2023-24

Assessment Report

Master of Science in Civil Engineering Degree Program

**Section 1 – Program Mission and Educational Objectives**

The MSCE degree, while technically offered as a stand-alone graduate degree, is predominately offered as part of a five-year, concurrent degrees program wherein students earn both their BSCE and MSCE. During the 2023-24 year, all graduating and continuing MSCE students were following the BSCE/MSCE concurrent degrees program of study.

The mission of the Oregon Tech Civil Engineering program (both BSCE and BSCE/MSCE) 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.

The mission of the graduate (MSCE) program is to prepare students for professional practice by offering courses in advanced topics in civil engineering that support our students in identifying complex problems in a specialty area of civil engineering and selecting and applying concepts, principles, and/or experiments to solve those complex problems.

Thus, the graduate degree requires coursework beyond the BSCE requirements and targeted instruction in problem identification and problem solving that employs literature review, experimentation, computation, and modeling.

The mission of the MSCE portion of the program aligns with the mission of the department and the mission of the university in important ways. It is directly tied to the last phrase of the department’s mission “…be able to pursue graduate-level education.” The MSCE relies on the outcomes of the BSCE and it is professionally-focused, directly linking it to Oregon Tech’s primary mission of “[providing] innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences”.

**BSCE Educational Objectives**

Civil engineering graduates will be able to:

1. Practice as a professional civil engineer.
2. Pursue advanced education in civil engineering or related fields.
3. Act as responsible, effective and ethical citizens.
4. Understand and effectively communicate the realistic constraints of civil engineering.
5. Perform effectively in a multi-disciplinary environment.

Because the **MSCE** is the graduate-level education described in the mission statement for the civil engineering program, and it fulfills the BSCE Objective 2, it relies on the undergraduate outcomes. Full details on the BSCE program may be found in the BSCE 2023-24 Assessment Report (submitted separately).

**Section 2 – Program Student Learning Outcomes**

Graduate-level education is inherently more rigorous and commonly requires greater self-direction and self-study than undergraduate education.

The **MSCE program outcomes,** to be met by all graduates, are that students will be able to:

1. Select appropriate advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering.
2. Apply advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering.

These outcomes were reviewed by the department faculty at a fall term department meeting on October 31, 2023.

The American Society of Civil Engineers (ASCE) provides the most direct guidance regarding graduate student learning outcomes. The ASCE Civil Engineering Body of Knowledge (CEBOK3) offers guidance regarding outcomes that might be satisfied in postgraduate education: “postgraduate education should certainly increase the critical thinking and problem-solving abilities of civil engineers.”

**Postgraduate outcomes** are identified in only three places in the CEBOK3, at the *application* or *analysis* levels of Bloom’s Taxonomy:

1. Experimentation (Analyze): Select appropriate experiments, and analyze the results in the solution of civil engineering problems.
2. Depth in a Civil Engineering Area (Analyze): Select appropriate advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering.
3. Depth in a Civil Engineering Area (Apply): Apply advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering.

At Oregon Tech, for the MSCE, we have embraced all three ASCE-recommended outcomes for thesis- and project-based degrees that employ experimentation whereas outcomes 2 and 3 are applicable to all graduate students, including those completing a course-based curriculum. Thus, the two MSCE program outcomes ultimately represent a goal of depth in a civil engineering area that requires students to select and apply advanced concepts and principles to solve complex problems.

**Section 3 – Curriculum Map**

The primary pathway to earning the MSCE degree is to complete the BSCE and MSCE degrees concurrently. Following the junior year, students choosing the BSCE/MSCE path adhere to the following curriculum map for their fourth and fifth years. The 400-level classes represent the final requirements of the BSCE degree and the 500-level classes (including Graduate Technical Electives and optional Grad Project or Graduate Thesis) comprise the MSCE degree. In all cases, MSCE students complete at least 45 quarter credits beyond the BSCE requirement of 180 quarter credits.

**Fourth Year**

* [CE 401 - Civil Engineering Project I](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 2
* [COM 401 - Civil Engineering Project I](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 3
* [CE 402 - Civil Engineering Project II](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 4
* [CE 405 - Sustainability & Infrastruct](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 3
* [CE 501 - Civil Engr Graduate Seminar](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 1
* [WRI 521 - Writing at the Grad Level](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 3
* Technical Electives Credit Hours: 3
* Graduate Technical Electives Credit Hours: 12
* MATH 4XX - Math/Science Elective Credit Hours: 4
* Social Science Elective Credit Hours: 3
* Social Science Elective Credit Hours: 3
* SPE/WRI/COM Elective Credit Hours: 3

**Year Total: 44 Credit Hours**

**Fifth Year**

* [ANTH 452 - Globalization](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 3
* [CE 590 - Civil Engineering Grad Project](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: varies 3-9

or

* [CE 595 - Graduate Thesis](https://catalog.oit.edu/preview_program.php?catoid=10&poid=2197) Credit Hours: 12
* Technical Electives Credit Hours: 12
* Graduate Technical Electives Credit Hours: varies

**Year Total: 44 Credit Hours**

The MSCE program outcomes of “select appropriate advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering” and “apply advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering” are met primarily in **Graduate Technical Elective** courses and the optional **Grad Project** or **Graduate Thesis** portion of the degree.

Since the MSCE is the graduate degree portion of the concurrent BSCE/MSCE program, all Oregon Tech ISLOs and all BSCE PSLOs have previously been met with the BSCE degree – please see the BSCE Program Assessment Report for details.

**Section 4 – Assessment Cycle**

Since the MSCE is the graduate degree portion of the concurrent BSCE/MSCE program, all Oregon Tech ISLOs and all BSCE PSLO have previously been met with the BSCE degree.

The two unique MSCE program student learning outcomes are currently met by holistic evaluation of each MSCE student’s performance in **Graduate Technical Elective** courses and (optionally) the **CE590 Civil Engineering Grad Project** or **CE595 Graduate Thesis** courses. As these are all elective courses, each student chooses their own set of courses.

**Section 5 – Assessment Data Collection Processes**

The Civil Engineering faculty decided at its Fall 2023 retreat and confirmed at its Fall 2024 retreat that assessment of the program is best accomplished by examining indirect data from the student exit surveys. These surveys have historically been directed primarily toward the BSCE outcomes and assessment of that program and have not generated feedback about the graduate program specifically. The faculty reviewed and drafted new questions for the 2023-2023 survey to elicit feedback related to the MSCE program student learning outcomes. A branching survey that directs BS/MS and MSCE students to this portion of the survey was implemented and results for this year are reported in Section 6.

Direct assessment of student learning outcomes could be accomplished by evaluating any student products from Graduate Technical Elective courses, but the faculty feel that since there is not a single elective course that is required for every graduate student, and that graduate student numbers average five students each year, a more rigorous direct assessment is not worthwhile. Rather, the faculty will review and discuss student performance holistically along with exit survey responses at their retreat each Fall and discuss potential areas for improvement.

**Section 6 – Assessment Data**

Unfortunately, the survey generated only ***one*** response out of ***four*** students graduating. The responses were positive as far as the program was concerned. The student indicated high proficiency in their *ability to conduct scholarly research commensurate with study at the graduate level* as well as in their *attainment of advanced technical knowledge in one or more civil engineering sub-disciplines*. The student reported that the greatest strength of the MSCE program at Oregon Tech is “the real world preparedness and the faculty overall,” and that the greatest weakness is that “not enough construction knowledge is taught.” The student has taken and passed the Fundamentals of Engineering exam to obtain an EIT credential and plans to become a licensed professional engineer. They rated the overall quality of education they received at the highest possible level (5 out of 5).

The lone reporting student lauded our faculty: “I think the professors in the civil engineering program are top-notch and care very dearly that their students understand the material.”

They offered one suggestions regarding the curriculum that will not be considered, after review by the faculty: “If a student is not doing a project or thesis based masters, they should be able to supplement the graduate writing course for another civil elective.”

Related to the program, the student indicated that they were extremely satisfied with the class schedule, curriculum, facilities, quality of instruction, interactions with other students in the program, and interaction with faculty in the program. They were somewhat satisfied with academic advising.

Related to the university, the student was somewhat satisfied with career services, financial aid, and student involvement and belonging. They were neutral regarding information and technology services, the office of disability services, peer tutoring services, and secondary advising. Finally, they were somewhat dissatisfied with the library, registrar’s office, and student health services and clarified that “I was giving [sic] false information from the registrars office my junior year that ended up costing my [sic] thousands of dollars.”

Since the faculty develop a close working relationship with our students during the bachelor’s degree years, they tend to receive unprompted feedback regarding the graduate program. Generalizing, most students appreciate the additional year of graduate studies for the depth it provides and the ability to focus on independent studies after a very team-focused senior project in the fourth year of the BSCE curriculum.

Faculty discussion during the Fall 2024 department retreat of the performance of our cohort of four graduate students this year was positive. These students were able to demonstrate the program outcomes

1. Select appropriate advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering.
2. Apply advanced concepts and principles to solve complex problems in a specialty area appropriate to the practice of civil engineering.

Two of the students completed the program by following the course-based option and demonstrating an ability to satisfy outcomes 1 and 2 in their technical elective courses. One of the four students successfully defended the program’s second graduate thesis and another completed a graduate project that received high marks, demonstrating their ability to satisfy outcomes 1 and 2. Overall, the program faculty were positive about both the approach of the program to develop graduate students to grow as identified in both outcome statements and expressed no concerns about necessary improvements to the program as a result of the activities in the past year.

**Section 7 – Data-driven Action Plans: Changes Resulting from Assessment**

***Action Plan***

During the 2024-25 academic year, faculty teaching graduate-level courses will continue to offer course content to meet the stated program outcomes. In general, this means offering additional assignments to students taking cross-listed courses (4XX/5XX) that require individual effort, more rigorous treatment of course material, and often graduate-level project(s) or assignment(s) to differentiate from the 4XX experience. Students pursuing the degree with the project- or thesis-based option will continue to be assigned a graduate project/thesis advisor who works individually with that student on a mutually agreed upon project resulting in a project report or thesis that documents their work.

**Section 8 – Closing the Loop: Reflection on previous work**

Reflecting on the assessment data above, there is no closing-the-loop activity required.