



**GUIDELINES FOR MSE DEGREE IN CIVIL
ENGINEERING:
MATERIALS AND HIGHWAY
ENGINEERING**

Department of Civil and Environment Engineering

The University of Michigan

2350 Hayward St, Ann Arbor, MI 48109

General

An applicant for the M.S.E. degree must present the equivalent of an undergraduate in a Civil Engineering program as preparation. Students with undergraduate degrees from other disciplines will be accepted into the M.S.E. degree program but may need to complete prerequisite courses that supplement their undergraduate course work and provide the necessary foundation for this program. Students will be informed of these requirements when they are accepted into the degree program.

Students entering the M.S.E. degree program in Materials Engineering with an undergraduate degree in Civil Engineering, or Civil and Environmental Engineering, will be accepted directly into the degree program. For students entering this program with some other undergraduate degree, there may be some prerequisite courses that need to be completed before formal admission into the program. Students must have completed three semesters of calculus and two semesters of physics. They should also have completed courses in statics, dynamics and solid mechanics. In addition, two core civil engineering courses are required but can be taken after the student enrolls in the M.S.E. degree program. Those courses are:

- Civil Engineering Materials: CEE 351¹
- Civil Engineering Breadth¹: Either CEE 312 (Structural Engineering) or CEE 331 (Construction Management) or CEE 345 (Geotechnical Engineering)

¹ These courses may not be used for credit towards the M.S.E. degree, and students should consider their minor area of emphasis when selecting between breadth courses.

Coursework

A student pursuing a MSE degree in Materials and Highway 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 satisfied:

- At least 15 of the credit hours must be in Civil and Environmental Engineering (CEE) courses.
- Two required courses are CEE 547 and CEE 574. Other acceptable courses including CEE 510-519 and CEE 540-549 are listed below. At least 12 credit hours must correspond to courses within the Materials and Highway concentration area. However, no more than 21 credit hours from the courses listed below can be counted toward the MSE degree.

Course Number	Course Name	Course Number	Course Name
Required Courses			
CEE 547	Soils Engineering and Pavement Systems	CEE 574	Material Selection for Sustainable Design
Acceptable Courses			
CEE 510	Finite Element Methods	CEE 540	Advanced Soil Mechanics
CEE 511	Dynamics of Structures	CEE 541	Soil Sampling and Testing
CEE 512	Nonlinear Analysis of Structures	CEE 543	Numerical Modeling in Geotechnical Engineering
CEE 513	Plastic Analysis and Design of Frames	CEE 544	Rock Mechanics
CEE 514	Prestressed Concrete	CEE 545	Foundation Engineering
CEE 515	Advanced Design of R/C Structures	CEE 546	Slopes, Dams and Retaining Structures
CEE 516	Bridge Structures	CEE 548	Geotechnical Earthquake Engineering
CEE 517	Reliability of Structures	CEE 549	Geoenvironmental Engineering
CEE 553	Infrastructure Systems Optimization	CEE 555	Sustainability of Civil Infrastructure Systems

- In addition to the minimum 12 credit hours of Materials and Highway concentration area courses, a student must enroll for 1 credit hour of the CEE 812 Structural Engineering Graduate Seminar, CEE 830 Construction Engineering and Management Seminar, or CEE 840 Geotechnical Engineering Seminar.
- A student must satisfactorily complete at least 3 credit hours of cognate courses related to the field of specialization, but offered outside the Civil and Environmental Engineering Department, to increase the intellectual breadth of the graduate education. Courses cross-listed with the Civil and Environmental Engineering Department 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 (refer to Rackham's website at: <https://rackham.umich.edu/policy/section5/#5-3> for more information). The list of courses on page 4 of this guideline can be used as a guide to satisfy the cognate course requirement. Courses other than those listed should be approved by the student's academic advisor in advance.
- 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 Civil and Environmental Engineering Department 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 Civil and Environmental Engineering Department or is cross-listed with another department and is outside the student's subfield of study. Approved courses within the department (see dept. guidelines) can be used to satisfy the math requirement.
- No more than 6 credit hours of directed studies, seminars or research can be counted toward the 30-credit requirement. This covers credit hours received for CEE 950.
- Up to 2 credit hours of seminar class (CEE 812, 830 or 840) may be applied towards the degree.
- No more than 12 credit hours at the 400 level are acceptable. Of these 12 hours, a maximum of 9 hours can be in CEE courses. CEE 412, 413 and 415 may be approved for graduate credit in advance by the MSE graduate advisor in materials and highway engineering provided a similar course was not taken during the student's undergraduate degree. Students receiving credit graduate credit for any of these courses must take at least 3 materials and highway engineering courses at the 500 or 600 level.
- A maximum of 6 graduate level semester hours (with a grade of B or better) can be transferred from other institutions approved by Rackham.

Grades

The grading system used for graduate studies is based on the following 4-point 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 be found on the Rackham Graduate School website (<http://www.rackham.umich.edu/>).

Acceptable Cognate Courses for MSE in Materials Engineering

Shown below is a partial list of courses that can be used to satisfy the advanced math course requirement for the CEE Department's MSE degrees. In general, the math course should have a prerequisite of Math 215 or equivalent.

Course Number	Course Name	Course Number	Course Name
Math 404	Intermediate Differential Equations	Math 471	Intro. to Numerical
Math 412	Introduction to Modern Algebra	Methods Math 5XX	Any 500 level math course
Math 416	Theory of Algorithms	IOE 510	Linear Programming
Math 417	Matrix Algebra I	BioStat 553	Applied Biostatistics
Math 419	Linear Spaces and Matrix	CEE 553	Infrastructure Systems Optimization
Math 433	Geometry	CEE 517	Reliability of Structures
Math 450	Adv. Math for Engineers I	CEE 571	Linear System Theory
Math 451	Adv. Calculus I	CEE 572	Dynamic Infrastructure Systems
Math 454	Boundary Value Prob. for PDE	CEE 573	Data Analysis in CEE
Math 462	Mathematical Models		

Shown below is a partial list of courses that may be used to satisfy the cognate course requirement for the CEE Department's MSE degrees.

Suggested cognate course list

Course Number	Course Name	Course Number	Course Name
ME 400	Mechanical Engineering Analysis	Aero 416	Plates and Shells
ME 401	Statistical Quality Control and Design	Aero 513	Solid and Structural Mechanics I
ME 412	Advanced Strength of Materials	Aero 514	Solid and Structural Mechanics II
ME 515	Contact Mechanics	Aero 516	Mechanics of Composites
ME 501	Analytical Methods in Mechanics	Aero 518	Theory of Elastic Stability I
ME 502	Methods of Diff. Eqns. In Mechanics	Aero 565	Optimal Structural Design
ME 511	Theory of Solid Continua	Aero 611	Advanced Finite Elements
ME 519	Theory of Plasticity I	MSE 514	Composite Materials
ME 543	Analytical and Comp. Dynamics I	ARCH 524	Surface Structures
ME 555	Design Optimization	ARCH 544	Wood Structures
ME 558	Discrete Design Optimization		
ME 563	Time Series Modeling Linear Systems	ARCH 571	Digital Fabrication
ME 564	Theory	MSE 514	Composite Materials
ME 605	Adv. Finite Element Methods in Mech.	MSE 550	Fundamentals of Materials Science
ME 619	Theory of Plasticity II	MSE 554	Computational Meth. in MS&E & ChemE
		MSE 556	Molecular Simulation of Materials
		MSE 562	Electron Microscopy I

There are many other courses in engineering, math, science, and architecture/urban planning that may satisfy the requirements for the cognate course. (A cognate course must be at the 400 level or higher, must be related to the field of specialization, and must be listed in the Rackham Program of Study website at: <https://rackham.umich.edu/programs-of-study>. Cognate courses must be passed with a B- or better to count towards the degree.) Such courses must be approved for cognate credit in advance by the student's academic advisor. Courses outside of engineering, math, science, and architecture/urban planning are generally not acceptable as cognate courses. Except as listed above, generally 400 level courses are not acceptable.

Concentration in Materials and Highway Engineering Worksheet

This worksheet can be used to monitor your progress toward your MSE degree.

Student's Full Name: _____ **Username:** _____

	Requirement Description	Course Number	Adv. Math <input type="checkbox"/>	Course Description	Credits	Transfer <input type="checkbox"/>
1	Cognate					
2	CEE	547				
3	CEE	574				
4	CEE (Concentration Area)					
5	CEE (Concentration Area)					
6	CEE					
7	Open Choice*					
8	Open Choice*					
9	Open Choice*					
10	Open Choice*					
11	CEE 812, 830 or 840 (Graduate seminar)					
	Extra					
	Extra					

*No more than 21 credits can be taken from the Materials and Highway concentration area (see list on page 2)

Advisor Approval: _____ (signature)

Date: _____