**Master of Science in Civil Engineering**

**AY 2018-19 Program Assessment Report**

**William Wright**

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**Table of Contents:**

**Section Page**

0. Program description and student enrollment 1

1. Learning outcomes assessed 2

2. Instruments used in the assessment 3

3. Assessment methods and results 3

4. Changes implemented since last assessment period 3

5. Changes under consideration 4

6. Assessment activities planned for the 2016-17 academic year 5

7. Progress made on items from last program review action plan 5

**Report Narrative**

**0. Program Description and Student Enrollment:**

The Civil Engineering Program offers a 30-unit Master of Science (MSCE) degree with an option in Water Resources & Environmental Engineering (WREE). Program requirements include completion of introductory course CE 210 Research Methods (min. grade B); completion of a graduate writing exercise (min. score 87.5%); completion culminating experience CE 298 project or CE 299 Thesis (min. grade C), or comprehensive exam (min. score 75%); and minimum GPA of 3.0.

Program curriculum consists of technical courses in five subject areas: Geomatics, geotechnical, structural, transportation and water resources/ environmental engineering. Students can take up to 6 units of coursework outside of the program curriculum. Students in the WREE option are required to take 12 units of core courses and 3 units of coursework outside of civil engineering.

MSCE Program student enrollment by semester during the past 5 years is presented in Figure 1. Enrollment was at a low in Spring 2016 (23) and is currently at a high in Fall 2019 (54). The WREE Option began accepting students in Spring 2014 and since then enrollment has fluctuated over time but generally increased. Enrollment is currently at a high in Fall 2019 (13).

**Figure 1.** Enrollment in the MSCE program by semester (past 5 years).

Civil Engineering Graduate Program Assessment AY 2018-19, William Wright, Oct. 10, 2019 1

**1. Learning Outcomes Scheduled for Assessment**

1. Describe and embrace principles of professional ethics, personal responsibility, and environmental stewardship.

2. Describe, explain, and employ beyond the undergraduate level scientific principles and modern professional techniques used in the planning, analysis, management and/or design of: a. buildings, bridges, and other structures, and/ or

b. transportation systems, transportation planning, and traffic operations, and/ or

c. water supply, flood management, water treatment, and environmental protection/ remediation facilities, and/ or

d. soil engineering, retaining walls, foundations, tunnels, and other geotechnical structures, and/or e. measuring and mapping the earth and the built infrastructure.

3. Identify major regulations, codes, and specifications applicable to the planning, analysis, measuring, mapping, or design of the built infrastructure; and be able to specify where current versions can be obtained.

4. Solve problems using advanced methods of engineering analysis and design through the use of mathematical analysis including but not limited to geospatial analysis, differential equations, finite elements, finite differences, least square errors, machine learning, optimization, or other numerical methods.

5. Use modern computer software for the analysis, design, operation, and/or measuring and mapping of the built infrastructure.

6. Exhibit excellence in written and graphical communication, including technical documents, research reports, research papers, proposals, and presentations.

7. Exhibit excellence in oral communication, including public presentations to technical and non-technical audiences.

**2. Instruments Used in the Assessment.**

**A. Direct Measures:**

1) *Students communication skills in CE 210: Not scheduled this year* 2) **Students’ score on specific questions in specific courses: Outcomes 1 & 2** 3) *Students’ performance in culminating experience: Not scheduled this year* B. **Indirect Measures:**

**1) Program Student Exit Surveys (MSCE Program): Outcomes 1 through 7** *3) Alumni Survey: Not scheduled this year 4) Employer Survey: Not scheduled this year*

Civil Engineering Graduate Program Assessment AY 2018-19, William Wright, Oct. 10, 2019 2

**3. Assessment Methods and Results.**

**A. Direct Measures:**

1) **Method**: Average student score on specific questions in specific courses: Student Learning Outcomes are assessed by statistical analysis of student scores on one or more questions or problems on course exams or assignments. Questions are selected by the instructor and results are forwarded to the Assessment Coordinator. Course used, learning outcomes assessed, and the implementation schedule are shown in Table 5 of the SOAP. Courses and the associated outcomes assessed in a given academic year vary over time.

**Learning outcomes scheduled to be assessed in courses this cycle:** 1 & 2

**Course(s) scheduled for assessment this cycle:** CE 205, 220, 240, 242

2) **Results:** Numeric results of student learning outcomes from direct measures are summarized in Table 1. Discussions are provided below the table.

**Table 1**: Numeric results – learning outcomes in courses.

No. of Students Learning Score, %

Course (type) Surveyed Outcome Program Standard Student Average CE 205 (lecture) 14\* 2 **75** 76.2\* CE 220 (lecture) 12 2 **75** 91.2

CE 240 (lecture) 0 1 **75** *No data* 10 2 **75** 86.0

CE 242 (lecture) 12 1 **75** 54.2 12 2 **75** 66.4

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\* Civil Engineering students (students from other majors also take this course).

**Outcome 1:** Describe and embrace principles of professional ethics, personal responsibility, and environmental stewardship.

Results O1: The Department standard for Learning Outcome 1 (75%) was not met in the one course that was assessed, CE 242 (54.2%). The instructor was looking for mention of community stakeholders and sustainability in the definition of “Integrated

Water Management.” The instructor of the second course scheduled for

assessment, CE 240, forgot to assess the outcome.

**Outcome 2:** Describe, explain, and employ beyond the undergraduate level scientific principles and modern professional techniques used in the planning, analysis, management

and/or design of: buildings, bridges, and other structures, and/ or transportation

systems, transportation planning, and traffic operations, and/ or water supply,

flood management, water treatment, and environmental protection/ remediation

facilities, and/ or soil engineering, retaining walls, foundations, tunnels, and other

geotechnical structures, and/or measuring and mapping the earth and the built

infrastructure.

Results O2: The Department standard for Outcome 2 was exceeded in 3 of the four courses assessed. The only course that it was not met was CE 242 (66.4%). The instrument used for assessment in CE 242 was 75% of the final exam (all calculation-based).

**B. Indirect Measures:**

Methods used in the assessment of indirect measures along with their results are presented below. 1) Graduating Student Exit Surveys: Students graduating from the MSCE program are asked to complete an exit survey and the results are used to assess all outcomes (1-7). A summary of the results of statistical analyses conducted on the raw data is provided below.

Civil Engineering Graduate Program Assessment AY 2018-19, William Wright, Oct. 10, 2019 3

a) Learning outcome numeric results. No. of students who graduated in current assessment period (i.e., last AY): 6 No. of student exit surveys obtained from this group: 1 (17%) Individual responses --~~average of all outcomes~~:

• Lowest 75% • Highest 100%

~~All responders as a group, by outcome (average):~~ [only one responder this cycle] Objective 1 –Ethics: 100% Objective 2 –Principles & techniques of analysis design of infrastructure: 75% Objective 3 –Regulations, codes, specifications: 75% Objective 4 –Problem solving using math in engr. analysis and/or design: 100% Objective 5 –Use modern computer software for analysis, design, or mapping: 75% Objective 6 & 7 Combined: –Excellence in communication (written & oral): 100%

Learning Outcome with lowest score: 2, 3 & 5 ~~Avg.~~ Score: 75% LO2: “Did the MSCE program help you better understand and employ, beyond the undergraduate level, the scientific principles and modern professional

techniques used in the planning, analysis, management and/ or design of the built environment, including: buildings, bridges, and other structures; and/ or transportation systems, transportation planning, and traffic operations; and/ or water supply, flood management, water treatment, and environmental protection/ remediation facilities; and/ or soil engineering, retaining walls, foundations, tunnels, & other geotechnical structures; and/or measuring and mapping the earth and the built infrastructure?”

LO3: “Did the MSCE program help you learn major regulations, codes, and specifications applicable to the planning, analysis, measuring, mapping, or design of the built infrastructure; and be able to specify where current

versions can be obtained?”

LO5: “Did the MSCE program help you learn how to use modern computer software for analysis, design, operation and/or measuring or mapping of the built

infrastructure?”

Learning Outcome with highest score: 1, 4 & 6 Avg. score: 100% LO1: “Did the MSCE program help you to understand and embrace principles of professional ethics, personal responsibility, and environmental stewardship?” LO4: “Did the MSCE program help you learn how to solve problems using advanced methods of engineering analysis and design through the use of mathematical analysis including but not limited to geospatial analysis,

differential equations, finite elements, finite differences, least square errors, machine learning, optimization, or other numerical methods?”

LO6: “Did the MSCE program help you to exhibit excellence in communication, specifically: • written and graphical communication, including technical

documents, research reports, research papers, proposals and presentations? •oral communication, including public presentations to technical and non technical audiences?”

**Grand mean, all responders and all outcomes**: 88%

b) Student written comments (Dept. Only).

Students are asked to state the “Best thing remembered about the MSCE Program” and the “Worst thing remembered about the MSCE Program.” These comments are provided only to department faculty.

Civil Engineering Graduate Program Assessment AY 2018-19, William Wright, Oct. 10, 2019 4

c) Additional numeric results.

Program/ Option choice: General 1 (100%) WREE 0 ( 0%)

Technical area of study choice: Geomatics 0

Geotechnical 0

Structural 0

Water/ env. 0.5 (50%)

Transportation 0.5 (50%)

Culminating Experience Choice: Project 1 (100%\*) Thesis 0

Comp. exam 0

Off-campus employment during graduate studies: Full-time 0

Part-time 1 (100%)

None 0

Full-time employment offer upon graduation: Yes 1

No 0

N/A\*\* 0

Employment offer starting salary: No. of Responses 0

Starting salary N/A

\* Among participants in the survey:

\*\* Those who responded “N/A” were likely already employed.

**4. Changes Implemented Since Last Assessment Period.**

A. CE 242 will no longer be used to assess Learning Outcome 3. While major regulations, codes, and specifications are included in the CE 242 course content there is little opportunity to reinforce that content during the semester due to the enormous number of other topics that must be covered in that course. Therefore, CE 242 will not be used to measure attainment of that knowledge.

B. Timely notification to faculty of data collection needs: More consistent and timely notification to faculty of assessment data needs was provided in AY 2018-19 than in the prior year.

**5. Changes Under Consideration and On-Going Tasks.**

A. SOAP: Changes to the SOAP are anticipated as a result of action items proposed by the MSCE program as part of the program review process.

B. The Dept. Standard for Learning Outcomes 1 and 2 were not met in CE 242 in AY 2018-19. The instructor believes that attainment of the Dep. Standard (75%) in CE 242 for:

1) Learning Outcome 1 is feasible if the subject were to be emphasized more the next time the course is taught. The instructor has placed a reminder note on the syllabus and exams that will be used the next time the course is taught;

2) Learning Outcome 2 is not feasible given the high challenge level of the course in terms of both breadth and depth. A significant curve is used to determine the final grade. The instructor prefers to set high learning expectations without going so far that students become discouraged. The instructor believes that the department standard for CE 242 should be reset to 65%.

The CGE Department will need to determine if it makes sense to have a different dept. standard for one course when it is a set value (75%) for all other assessed courses and, if not, decide if CE 242 is a suitable instrument to assess Learning Outcome 2 and others that are assigned to this course.

C. Greater response needed from graduating students on the exit surveys. Only one of 6 students completed the exit survey upon graduation. Following the initial request in December 2018 a reminder was sent to the three students who graduated in Fall 2018 to complete the survey. No responses were received. The initial request for Spring 2019 graduates to complete the survey was

Civil Engineering Graduate Program Assessment AY 2018-19, William Wright, Oct. 10, 2019 5

issued until late September and one of the three graduates responded. In the future greater attention needs to be given to ensuring that exit surveys are sent to students early and that the students are informed about the importance of their feedback.

D. Employer Survey: An employer survey is being considered for AY 2019-20. Building and maintain an employer database would be required and the practical and legal aspects of doing so need to be explored. The survey is expected to provide insight on the preparedness of our graduates and on how they perform after several years on the job.

E. Culminating Experience:

1) **CE 298 Project:** Communication skills (Learning Outcomes 6 and 7) are currently being assessed in CE 298 based on the total score from Rubric I (written report) and Rubric II (oral presentation). Assessment of additional learning outcomes (i.e., 1-5) based on the existing evaluation rubrics or an expansion of it is being discussed within the department. Although beneficial to assessment, adding this component may make the grading rubrics overly burdensome and less likely that the rubrics would be used at all.

2) **CE 299 Thesis:** At present a rubric for CE 299 Thesis has not been developed. Instead, the one developed for CE 298 Project is used, but it is not a good fit in all areas of evaluation. The merits of developing a set of rubrics for CE 299 for use in future years are being discussed within the department.

3) **Comprehensive Exam:**

a) Only Learning Outcome 6 has been assessed in comprehensive exam. Although several technical learning outcomes can generally be assumed to have been met when the student passes the exam with a minimum score of 75%, assessment of specific could be assessed, resulting in greater resolution.

b) Students who select Plan C (Comprehensive Exam) are not required to do undergo an oral defense of their knowledge, which is required for all students who choose Plans A (Thesis) and B (Project). If oral defense of comp. exam were to be implemented a more complete/ accurate measurement of student attainment of oral communication skill in culminating experiences could be obtained.

F. Oral presentation evaluation rubric. A proposal to adopt the WASC oral presentation evaluation rubric for CE 210 and the culminating experiences needs to be explored.

G. Professional License and Doctorate Degrees: The ability to obtain PE and PLS license attainment data from the State or NCEES, and the practicality of researching the number graduates from our program that went on to earn a doctorate degree, should be investigated. It would help asses the technical ability of program graduates. In AY 2018-19 a member of the State licensing board informed the MSCE coordinator that some data can be provided but follow-up is needed on this item.

**6. Assessment Activities Planned for the 2019-20 Academic Year.**

**Activity Learning Outcomes to be Assessed** Instrument 1 -- Students communication skills in CE 210 6 & 7

Instrument 2 -- Questions in specific courses 3 & 4

Instrument 6 – Employer survey (to be developed) All (1 – 7)

**7. Progress Made on Items from Last Program Review Action Plan.**

The most recent program review took place in AY 2017-18 and Department faculty generally agree with the findings. An action plan designed to help the program achieve the program’s stated vision was submitted this week, along with a letter of review and approval from our dean, and a campus level meeting to discuss it is scheduled October 22, 2019.

***End of M.S.C.E. Assessment Report AY 2018-19***

Civil Engineering Graduate Program Assessment AY 2018-19, William Wright, Oct. 10, 2019 6