ENGINEERING MECHANICS, PH.D.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Mode of Instruction</th>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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</table>

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students are able to complete a program with minimal disruptions to careers and other commitments.

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

Requirements Detail

Minimum Credit Requirement

Minimum 60 credits

Minimum Residence Credit Requirement

Minimum 32 credits

Minimum Graduate Coursework Requirement

30 of the required 60 credits must be in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (https://registrar.wisc.edu/course-guide/). In addition, at least 18 of the non-research credits must be in classes having the graduate-level designation.

Overall

Graduate GPA Requirement

3.00 GPA required.

Other Grade Requirements

Courses in which grades of BC, C, or below are received cannot be counted toward the degree except as follows:
1) Credits of C will be allowed provided they are balanced by twice as many credits of A or by four times as many credits of AB
2) Credits of BC will be allowed provided they are balanced by twice as many credits of AB or by an equal number of credits of A.

Assessments and Examinations

Ph.D. qualifying examination is required of all students.

After acceptance of the student's doctoral plan of study, the student must take an oral preliminary examination.

Final oral examination is required at the end of the thesis work.

Language Requirements

No language requirements.

Doctoral Minor/Breadth Requirements

There are two minor options available:

Minor Option A
Students minor in a single department and satisfy the minor requirements of that department.

Minor Option B (Distributed Minor)
This option requires a minimum of 9 credits in two or more departments outside the major, in related courses selected for their relevance to a particular area of concentration. The following rules apply.
1. Courses typically included on or within the scope of the E M A Qualifying Exam shall not be considered acceptable for the Ph.D. Minor Option B.
2. At least 6 credits must be taken in courses listed in the UW-Madison Guide as "Grad 50%" courses.

REQUIRED COURSES

At least 36 of the required 60 credits must be in classes satisfying the following general requirements and mathematics, breadth and depth requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>E M A/CIV ENGR/ M E 508</td>
<td>Composite Materials</td>
<td>21</td>
</tr>
<tr>
<td>E M A 519</td>
<td>Fracture Mechanics</td>
<td></td>
</tr>
<tr>
<td>E M A 522</td>
<td>Aerodynamics Lab</td>
<td></td>
</tr>
<tr>
<td>E M A 523</td>
<td>Flight Mechanics Lab</td>
<td></td>
</tr>
<tr>
<td>E M A/M E 540</td>
<td>Experimental Vibration and Dynamic System Analysis</td>
<td></td>
</tr>
<tr>
<td>E M A/M S &amp; E 541</td>
<td>Heterogeneous and Multiphase Materials</td>
<td></td>
</tr>
<tr>
<td>E M A/E P 547</td>
<td>Engineering Analysis I</td>
<td></td>
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<tr>
<td>E M A/E P 548</td>
<td>Engineering Analysis II</td>
<td></td>
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<tr>
<td>E M A/M E 570</td>
<td>Experimental Mechanics</td>
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</tbody>
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Mathematics Requirements

At least 6 credits (2 courses) must be in applied mathematics from the following list:

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<tr>
<td>E M A/E P 547</td>
<td>Engineering Analysis I</td>
</tr>
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</table>
### Breadth Requirement

As part of their M.S. or Ph.D., students must have taken courses from at least 2 of the 3 areas defined below. For each of the 2 areas, the student must have taken at least 2 courses. The courses must be at a similar level to those listed below.

#### Solid Mechanics
- **EM A 506** Advanced Mechanics of Materials I 3
- **EM A/CIV ENGR/M E 508** Composite Materials 3
- **EM A 519** Fracture Mechanics 3
- **EM A/M S & E 541** Heterogeneous and Multiphase Materials 3
- **EM A/M E 570** Experimental Mechanics 3
- **EM A 601** Advanced Mechanical Testing of Materials 3
- **EM A/E P 615** Micro- and Nanoscale Mechanics 3
- **EM A 622** Mechanics of Continua 3
- **EM A 630** Viscoelastic Solids 3
- **EM A 700** Theory of Elasticity 3
- **EM A/M E 703** Plasticity Theory and Physics 3
- **EM A 705** Advanced Topics in Finite Elements 3
- **EM A/M E 706** Plates, Shells and Pressure Vessels 3
- **EM A/M E 708** Advanced Composite Materials 3
- **EM A/M E 722** Introduction to Polymer Rheology 3
- **M E/B M E 603** Topics in Bio-Medical Engineering (Topic: FE for Biomechanics) 1-3
- **M E 753** Friction, Lubrication and Wear 3

#### Fluid Mechanics
- **EM A 521** Aerodynamics 3
- **EM A 622** Mechanics of Continua 3
- **M E 563** Intermediate Fluid Dynamics 3
- **M E 572** Intermediate Gas Dynamics 3
- **M E 573** Computational Fluid Dynamics 3
- **M E 769** Combustion Processes 3
- **M E 770** Advanced Experimental Instrumentation 3
- **M E 774** Chem Kinetics of Combust Systems 3

### Depth Requirement

At least 4 courses (12 credits) must be 700-level or above in mechanics, applied mathematics, or computer science. At least 2 of the courses (6 credits) must be from List 1 (below), and the remaining 2 courses (6 credits) may be from List 1 or List 2.

#### List 1
- **EM A 601** Special Topics courses may only be counted as 700-level 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
- **CIV ENGR/G L E 735** Soil Dynamics
- **MATH 705** Mathematical Fluid Dynamics
- **M E 740** Advanced Vibrations
- **M E 746** 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 769** Combustion Processes
- **M E 770** Advanced Experimental Instrumentation
- **M E 774** Chem Kinetics of Combust Systems
It is acceptable for students who earned an M.S. degree in Engineering Mechanics at UW-Madison to use coursework completed while in the M.S. degree program to meet the requirements above.