Institutional Effectiveness Report
2018-19

Program: Civil and Environmental Engineering MS

College and Department: College of Engineering – Civil Engineering

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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.

Program Goals

1. MS graduates will have the technical competence to be successful in the chosen sub-discipline of civil engineering professional practice or research.

2. MS graduates will have the skills to undertake technically sound analysis independently and present their work at professional meetings or publish their work in scholarly journals.

3. MS graduates will have the technical competence to successfully undertake further advanced study at the doctoral level in civil engineering or a related area, and pursue lifelong learning through professional education.

Student Learning Outcomes

1. MS graduates will demonstrate clear understanding of the chosen sub-discipline of civil engineering covered in course material in the graduate program.

2. MS graduates will apply advanced methods in the development of solutions in the chosen sub-discipline of civil engineering.

3. MS graduates will demonstrate the ability to conduct professional presentations or write scholarly manuscripts worthy of publication in peer reviewed journals.

   A departmentally developed curriculum map can be found in Appendix 1 that shows the connections between courses and student learning outcomes.

Assessment Methods

1. *Alumni Surveys:* Approximately every 5 years alumni are given a set of questionnaires to examine (1) the appropriateness and relevance of the curriculum structure to their activities after graduation, (2) the extent to which they acquire needed skills for job performance and the degree of engagement in professionally-related learning experience, and (3) whether the curriculum objectives and outcomes are met. The metric that has been established is that at least eighty percent of alumni respondents “agree” or “strongly agree” that the program provided them with adequate preparation. A lesser

percentage and response on individual questions that constitute less than fifty percent combined "agree or strongly agree" would generate a concern, which would require a review and actions by department ABET advisory committee.

a. The CEE MS degree has provided me with skills to be successful in civil engineering professional practice.

b. The CEE MS degree has made me aware of the present day professional practice in my area of study in civil engineering.

c. The CEE MS degree has provided me with the necessary skills to present work at professional meetings or publish work in scholarly journals.

d. The CEE MS degree has provided me with skills to independently undertake technically sound analysis.

e. The CEE MS degree has provided me with the technical competence needed to successfully undertake further advanced study at the doctoral level in civil engineering or a related area.

f. The CEE MS degree has provided me with the technical competence to pursue lifelong learning through professional education.

g. Would you recommend the TTU CEE MS degree program to other potential candidates in future?

The first six questions were framed as multiple choice (no opinion, strongly disagree, disagree, agree and strongly.

2. *Thesis and oral defense rubric***:** CEE MS students are required to undertake thesis research or a project independently under the direction of a CEE faculty advisor and the student's graduate advisory committee. Students through this experience learn to manage a significant research or project effort, acquire the technical knowledge and skills required for its successful completion, learn to pose the appropriate questions whose answers lead to the advancement of their research or project, and also learn to have meaningful periodic interaction with their advisory committee.

   Communication skills are critical to achieving scholarly accomplishments; that is, they are critical to proper technical paper writing and its presentation at conferences, or publication in peer reviewed journals. Hence, at the onset of his/her research or project, a graduate student has to present a proposal on his/her proposed research or project to his/her graduate advisory committee for approval. In addition to judging the intellectual merit of the proposal, the advisory committee also evaluates the oral communication skills of the student and provides feedback to the student soon thereafter through a standardized form adopted by the CEE Department.

3. *Grades for Core Courses:* CEE MS students are required to complete sub-discipline courses and electives that provide both an in-depth and broad understanding of civil engineering to students.

4. *Publications and Presentations:* A critical element of the process for facilitating a students' development in independent thinking is the requirement that each student work on a research project of real-world significance to the Civil Engineering discipline and to present their work at a peer-reviewed conference and/or publish it in a peer-reviewed journal.

Results

SLO 1 - demonstrate clear understanding of the chosen sub-discipline of civil engineering covered in course material in the graduate program.

Summary of Grades and Five-Year Average of Course Enrollment in Core MS CEE Courses

Course	Average Grades (by academic year)					Average number of students
	2014-15	2015-16	2016-17	2017-18	2018-19	
CEE 6200 – Statistical Inference for Engineers	3.47	3.60	N/A	N/A	N/A	15.75
CEE 6300 – Multiscale Analysis of Concrete	4.00	3.88	3.75	4.00	3.75	5.4
CEE 6410 – Traffic Control Systems	4.00	4.00	3.50	Not Offered/No Takers	Medical Leave-Not Offered	2.75
CEE 6470 – Transportation Demand Analysis	3.00	3.50	3.50	3.00	3.33	1.57
CEE 6520 – Open-Channel Hydraulics	3.75	3.33	3.40	4.0	4.0	4.53
CEE 6610 – Applied Environmental Chemistry	3.67	4.00	3.89	Not taught	3.57	6.25
CEE 6930 – Theory of Elasticity	3.75	3.50	3.25	3.33	3.09	4.80
CEE 7610 / 6350 – Finite Element Analysis	3.60	3.43	3.33	3.00	3.60	5.80

SLO 2 - apply advanced methods in the development of solutions in the chosen sub-discipline of civil engineering.

Assessments of MS Proposal Presentations

Assessed by	Academic Year	Number of Evaluations	Average Score[1]	
			Content	Response to Questions and Comments
Committee Members	2015-2016	5	4.000	3.665
	2016-2017	3	4.000	3.330
	2017-2018	6	3.250	3.250
	2018-2019	16	3.027	2.945
Other Faculty	2015-2016	NA	NA	NA
	2016-2017	NA	NA	NA
	2017-2018	1	4.000	4.000
	2018-2019	NA	NA	NA

[1] Assessment scale: 1 = Not Acceptable, 2 = Below Expectations, 3 = Meets Expectations, 4 = Above Expectations

Assessments of MS Thesis Defense Presentations

Assessed by	Academic Year	Number of Evaluations	Average Score[1]	
			Content	Response to Questions and Comments
Committee Members	2015-2016	17	3.818	3.595
	2016-2017	10	3.832	3.665
	2017-2018	2	3.500	3.500
	2018-2019	15	3.263	3.333
Other Faculty	2015-2016	NA	NA	NA
	2016-2017	1	4.000	3.000
	2017-2018	1	4.000	4.000
	2018-2019	2	4.000	3.500

[1] Assessment scale: 1 = Not Acceptable, 2 = Below Expectations, 3 = Meets Expectations, 4 = Above Expectations

SLO 3 - demonstrate the ability to conduct professional presentations or write scholarly manuscripts worthy of publication in peer reviewed journals.

Assessments of MS Proposal Presentations

Assessed by	Academic Year	Number of Evaluations	Average Score[1]		
			Visual Aids	Presenter Preparation	Presentation Mechanics
Committee Members	2015-2016	5	3.665	4.000	4.000
	2016-2017	3	3.665	4.000	3.660
	2017-2018	6	3.660	3.250	3.500
	2018-2019	16	3.000	3.112	3.140
Other Faculty	2015-2016	NA	NA	NA	NA
	2016-2017	NA	NA	NA	NA
	2017-2018	1	4.000	4.000	4.000
	2018-2019	NA	NA	NA	NA

[1] Assessment scale: 1 = Not Acceptable, 2 = Below Expectations, 3 = Meets Expectations, 4 = Above Expectations

Assessments of MS Thesis Defense Presentations

Assessed by	Academic Year	Number of Evaluations	Average Score[1]		
			Visual Aids	Presenter Preparation	Presentation Mechanics
Committee Members	2015-2016	17	3.622	3.623	3.581
	2016-2017	10	3.915	3.915	3.750
	2017-2018	2	3.500	3.500	3.500
	2018-2019	15	3.549	3.881	3.596
Other Faculty	2015-2016	NA	NA	NA	NA
	2016-2017	1	4.000	4.000	4.000
	2017-2018	1	4.000	4.000	4.000
	2018-2019	2	4.000	4.000	3.500

[1] Assessment scale: 1 = Not Acceptable, 2 = Below Expectations, 3 = Meets Expectations, 4 = Above Expectations

Modifications for Improvement:

For SLO 2, it is noted that one of scores fell below 3.0. As the number of evaluations increased (indicating a more thorough representation of actual results), it was noted that the representative scores decreased. This will be monitored in future academic years.

Appendices

1. Curriculum Maps
2. Thesis and Oral Defense Rubric
3. Alumni Survey

Appendix 1: Curriculum Maps

Civil Engineering, MS (Thesis): Mapping of the Graduate Curriculum and Student Learning Objectives

Course	Title	Student Outcomes		
		SLO 1: Sub-discipline course knowledge	SLO 2: Advanced methods in sub-discipline	SLO3: Communication Skills
Core Sub-Discipline Courses	6-9 credits minimum in subdiscipline	X	X	
Program of Study Courses	15-18 credits of elective courses approved by student's advisory committee	X	X	
CEE 6910	Graduate Seminar (1 credit)			X
CEE 6990	Research and Thesis (6 credits total)		X	X

Civil Engineering, MS (Non-Thesis): Mapping of the Graduate Curriculum and Student Learning Objectives

Course	Title	Student Outcomes		
		SLO 1: Sub-discipline course knowledge	SLO 2: Advanced methods in sub-discipline	SLO3: Communication Skills
Core Sub-Discipline Courses	6-9 credits minimum in subdiscipline	X	X	
Program of Study Courses	21-24 credits of elective courses approved by student's advisory committee	X	X	
CEE 6910	Graduate Seminar (1 credit)			X
CEE 6980	Directed Studies Project Work (3 credits)		X	X

Appendix 2: Thesis and Oral Defense Rubric

Master of Science in Civil and Environmental Engineering
Oral Defense and Thesis Assessment Form

Candidate Name: _____ Sub-discipline: _____

Committee Member _____ Faculty _____ Student _____ (Please check one)

Date: _____

Evaluation of Oral Presentation

Oral Presentation Type (circle): Proposal Thesis Defense

Graduates of the M.S. program in Civil and Environmental Engineering will be able to communicate their ideas effectively with their technical peers and with others outside their discipline. Please assess this candidate's oral presentation and written work using the following scale:

Not Acceptable	Below Expectations	Meets Expectations	Above Expectations
1	2	3	4

1 2 3 4	**Content:** appropriate, complete, concise, and logically organized; problem, approach and results clear; appropriate use of time.
1 2 3 4	**Visual aids:** readable & clear, concise wording, effective use of graphics, appropriate amount of information
1 2 3 4	**Presenter:** appears well-prepared, vocabulary technically correct and audience-appropriate
1 2 3 4	**Presentation mechanics:** good voice volume, enunciation, speed; free of hesitations, distracting mannerisms; good poise, eye contact
1 2 3 4	**Responses to questions and comments**: appropriate, direct, and complete

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Evaluation of Thesis Document

1 2 3 4	**Quality of English**: good grammatical form, voice, tense, punctuation. Concise presentation
1 2 3 4	**Technical content**: clear description of problem, state-of-the-art, technical approach, and results; relevant and timely references
1 2 3 4	**Technical writing**: good organization; clear description of problem; clear figures and tables

Appendix 3: Alumni Survey

Alumni Survey

The survey questions are listed below.

1. Did the CEE MS degree program provide you with the technical knowledge to be successful in civil engineering professional practice?
2. Did the CEE MS degree program provide you with the necessary communication skills to present work at professional meetings and/or publish work in scholarly journals?
3. Did the CEE MS degree program provide you with the ability to undertake technical work independently?
4. Did the CEE MS degree program provide you with the technical competence needed for advanced study at the doctoral level in civil engineering or a related area?
5. Did the CEE MS degree program provide you with the technical competence to pursue lifelong learning through continuing professional education?
6. Have you received any award from a professional civil engineering or related organization? If answered “yes,” please provide details.
7. Would you recommend the TTU CEE MS degree program to other potential candidates in the future?