

## **GUIDELINES FOR M.S.E. DEGREE IN CIVIL ENGINEERING CONCENTRATION IN GEOTECHNICAL ENGINEERING**

### Introduction

The growth in world population has led to an unprecedented development of civil infrastructure, with Geotechnical Engineering needed for every structure and facility supported by soil or rock. Geotechnical Engineering played a leading role in prominent historical projects such as the Panama Canal, Hoover Dam and Europe's Chunnel. Geotechnical engineers provide their expertise towards challenging development of underground space, whether related to urban transportation infrastructure or the development of the underground lifeline systems. The Geotechnical Engineering concentration has been designed for students planning to pursue careers focusing on projects related to geotechnical engineering and design, assessment of the safety of geotechnical structures, or on research.

### General

An applicant for the M.S.E. degree is expected to have an undergraduate degree in Civil Engineering or similar related preparation. Students with undergraduate degrees from other disciplines will be accepted into the M.S.E. degree program, but they may need to complete prerequisite courses that supplement their undergraduate course work and provide the necessary foundation in mathematics, physics, and engineering fundamentals. Students will be informed of these requirements when they are accepted into the degree program. The prerequisite courses include:

- Calculus and Differential Equations equivalent to UM MATH 216 and its prerequisites
- Solid and Structural Mechanics equivalent to UM CEE 212
- Introductory Geotechnical Engineering equivalent to UM CEE 345

### Coursework

A student pursuing a M.S.E. degree in Geotechnical Engineering must complete at least 30 credit hours of acceptable graduate work. This usually corresponds to 10 courses. A thesis is not required. In satisfying the credit hour requirement, the following requirements must be met:

- At least 9 credit hours must correspond to courses within the Geotechnical Engineering concentration area, but no more than 21. Examples of acceptable courses:
 

CEE 446	Engineering Geology & Site Characterization
CEE 535	Excavation and Tunneling
CEE 540	Advanced Soil Mechanics
CEE 542	Soil and Site Improvement
CEE 543	Numerical Modeling in Geotechnical Engineering
CEE 544	Rock Mechanics
CEE 545	Foundation Engineering
CEE 546	Slopes, Dams and Retaining Structures
- At least 15 of the credit hours must be from courses offered by the Department of Civil and Environmental Engineering (CEE) at the University of Michigan; the 15 credit hour requirement includes the courses in Geotechnical Engineering. Examples of acceptable courses are:
 

CEE 421	Hydrology and Floodplain Hydraulics
CEE 428	Groundwater Hydrology
CEE 504	Engineering Economics and Finance

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<sup>1</sup> For additional information on M.S.E. degree requirements, see the Rackham Graduate School's website for current students at: <https://rackham.umich.edu/current-students/> and the CEE Department Guidelines found on the CEE website at: <https://cee.engin.umich.edu/academics/graduate/masters/>.

CEE 510	Finite Element Methods in Solid and Structural Mechanics
CEE 547	Soils Engineering and Pavement Systems
CEE 573	Data Analysis in CEE
CEE 574	Materials Selection for Sustainable Design
CEE 575	Sensing for Civil Infrastructure Systems

- At least one course (3 credits) must be taken in an area outside of the field of specialization (cognate). Courses cross-listed with CEE may satisfy the cognate requirement provided that the course is in a subfield different from the student's own. Cognate courses must be passed with a B- or better (see Rackham's website at: <https://rackham.umich.edu/academic-policies/section5/#5-3> for more information). The cognate course must be chosen from a list of Rackham-approved graduate courses and should be relevant to the student's program of study. Typical areas from which the cognate can be selected are: mechanical engineering, theoretical mechanics, computer science, earth science, environmental science, electrical engineering.
- The student must complete at least one course (minimum of 3 credit hours) in mathematics or math intensive studies, probability, statistics, or mathematical programming, beyond the minimum undergraduate requirements of the Department of Civil and Environmental Engineering of the University of Michigan. A course used to satisfy this math requirement also can be used toward the 3 credit hour cognate requirement provided that it is taken outside the Department of Civil and Environmental Engineering or is cross-listed with another department and is outside the student's subfield of study. Examples of advanced math courses:

Math 417	Matrix Algebra I
Math 451	Advanced Calculus I
CEE 553	Infrastructure Systems Optimization
CEE 571	Linear System Theory
CEE 572	Dynamic Infrastructure Systems
CEE 573	Data Analysis in CEE

### Grades

The grading system used for graduate studies is based on the following scale:

A+ = 4.3; A = 4; A- = 3.7; B+ = 3.3; B = 3.0; B- = 2.7; C+ = 2.3; C = 2; C- = 1.7

A minimum cumulative graduate grade point average (GPA) of 3 on this 4-point scale is required for all graduate courses taken for credit and applied toward the Master's Degree.

### Diploma

To be considered for a master's degree diploma, a student must submit a formal application to the Office of Graduate Academic Records of the Graduate School. The deadline for the Graduate School to receive the degree application form is four weeks after the first day of classes in a full term and one week after the first day of classes in a half term. These dates can usually be found on the Rackham Graduate School web site <http://www.rackham.umich.edu/>.

Checklist

The checklist below can be used to monitor your progress toward your M.S.E. degree.

Student Name: \_\_\_\_\_

	Requirement Description	Course Number	Adv. Math √	Course Description	Credits	Transfer √
1	Cognate					
2	CEE (Concentration Area)					
3	CEE (Concentration Area)					
4	CEE (Concentration Area)					
5	CEE (Concentration Area)					
6	CEE					
7	Open Choice*					
8	Open Choice*					
9	Open Choice*					
10	Open Choice*					
	Extra					
	Extra					

\*No more than 21 credits can be taken from the Geotechnical concentration area (see page 1)

Advisor Approval: \_\_\_\_\_ Date: \_\_\_\_\_