ENGINEERING MECHANICS: RESEARCH, MS

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum degree requirements (https://guide.wisc.edu/graduate/#requirementstext) and policies (https://guide.wisc.edu/graduate/#policiestext), in addition to the program requirements listed below.

NAMED OPTION REQUIREMENTS

MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW-Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirement	Detail
Minimum Credit Requirement	30 credits
Minimum Residence Credit Requirement	16 credits
Minimum Graduate Coursework Requirement	15 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: https://policy.wisc.edu/library/UW-1244 (https://policy.wisc.edu/library/UW-1244/).
Overall Graduate GPA Requirement	3.00 GPA required. Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: https://policy.wisc.edu/library/UW-1203 (https://policy.wisc.edu/library/UW-1203/).
Other Grade Requirements	Students must earn a C or above in all formal coursework. Students may not have more than two incompletes on their record at any one time.
Assessments and Examinations	A thesis is not required for a master's degree in Engineering Mechanics. Credit for master's research (E M A 790) will be granted toward meeting the MS requirements only when a formal MS thesis is submitted and approved by the thesis committee. If submitting a MS thesis, a thesis Oral Defense is required. Candidates must pass an oral exam administered by a three-member committee, selected by the student's advisor. At least two of the committee members must be members of the UW-Madison Graduate Faculty. (For more information, see https://grad.wisc.edu/documents/committees (https://grad.wisc.edu/documents/committees/)/.) Typically, the student presents an overview of their thesis/research, and then the examiners ask questions in closed session. See the Graduate School's information https://grad.wisc.edu/current-students/masters-guide (https://grad.wisc.edu/current-students/masters-guide/)/ and note the requirement for an advisor approval page.
Language Requirements	No language requirements.

REQUIRED COURSES

The program requires 30 credits of technical coursework approved by the student's advisor. All courses must be numbered 500 or above. Technical coursework is defined as courses in Engineering departments, Physics, Math, Statistics, Computer Science, Medical Physics, and Chemistry. Other courses may be deemed appropriate by a student's faculty advisor.

Code	Title	Credits
General [1]		
At least 15 credits must be taken in courses numbered 600 and above OR from the following list:		15
E M A/CIV ENGR/ M E 508	Composite Materials	
E M A 519	Fracture Mechanics	
E M A 522	Aerodynamics Lab	
E M A 523	Flight Dynamics and Control	
E M A/M E 540	Experimental Vibration and Dynamic System Analysis	
E M A/ M S & E 541	Heterogeneous and Multiphase Materials	
E M A/E P 547	Engineering Analysis I	
E M A/E P 548	Engineering Analysis II	
E M A/M E 570	Experimental Mechanics	
Mathematics Requirements [1]		
Students must take at least 3 credits (1 course) from the following list:		3
E M A/E P 547	Engineering Analysis I	
E M A/E P 548	Engineering Analysis II	

MATH 519	Ordinary Differential Equations
MATH 521	Analysis I
MATH 522	Analysis II
MATH 540	Linear Algebra II
MATH 619	Analysis of Partial Differential Equations
MATH 623	Complex Analysis
MATH 703	Methods of Applied Mathematics 1
MATH 704	Methods of Applied Mathematics-2
MATH/ COMP SCI 714	Methods of Computational Mathematics I
MATH/ COMP SCI 715	Methods of Computational Mathematics II

Breadth Requirement [1]

Five courses are required to complete the Breadth Requirement. Students must select two of the three area lists below (Solid Mechanics, Fluid Mechanics, Dynamic) and complete two courses in each of the two area lists. A fifth course must be completed and may be from any of the three area lists. Across the 5 courses, at least 3 courses must be identified with an *.

Solid Mechanics	
E M A 506	Advanced Mechanics of Materials I *
E M A/CIV ENGR/ M E 508	Composite Materials
E M A 519	Fracture Mechanics *
E M A/ M S & E 541	Heterogeneous and Multiphase Materials *
E M A/M E 570	Experimental Mechanics
E M A 605	Introduction to Finite Elements *
E M A 611	Advanced Mechanical Testing of Materials *
E M A/E P 615	Micro- and Nanoscale Mechanics *
E M A 630	Viscoelastic Solids *
E M A 700	Theory of Elasticity *
E M A/M E 703	Plasticity Theory and Physics
E M A 705	Advanced Topics in Finite Elements *
E M A/M E 708	Advanced Composite Materials
E M A 710	Mechanics of Continua
E M A/M E 722	Introduction to Polymer Rheology
M E/B M E 516	Finite Elements for Biological and Other Soft Materials
M E 753	Friction, Lubrication and Wear
Fluid Mechanics	
E M A 521	Aerodynamics *
E M A 524	Rocket Propulsion *
E M A 710	Mechanics of Continua
M E 563	Intermediate Fluid Dynamics *
M E 572	Intermediate Gas Dynamics *
M E 573	Computational Fluid Dynamics *
M E 769	Combustion Processes
M E 770	Advanced Experimental Instrumentation
M E 774	Chem Kinetics of Combust Systems
M E/CIV ENGR/ E M A 775	Turbulent Heat and Momentum Transfer
MATH 705	Mathematical Fluid Dynamics
Dynamics	
E M A 523	Flight Dynamics and Control *
E M A/M E 540	Experimental Vibration and Dynamic System Analysis *
E M A 542	Advanced Dynamics *
E M A 545	Mechanical Vibrations *
E M A/ ASTRON 550	Astrodynamics
E M A 610	Structural Finite Element Model Validation *
E M A 642	Satellite Dynamics *
E M A 742	*
E M A 745	Advanced Methods in Structural Dynamics *
E M A 747	Nonlinear and Random Mechanical Vibrations *
M E/E C E 577	Automatic Controls Laboratory
M E 740	Advanced Vibrations
M E 747	Advanced Computer Control of Machines and Processes
or M E/ E C E 733	Advanced Computer Control of Machines and Processes
M E 748	Optimum Design of Mechanical Elements and Systems

Depth Requirement [1]

At least 2 courses (6 credits) must be numbered 700 or above in mechanics, from the following list:	6
Any E M A course except E M A 790, E M A 890, or E M A 990.	
E M A 601 Special Topics courses may only be counted as course numbered 700 or above if designated as such by the instructor.	
CBE 720	Microhydrodynamics, Brownian Motion, and Complex Fluids
CIV ENGR/ G L E 730	Engineering Properties of Soils
MATH 705	Mathematical Fluid Dynamics
M E 740	Advanced Vibrations
M E 746	Dynamics of Controlled Systems
or M E/ E C E 732	Dynamics of Controlled Systems
M E 747	Advanced Computer Control of Machines and Processes
M E 748	Optimum Design of Mechanical Elements and Systems
M E 751	Advanced Computational Dynamics
M E 753	Friction, Lubrication and Wear
M E 768	Precision Measurements
M E 769	Combustion Processes
M E 770	Advanced Experimental Instrumentation
M E 774	Chem Kinetics of Combust Systems

M E/CIV ENGR/ E M A 775	Turbulent Heat and Momentum Transfer	
Independent Study		
At least 3 credits of the following course is required of all students. A maximum of 6 credits may be applied toward minimum degree requirements.		3-6
E M A 599	Independent Study	
Thesis Credits		
Thesis credits are not required to meet minimum degree requirements. However, they may be used to satisfy degree requirements ONLY if a thesis is written and defended. Students utilizing thesis credits may use a maximum of 12 credits E M A 599 and E M A 790, combined, toward the minimum degree requirement.		0-9
E M A 790	Master's Research and Thesis	
Seminar Credits		
A maximum of 3 seminar credits, as deemed appropriate by faculty advisor, may be applied to the minimum degree requirements. Seminar credits are not required within the Engineering Mechanics MS - Research program. The following is an example:		0-3
E M A 601	Special Topics in Engineering Mechanics (Mechanics Seminar)	
Total Credits		**30**

[1] Courses used to satisfy the following degree requirements may overlap: General, Mathematics Requirement, Breadth Requirement, Depth Requirement.

Pathway

Students must select to follow either the thesis pathway or the independent study pathway. These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.