL 2130, 2230, or 2330 Literature	3	COMM 2025 or PC 2500 Communication	3
MATH 2110 Calculus III	4	MATH 2120 Differential Equations	3
PHYS 2110 Physics I	4	CEE 3600 Surveying	3
CEE 2110 Statics	3	CEE 3110 Mechanics of Materials	3
Social/Behavioral Science Elective	3	ME 2330 Dynamics	3
		CEE (ENGR) 3710 Engineering Economics	2
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>JUNIOR YEAR</b>			
Semester: Fall Total Credit Hours: 16		Semester: Spring Total Credit Hours: 17 or 18	
CEE 3500 Construction Engineering	3	CEE (ENGR) 3720 or MATH 3470 Statistics	2 or 3
CEE 3413 Environmental Engineering	3	MATH Elective <sup>4</sup>	3
CEE 3610 Transportation Engineering	3	GEOL 3210 Geology for Engineers	3
CEE 3415 or ME 3720 Fluid Mechanics	3	CEE 3420 Hydraulics	3
CEE 3320 Structural Mechanics	3	CEE 4310 Steel Design	3
CEE Lab Elective <sup>3</sup>	1	CEE 3030 Civil Engineering Materials	3
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SENIOR YEAR</b>			
Semester: Fall Total Credit Hours: 15 or 16		Semester: Spring Total Credit Hours: 13	
CEE 4920 Professionalism and Ethics	1	CEE 4950 Senior Design	3
CEE 4940 Fundamentals of CEE	0	CEE Lab Elective <sup>3</sup>	1
Technical Elective <sup>5</sup>	2 or 3	CEE Elective <sup>6</sup>	3
CEE Elective <sup>6</sup>	3	CEE Elective <sup>6</sup>	3
CEE 4320 Concrete Design	3	CEE Sequence <sup>7</sup>	3
CEE 4800 Geotechnical Engineering	3		
CEE Sequence <sup>7</sup>	3		

**Notes:**

1. Optional course for first semester freshman only
2. CHEM 1120 or PHYS 2120. CHEM 1120 is preferred.
3. CEE Lab Elective: CEE 3040 (P: CEE 3030), CEE 3120 (P: CEE 3110), or CEE 3430 (C: CEE 3413)
4. MATH Elective: MATH 2010, MATH 3810, MATH 4210, MATH 4510
5. Technical Elective: ENGR 1120, ECE 2850, ME 3210, or CHE 3010 (*fall only*)
6. CEE Elective: Any 4000 level CEE course
7. Approved CEE Sequence
  - a. Structural Mechanics: CEE 4130, CEE 4160, CEE 4190
  - b. Structural Engineering: CEE 4130, CEE 4350, CEE 4360, CEE 4370, CEE 4380, CEE 4810
  - c. Environmental Engineering: CEE 4410, CEE 4420, CEE 4430, CEE 4440, CEE 4450
  - d. Transportation Engineering: CEE 4600, CEE 4610, CEE 4630, CEE 4640, CEE 4660



# College of Engineering

TENNESSEE TECH

Degree Map		
<b>CATALOG YEAR:</b> 2022-2023	<b>Degree:</b> BSCE	<b>MAJOR:</b> Civil Engineering <i>Concentration:</i> Environmental Engineering

The major map illustrates one path to completing your major, based on faculty members' advice on course sequence and course schedule. This document provides general direction.

Course	Cr. Hrs.	Course	Cr. Hrs.
<b>FIRST YEAR</b>			
Semester: Fall Total Credit Hours: 16 (17)		Semester: Spring Total Credit Hours: 17	
ENGL 1010 Writing Composition I	3	ENGL 1020 Writing Composition II	3
CEE 1020 Connections to CEE <sup>1</sup>	1	Humanities/Fine Arts Elective	3
MATH 1910 Calculus I	4	MATH 1920 Calculus II	4
CHEM 1110 Chemistry I	4	CHEM 1120 Chemistry II	4
ENGR 1110 Engineering Graphics	2	Social/Behavioral Science Elective	3
Humanities/Fine Arts Elective	3		
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SOPHOMORE YEAR</b>			
Semester: Fall Total Credit Hours: 17		Semester: Spring Total Credit Hours: 17	
ENGL 2130, 2230, or 2330 Literature	3	COMM 2025 or PC 2500 Communication	3
MATH 2110 Calculus III	4	MATH 2120 Differential Equations	3
PHYS 2110 Physics I	4	CEE 3600 Surveying	3
CEE 2110 Statics	3	CEE 3110 Mechanics of Materials	3
Social/Behavioral Science Elective	3	ME 2330 Dynamics	3
		CEE (ENGR) 3710 Engineering Economics	2
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>JUNIOR YEAR</b>			
Semester: Fall Total Credit Hours: 16		Semester: Spring Total Credit Hours: 17 or 18	
CEE 3500 Construction Engineering	3	CEE (ENGR) 3720 or MATH 3470 Statistics	2 or 3
CEE 3413 Environmental Engineering	3	CHE 3010 or ME 3210 Thermodynamics	3
CEE 3610 Transportation Engineering	3	GEOL 3210 Geology for Engineers	3
CEE 3415 or ME 3720 Fluid Mechanics	3	CEE 3420 Hydraulics	3
CEE 3320 Structural Mechanics	3	CEE 4310 or CEE 4320	3
CEE 3430 Environmental Engineering Lab	1	CEE 3030 Civil Engineering Materials	3
Course	Cr. Hrs.	Course	Cr. Hrs.
<b>SENIOR YEAR</b>			
Semester: Fall Total Credit Hours: 15 or 16		Semester: Spring Total Credit Hours: 13	
CEE 4800 Geotechnical Engineering	3	CEE 4950 Senior Design	3
CEE 4920 Professionalism and Ethics	1	CEE Lab Elective <sup>3</sup>	1
CEE 4940 Fundamentals of CEE	0	CEE Elective <sup>4</sup>	3
ENGR 1120 or ECE 2850	2 or 3	Environmental Engineering Elective <sup>2</sup>	3
Environmental Engineering Elective <sup>2</sup>	3	Environmental Engineering Elective <sup>2</sup>	3
Environmental Engineering Elective <sup>2</sup>	3		
Environmental Engineering Elective <sup>2</sup>	3		

**Note:**

- Optional course for first semester freshman only
- Environmental Engineering Elective: CEE 4400-4499, ESS 3000, GEOG 4510, GEOG 4511, GEOG 4620, GEOG 4650, or GEOL 4711; At least 3 of 5 courses must be CEE courses
- CEE Lab Elective: CEE 3040 or CEE 3120; CEE 3040 preferred
- CEE Elective: Any 4000 level CEE course



## Appendix 2: Assessment Methods

### CRITERION 4. CONTINUOUS IMPROVEMENT

The purpose of this chapter is to present in detail our continuous improvement process for the most recent six-year cycle.

#### 4A. Student Outcomes

This section presents the assessment and level-of-attainment for each SO. The section includes information on the process, frequency, expected level of attainment, summary results for each SO, and how these results are documented and maintained.

##### 4A.1. The Assessment Process

CEE describes each of the assessment metrics are as follows:

1. Course Components are grades on a specific, recurring assignment or collection of assignments in a specific course. The assignment must be common to all faculty who teach the course. In the revision process, CEE increased the use of this type of metric, focusing on several assignments in the capstone Design course (CEE 4950 Senior Design).
2. FE Exam Scores are the topic area ratio scores provided to CEE by NCEES. CEE requires all students to take the FE exam, so our scores are representative of all students.
3. Course Instructional Outcome Surveys and Senior Exit Surveys are Likert scale survey questions. All have 4 answers: Strongly Disagree, Disagree, Agree, and Strongly Agree.

##### 4A.2. Assessment Frequency

CEE uses a hybrid assessment frequency. Data collection for most metrics occurs each semester, but results are reviewed annually. Regarding the review interval, results are discussed by the CEE faculty at the annual faculty meeting just prior to fall semester.

##### 4A.3. Expected Levels of Attainment

Because of scale differences between metrics, CEE has implemented color-coding to aid in the review process. The color coding and the criteria used in its application are found in **Error! Reference source not found.**4-2.

**Table 4-2. SO Attainment Color Coding Criteria**

Color Code			
Attainment Level	Unacceptable	Acceptable	Excellent
Metric	Criteria		
Course Components (Out of 100)	Average < 70	Average ≥ 70	Average ≥ 80
FE Exam Ratio Scores (CEE Performance Index / Comparator)	Ratio Score < 0.80	Ratio Score ≥ 0.80	Ratio Score ≥ 0.90
Final Course Grades (4-Point Grading Scale)	Average < 2.50	Average ≥ 2.50	Average ≥ 2.75
Course Instructional Outcome Surveys (Out of 4)	Average < 2.50	Average ≥ 2.50	Average ≥ 2.75
Senior Exit Surveys (Out of 4)	Average < 2.50	Average ≥ 2.50	Average ≥ 2.75

Note that rounding in the data can cause the appearance of incorrect color-coding, as the color is based on a non-rounded value.

Both before and after revising the CEE assessment metrics, the faculty chose to include multiple metrics for each SO. Multiple metrics help the faculty to avoid unneeded reactions to statistical outliers that occur during any evaluation. As such, the occurrence of a single Low or Unsatisfactory rating will not necessarily require a response.

The thresholds for a required response are:

- Multiple metrics in the red in a single academic year for a given outcome
- Single metrics in the red in consecutive academic years for a given outcome
- Multiple metrics that remain “in the yellow” (i.e., satisfactory) in multiple academic years for a given outcome. Yellow followed by red and vice versa are considered multiple “satisfactory” years as well as single years in the red.

In addition to these required responses, there are three additional ways in which responses may be initiated. During their reviews of the metrics, the Chair, the Faculty, or the Advisory Board can request action or further investigation even if all the metrics are Excellent. This flexibility allows the opportunity to begin investigations before they are required, hopefully reducing our response time in applying improvements. It also allows for improvements even when there are no issues.

