MECHANICAL ENGINEERING: AUTOMOTIVE ENGINEERING, M.S.

This is a named option within the Mechanical Engineering M.S. (http://guide.wisc.edu/graduate/mechanical-engineering/mechanical-engineering-ms/#text)

The Department of Mechanical Engineering M.S. named option: Automotive Engineering is an accelerated on campus degree program (completed in 12 months) geared toward preparing students for a career in the automotive industry. With a strong emphasis on in-cylinder energy conversion processes, graduates of this program will be poised to immediately participate in engine development programs in the automotive, heavy duty, or recreational engine sectors. The coursework includes 12 credits of thermofluid processes, 12 formal credits in other relevant topics, and a 6 credits of summer practicum that pairs a hands-on laboratory course with a hands-on modeling course. The summer practicum coalesces information from coursework by applying it to internal combustion engines in a hands-on environment.

For more information on the Automotive Engineering named option see the program website (https://www.engr.wisc.edu/department/mechanical-engineering/academics/masters-degree-mechanical-engineering-2).

ADMISSIONS

Students with a strong background in mechanical engineering or a related field with interest in furthering their education in mechanical engineering are encouraged to apply for admission to the department. Applicants accepted into the program generally have an undergraduate grade point average well above the graduate school minimum of 3.0 on a 4.0 scale. All applicants are required to take the Graduate Record Exam (GRE). Applications are evaluated on the basis of previous academic record, GRE scores, letters of recommendation, and a personal statement. For more information on admission requirements see the program’s website (https://www.engr.wisc.edu/department/mechanical-engineering/academics/masters-degree-mechanical-engineering-2).

APPLICATION DEADLINE: JANUARY 1

Applications are accepted for admission during the fall semester.

GRADUATE SCHOOL ADMISSIONS

Graduate admissions is a two-step process between academic degree programs and the Graduate School. Applicants must meet requirements of both the program(s) and the Graduate School. Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/admissions).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

PROGRAM RESOURCES

Students in this program are NOT be eligible for teaching assistant, research assistant, or project assistant positions as this is an accelerated coursework ONLY degree.

FEDERAL LOANS

Students who are U.S. citizens or permanent residents are eligible to receive some level of funding through the federal direct loan program. These loans are available to qualified graduate students who are taking at least 4 credits during the fall and spring semesters, and 2 credits during summer. Private loans are also available. Learn more about financial aid at their website (https://financialaid.wisc.edu).

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.

NAMED OPTION 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></td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

**Evening/Weekend:** These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

**Online:** These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

**Hybrid:** These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

**Accelerated:** These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

CURRICULAR REQUIREMENTS

<table>
<thead>
<tr>
<th>Minimum</th>
<th>30 credits</th>
</tr>
</thead>
<tbody>
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<td>Credit</td>
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<tbody>
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<td>Requirement</td>
</tr>
</tbody>
</table>
Minimum Residence Credit Requirement 18 credits

Minimum Graduate Coursework Requirement Half of degree coursework (15 credits out of 30 total credits) must be completed 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/).

Overall Graduate GPA Requirement 3.00 GPA required.

Other Grade Requirements Students must earn a C or above in all formal coursework. Students may not have any more than two incompletes on their record at any one time.

Assessments and Examinations None.

Language Requirements No language requirements.

REQUIRED COURSES

A minimum of 24 formal course credits are required (minimum of 15 credits in Mechanical Engineering taken at UW-Madison), one of these courses must be numbered 700 or higher.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M E 903</td>
<td>Graduate Seminar</td>
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</tbody>
</table>

A minimum of 12 credits (4 courses) must be taken from the courses listed:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M E 461</td>
<td>Thermal Systems Modeling</td>
<td>3</td>
</tr>
<tr>
<td>M E 466</td>
<td>Air Pollution Effects, Measurements and Control</td>
<td>3</td>
</tr>
<tr>
<td>M E 469</td>
<td>Internal Combustion Engines</td>
<td>3</td>
</tr>
<tr>
<td>M E 561</td>
<td>Intermediate Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>M E 563</td>
<td>Intermediate Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>M E 564</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>M E 569</td>
<td>Applied Combustion</td>
<td>3</td>
</tr>
<tr>
<td>M E 572</td>
<td>Intermediate Gas Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>M E 573</td>
<td>Computational Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>M E 761</td>
<td>Topics in Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>M E 764</td>
<td>Advanced Heat Transfer I-Conduction</td>
<td>3</td>
</tr>
<tr>
<td>M E 769</td>
<td>Combustion Processes</td>
<td>3</td>
</tr>
<tr>
<td>M E 770</td>
<td>Advanced Experimental Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>M E 774</td>
<td>Chem Kinetics of Combust Systems</td>
<td>3</td>
</tr>
<tr>
<td>M E 775</td>
<td>Turbulent Heat and Momentum Transfer</td>
<td>3</td>
</tr>
</tbody>
</table>

During the summer term, students are required to enroll in Independent Study for the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M E 699</td>
<td>Advanced Independent Study (Engine Testing Practicum)</td>
<td>3</td>
</tr>
<tr>
<td>M E 699</td>
<td>Advanced Independent Study (Engine Computational Fluid Dynamics Practicum)</td>
<td>3</td>
</tr>
</tbody>
</table>

1 Two semesters of M E 903 Graduate Seminar are required. These should be taken the first two semester the student is in residence.

Courses Numbered 400 and above in ME which count toward course, independent study, research credit requirements:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M E/B M E 415</td>
<td>Biomechanics of Human Movement</td>
<td>3</td>
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<tr>
<td>M E 417</td>
<td>Transport Phenomena in Polymer Processing</td>
<td>3</td>
</tr>
<tr>
<td>M E 418</td>
<td>Engineering Design with Polymers</td>
<td>3</td>
</tr>
<tr>
<td>M E 419</td>
<td>Fundamentals of Injection Molding</td>
<td>3</td>
</tr>
<tr>
<td>M E 420</td>
<td>Introduction to Polymer Composites Processing</td>
<td>3</td>
</tr>
<tr>
<td>M E/STAT 424</td>
<td>Statistical Experimental Design</td>
<td>3</td>
</tr>
<tr>
<td>M E/CBE/CHM/EMA 425</td>
<td>Undergraduate Rheology Seminar</td>
<td>1</td>
</tr>
<tr>
<td>M E 429</td>
<td>Metal Cutting</td>
<td>3</td>
</tr>
<tr>
<td>M E 437</td>
<td>Advanced Materials Selection</td>
<td>3</td>
</tr>
<tr>
<td>M E/E C E 439</td>
<td>Introduction to Robotics</td>
<td>3</td>
</tr>
<tr>
<td>M E 440</td>
<td>Intermediate Vibrations</td>
<td>3</td>
</tr>
<tr>
<td>M E/BSE/FOOD SCI 441</td>
<td>Rheology of Foods and Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>M E 444</td>
<td>Design Problems in Elasticity</td>
<td>3</td>
</tr>
<tr>
<td>M E 445</td>
<td>Mechatronics in Control &amp; Product Realization</td>
<td>3</td>
</tr>
<tr>
<td>M E 446</td>
<td>Automatic Controls</td>
<td>3</td>
</tr>
<tr>
<td>M E 447</td>
<td>Computer Control of Machines and Processes</td>
<td>3</td>
</tr>
<tr>
<td>M E 448</td>
<td>Mechanical Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>M E 449</td>
<td>Redesign and Prototype Fabrication</td>
<td>3</td>
</tr>
<tr>
<td>M E 450</td>
<td>Design and Dynamics of Vehicles</td>
<td>3</td>
</tr>
<tr>
<td>M E 451</td>
<td>Kinematics and Dynamics of Machine Systems</td>
<td>3</td>
</tr>
<tr>
<td>M E 460</td>
<td>Applied Thermal / Structural Finite Element Analysis</td>
<td>3</td>
</tr>
<tr>
<td>M E 461</td>
<td>Thermal Systems Modeling</td>
<td>3</td>
</tr>
<tr>
<td>M E/M S &amp; E 462</td>
<td>Welding Metallurgy</td>
<td>3</td>
</tr>
<tr>
<td>M E 466</td>
<td>Air Pollution Effects, Measurements and Control</td>
<td>3</td>
</tr>
<tr>
<td>M E 469</td>
<td>Internal Combustion Engines</td>
<td>3</td>
</tr>
<tr>
<td>M E/BSE 475</td>
<td>Engineering Principles of Agricultural Machinery</td>
<td>3</td>
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<tr>
<td>M E/BSE 476</td>
<td>Engineering Principles of Off-Road Vehicles</td>
<td>3</td>
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<tr>
<td>M E 489</td>
<td>Honors in Research</td>
<td>1-3</td>
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<tr>
<td>M E 491</td>
<td>Mechanical Engineering Projects I</td>
<td>1-3</td>
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<tr>
<td>M E 492</td>
<td>Mechanical Engineering Projects II</td>
<td>1-3</td>
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<tr>
<td>M E/CIV ENGR/EMA 508</td>
<td>Composite Materials</td>
<td>3</td>
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<tr>
<td>M E/I SY E 510</td>
<td>Facilities Planning</td>
<td>3</td>
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<tr>
<td>M E/I SY E 512</td>
<td>Inspection, Quality Control and Reliability</td>
<td>3</td>
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<tr>
<td>M E/I SY E 513</td>
<td>Analysis of Capital Investments</td>
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<td>Course Code</td>
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<tr>
<td>M E 514</td>
<td>Additive Manufacturing</td>
<td>3</td>
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<tr>
<td>M E/N E 520</td>
<td>Two-Phase Flow and Heat Transfer</td>
<td>3</td>
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<tr>
<td>M E/CBE 525</td>
<td>Macromolecular Hydrodynamics</td>
<td>3</td>
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<tr>
<td>M E/COMP SCI/EE 532</td>
<td>Matrix Methods in Machine Learning</td>
<td>3</td>
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<tr>
<td>M E 535</td>
<td>Computer-Aided Geometric Design</td>
<td>3</td>
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<tr>
<td>M E/COMP SCI/EE 539</td>
<td>Introduction to Artificial Neural Network and Fuzzy Systems</td>
<td>3</td>
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<tr>
<td>M E/E MA 540</td>
<td>Experimental Vibration and Dynamic System Analysis</td>
<td>3</td>
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<tr>
<td>M E 545</td>
<td>Fluid Power</td>
<td>3</td>
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<tr>
<td>M E 549</td>
<td>Product Design</td>
<td>3</td>
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<tr>
<td>M E/COMP SCI/ISY E 558</td>
<td>Introduction to Computational Geometry</td>
<td>3</td>
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<tr>
<td>M E 561</td>
<td>Intermediate Thermodynamics</td>
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<td>Intermediate Fluid Dynamics</td>
<td>3</td>
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<tr>
<td>M E 564</td>
<td>Heat Transfer</td>
<td>3</td>
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<tr>
<td>M E/N E 565</td>
<td>Power Plant Technology</td>
<td>3</td>
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<tr>
<td>M E/E P 566</td>
<td>Cryogenics</td>
<td>3</td>
</tr>
<tr>
<td>M E/CBE 567</td>
<td>Solar Energy Technology</td>
<td>3</td>
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<tr>
<td>M E 569</td>
<td>Applied Combustion</td>
<td>3</td>
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<tr>
<td>M E/E MA 570</td>
<td>Experimental Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>M E 572</td>
<td>Intermediate Gas Dynamics</td>
<td>3</td>
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<tr>
<td>M E 573</td>
<td>Computational Fluid Dynamics</td>
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<tr>
<td>M E/E C E 577</td>
<td>Automatic Controls Laboratory</td>
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<td>M E 601</td>
<td>Special Topics in Mechanical Engineering</td>
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<tr>
<td>M E/I SY E 641</td>
<td>Design and Analysis of Manufacturing Systems</td>
<td>3</td>
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<td>M E/I SY E 643</td>
<td>Performance Analysis of Manufacturing Systems</td>
<td>3</td>
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<td>M E 699</td>
<td>Advanced Independent Study</td>
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<tr>
<td>M E 702</td>
<td>Graduate Cooperative Education Program</td>
<td>1-2</td>
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<tr>
<td>M E/E MA 706</td>
<td>Plates, Shells and Pressure Vessels</td>
<td>3</td>
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<td>M E/E MA 708</td>
<td>Advanced Composite Materials</td>
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<td>M E 714</td>
<td>Advanced Materials Processing and Manufacturing</td>
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<td>M E 717</td>
<td>Advanced Polymer Processing</td>
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<td>M E 718</td>
<td>Modeling and Simulation in Polymer Processing</td>
<td>3</td>
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<tr>
<td>M E/E MA 722</td>
<td>Introduction to Polymer Rheology</td>
<td>3</td>
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<tr>
<td>M E/E C E 739</td>
<td>Advanced Robotics</td>
<td>3</td>
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<td>M E 740</td>
<td>Advanced Vibrations</td>
<td>3</td>
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<tr>
<td>M E 746</td>
<td>Dynamics of Controlled Systems</td>
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<td>M E 747</td>
<td>Advanced Computer Control of Machines and Processes</td>
<td>3</td>
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<tr>
<td>M E 748</td>
<td>Optimum Design of Mechanical Elements and Systems</td>
<td>3</td>
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<tr>
<td>M E 751</td>
<td>Matrix Methods in the Design and Analysis of Mechanisms</td>
<td>3</td>
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<tr>
<td>M E 753</td>
<td>Friction, Lubrication and Wear</td>
<td>3</td>
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<td>M E 758</td>
<td>Solid Modeling</td>
<td>3</td>
</tr>
<tr>
<td>M E/COMP SCI/ECE MA 759</td>
<td>High Performance Computing for Applications in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>M E 761</td>
<td>Topics in Thermodynamics</td>
<td>3</td>
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<tr>
<td>M E 764</td>
<td>Advanced Heat Transfer I-Conduction</td>
<td>3</td>
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<tr>
<td>M E 765</td>
<td>Advanced Heat Transfer II-Convection</td>
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<td>M E 769</td>
<td>Combustion Processes</td>
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<td>Advanced Experimental Instrumentation</td>
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<td>M E 773</td>
<td>Boundary Layer Theory</td>
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<td>M E 774</td>
<td>Chem Kinetics of Combust Systems</td>
<td>3</td>
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<td>M E 775</td>
<td>Turbulent Heat and Momentum Transfer</td>
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<td>M E/E P 777</td>
<td>Vacuum Technology</td>
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<td>M E 790</td>
<td>Master’s Research and Thesis</td>
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<td>M E 890</td>
<td>PhD Research and Thesis</td>
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<td>M E 903</td>
<td>Graduate Seminar</td>
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<td>M E/CBE/CHEM/E MA 925</td>
<td>Rheology Research Seminar</td>
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<td>M E 964</td>
<td>Special Advanced Topics in Mechanical Engineering</td>
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<tr>
<td>M E 990</td>
<td>Dissertator Research and Thesis</td>
<td>1-9</td>
</tr>
<tr>
<td>M E 999</td>
<td>Advanced Independent Study</td>
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**PROFESSIONAL DEVELOPMENT**

**GRADUATE SCHOOL RESOURCES**

Take advantage of the Graduate School's professional development resources [https://grad.wisc.edu/pd](https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.

**POLICIES**

**GRADUATE SCHOOL POLICIES**

The Graduate School’s Academic Policies and Procedures [https://grad.wisc.edu/acadpolicy](https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

**NAMED OPTION-SPECIFIC POLICIES**

**GRADUATE PROGRAM HANDBOOK**


**PRIOR COURSEWORK**

Graduate Work from Other Institutions

With program approval, students are allowed to count graduate coursework from other institutions (up to 12 credits) toward the minimum graduate degree credit requirement and the minimum graduate coursework (50%) requirement. No credits from other institutions can be counted toward the
minimum graduate residence credit requirement. Coursework earned five or more years prior to admission is not allowed to satisfy requirements.

**UW–Madison Undergraduate**

With advisor approval, up to 7 credits numbered 400 or above may be counted toward the minimum graduate degree credit requirement. These credits may be counted toward the minimum graduate coursework (50%) requirement if they are in courses numbered 700 or above. No credits may be counted toward the minimum graduate residence credit requirement. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

**UW–Madison University Special**

With program approval, and payment of the difference in tuition, students are allowed to count up to 15 credits of coursework numbered 400 or above taken as a UW–Madison Special student toward the minimum graduate residence credit requirement and the minimum graduate degree credit requirement. These credits may be counted toward the minimum graduate coursework (50%) requirement if they are in courses numbered 700 or above. Coursework earned five or more years prior to admission is not allowed to satisfy requirements.

**PROBATION**

The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

1. Good standing (progressing according to standards; any funding guarantee remains in place).
2. Probation (not progressing according to standards but permitted to enroll; loss of funding guarantee; specific plan with dates and deadlines in place in regard to removal of probationary status).
3. Unsatisfactory progress (not progressing according to standards; not permitted to enroll, dismissal, leave of absence or change of advisor or program).

A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full time enrollment (or 12 credits of enrollment if enrolled part-time), this will be deemed unsatisfactory progress and the student may be dismissed from the program or allowed to continue for one additional semester based on advisor appeal to the Graduate School.

**ADVISOR / COMMITTEE**

All students are required to obtain a mechanical engineering faculty advisor who assists them in planning a course sequence that meets degree requirements and who will discuss career objectives with the students.

**CREDITS PER TERM ALLOWED**

15 credits

**TIME CONSTRAINTS**

Master’s degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

**OTHER**

Students enrolled in this program are not permitted to accept teaching assistantships, project assistantships, research assistantships or other appointments that would result in a tuition waiver. Students in this program cannot enroll in other graduate programs nor take courses outside the prescribed curriculum.

**PEOPLE**

**Faculty**: Professors Ghandhi (chair), Lorenz, Nellis, Osswald, Pfotenhauer, Rowlands, Rutland, Sanders, Shapiro, Thelen, Turng; Associate Professors Krupenkin, Negrut, Pfefferkorn, Ploeg, Qian, Rothamer, Suresh, Trujillo, Zinn; Assistant Professors Adamczyk, Eriten, Henak, Kokjohn, Miller, Min, Roldan-Alzate, Rudolph; Faculty affiliates Allen, Bonazza, Holloway, Luzzio, Reindl, Scarlat, Schauer