MECHANICAL ENGINEERING: RESEARCH, M.S.

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

The Department of Mechanical Engineering offers a Master of Science (M.S.) Mechanical Engineering degree with a named option in Research. Students in this program will select one of two tracks: either the Thesis track or the Independent Study track.

- M.S. Mechanical Engineering: Research (2 tracks)
  - Thesis
  - Independent Study

The M.S. Mechanical Engineering: Research degree program takes approximately two years to complete. The thesis track has a significant research component giving students valuable hands-on research experience with mentoring by faculty in the Department of Mechanical Engineering. The independent study track has a stronger focus on coursework but also requires at least 3 credits of independent study mentored by faculty in the Department of Mechanical Engineering.

All students are mentored by the world-class faculty in the mechanical engineering department at UW–Madison. For a list of mechanical engineering faculty along with faculty research interests, please visit our faculty directory (https://directory.engr.wisc.edu/display.php/faculty?page=me&search=faculty). For more information on research areas see our page on research in Mechanical Engineering (https://www.engr.wisc.edu/department/mechanical-engineering/research-in-mechanical-engineering).

ADMISSIONS

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).

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>October 1</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>Required.</td>
</tr>
<tr>
<td>English Proficiency Test</td>
<td>Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (<a href="https://grad.wisc.edu/apply/requirements/english-proficiency">https://grad.wisc.edu/apply/requirements/english-proficiency</a>).</td>
</tr>
<tr>
<td>Other Test(s) (e.g., GMAT, MCAT)</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Letters of Recommendation Required

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. Applicants are strongly encouraged to identify a faculty (p. 4) advisor during the application process. For more information on admission requirements see the department’s MS degree website (https://www.engr.wisc.edu/department/mechanical-engineering/academics/masters-degree-mechanical-engineering-2-2).

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

There are three mechanisms for Graduate Student funding through the university for M.S. Mechanical Engineering: Research students:

1. Fellowships
2. Graduate assistantships: project assistantships, teaching assistantships, and research assistantships
3. Traineeships

Funding is awarded based on the qualifications of the student, the number of applicants, the amount of available funding, the number of continuing students receiving support, and the degree program a student is enrolled in. Fellowship and research assistantship funding is only considered for thesis-based M.S. students. You can apply for funding for research assistantships by contacting individual faculty members directly. Please check our website (http://directory.engr.wisc.edu/me/faculty) to look for faculty (only those listed with titles of assistant professor, associate professor, or professor can serve as graduate student advisors). Search for faculty who have research interests that align closely with your own by viewing faculty directory entries, visiting the faculty’s website (linked from the directory page), and reviewing publications by the faculty member. Once you have identified faculty with interests close to your own, you are encouraged to contact them by email to inquire regarding available research assistant positions. The admissions office does not know if a particular professor has research assistant positions available.

Students who apply to the department will be automatically considered for fellowship opportunities within the department. For information on applying for teaching assistant positions and for other information on funding please see the department website (https://www.engr.wisc.edu/department/mechanical-engineering/contact/forms).
More information on graduate student funding is available from the Graduate School’s Office of Fellowships and Funding Resources (http://grad.wisc.edu/studentfunding/currentstudents).

**ADDITIONAL RESOURCES**

**FEDERAL LOANS**
Students who are U.S. citizens or permanent residents may be 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).

**INTERNATIONAL STUDENT SERVICES FUNDING AND SCHOLARSHIPS**
For information on International Student Funding and Scholarships visit the ISS website (https://iss.wisc.edu/students/new-students/funding-scholarships).

**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>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>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**

**Requirements Detail**

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Credit Requirement</td>
<td>30 credits</td>
</tr>
<tr>
<td>Minimum Thesis track Credits</td>
<td>21 credits</td>
</tr>
<tr>
<td>Minimum Independent Study track Credits</td>
<td>18 credits</td>
</tr>
<tr>
<td>Minimum Graduate Coursework Credits</td>
<td>At least 50% of credits applied toward the graduate degree credit requirement must be completed in graduate-level coursework.</td>
</tr>
<tr>
<td>Overall Graduate GPA Requirement</td>
<td>3.00 GPA required</td>
</tr>
<tr>
<td>Other Grade Requirements</td>
<td>The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.</td>
</tr>
<tr>
<td>Assessments and Examinations</td>
<td>The M.S. Mechanical Engineering: Research, thesis track requires the student pass a formal thesis defense. The independent study track does not require a thesis.</td>
</tr>
<tr>
<td>Language Requirements</td>
<td>No language requirements</td>
</tr>
</tbody>
</table>

**REQUIRED COURSES**

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

**Thesis Track Required Courses:**
A minimum of 18 formal course credits (minimum of 9 formal course credits in ME taken at UW–Madison); one of these courses must be numbered 700 or higher, and a minimum of 9 thesis credits (M E 790 Master’s Research and Thesis).

**Independent Study Track Required Courses:**
A minimum of 24 formal course credits (minimum of 15 formal course credits in ME taken at UW–Madison); one of these courses must be numbered 700 or higher, and a minimum of 3 independent study credits (M E 699 Advanced Independent Study).

**Courses numbered 400 and above in ME that may 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>
</tr>
<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/CHEM/ E M A 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>
</tbody>
</table>
M E 437  Advanced Materials Selection 3
M E 440  Intermediate Vibrations 3
M E/BSE/FOOD SCI 441  Rheology of Foods and Biomaterials 3
M E 444  Design Problems in Elasticity 3
M E 445  Mechatronics in Control & Product Realization 3
M E 446  Automatic Controls 3
M E 447  Computer Control of Machines and Processes 3
M E 448  Mechanical Systems Analysis 3
M E 449  Redesign and Prototype Fabrication 3
M E 450  Design and Dynamics of Vehicles 3
M E 451  Kinematics and Dynamics of Machine Systems 3
M E 460  Applied Thermal / Structural Finite Element Analysis 3
M E 461  Thermal Systems Modeling 3
M E/M S & E 462  Welding Metallurgy 3
M E 466  Air Pollution Effects, Measurements and Control 3
M E 469  Internal Combustion Engines 3
M E/BSE 475  Engineering Principles of Agricultural Machinery 3
M E/BSE 476  Engineering Principles of Off-Road Vehicles 3
M E 489  Honors in Research 1-3
M E 491  Mechanical Engineering Projects I 1-3
M E 492  Mechanical Engineering Projects II 1-3
M E/CIV ENGR/EMA 508  Composite Materials 3
M E/I SY E 510  Facilities Planning 3
M E/I SY E 512  Inspection, Quality Control and Reliability 3
M E/I SY E 513  Analysis of Capital Investments 3
M E 514  Additive Manufacturing 3
M E/N E 520  Two-Phase Flow and Heat Transfer 3
M E/CBE 525  Macromolecular Hydrodynamics 3
M E/COMP SCI/ECE 532  Matrix Methods in Machine Learning 3
M E 535  Computer-Aided Geometric Design 3
M E/COMP SCI/ECE 539  Introduction to Artificial Neural Network and Fuzzy Systems 3
M E/E M A 540  Experimental Vibration and Dynamic System Analysis 3
M E 545  Fluid Power 3
M E 549  Product Design 3
M E/COMP SCI/ISY E 558  Introduction to Computational Geometry 3
M E 561  Intermediate Thermodynamics 3
M E 563  Intermediate Fluid Dynamics 3
M E 564  Heat Transfer 3
M E/N E 565  Power Plant Technology 3
M E/E P 566  Cryogenics 3
M E/CBE 567  Solar Energy Technology 3
M E 569  Applied Combustion 3
M E/E M A 570  Experimental Mechanics 3
M E 572  Intermediate Gas Dynamics 3
M E 573  Computational Fluid Dynamics 3
M E/E C E 577  Automatic Controls Dynamic 4
M E 601  Special Topics in Mechanical Engineering 1-3
M E/I SY E 641  Design and Analysis of Manufacturing Systems 3
M E/I SY E 643  Performance Analysis of Manufacturing Systems 3
M E 699  Advanced Independent Study 1-3
M E 702  Graduate Cooperative Education Program 1-2
M E/E M A 706  Plates, Shells and Pressure Vessels 3
M E/E M A 708  Advanced Composite Materials 3
M E 714  Advanced Materials Processing and Manufacturing 3
M E 717  Advanced Polymer Processing 3
M E 718  Modeling and Simulation in Polymer Processing 3
M E/E M A 722  Introduction to Polymer Rheology 3
M E/E C E 739  Advanced Robotics 3
M E 740  Advanced Vibrations 3
M E 746  Dynamics of Controlled Systems 3
M E 747  Advanced Computer Control of Machines and Processes 3
M E 748  Optimum Design of Mechanical Elements and Systems 3
M E 751  Advanced Computational Dynamics 3
M E 753  Friction, Lubrication and Wear 3
M E 758  Solid Modeling 3
M E/COMP SCI/ECE/E M A/E P 759  High Performance Computing for Applications in Engineering 3
M E 761  Topics in Thermodynamics 3
M E 764  Advanced Heat Transfer I- Conduction 3
M E 765  Advanced Heat Transfer II- Convection 3
M E 769  Combustion Processes 3
M E 770  Advanced Experimental Instrumentation 3
M E 774  Chem Kinetics of Combust Systems 3
M E 775  Turbulent Heat and Momentum Transfer 3
M E/E P 777  Vacuum Technology 3
M E 790  Master’s Research and Thesis 1-9
M E 890  PhD Research and Thesis 1-9
M E 903  Graduate Seminar 0
GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (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

The Mechanical Engineering Graduate Program Handbook (https://www.engr.wisc.edu/me-grad-handbook) is the repository for all of the program's policies and requirements.

PRIOR COURSEWORK

Graduate Work from Other Institutions

With program approval, students are allowed to count previously earned graduate coursework from other institutions: up to 9 credits of graduate coursework for the thesis track or up to 12 credits of graduate coursework for the independent study track. Approved credits will be allowed to count toward the minimum graduate degree credit requirement and the minimum graduate coursework requirement, but will not count 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 Undergraduate

With program approval, no more than 7 credits of coursework numbered 400 or higher from a UW–Madison undergraduate degree are allowed to count only toward the minimum graduate degree 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, students are allowed to count up to 15 credits of coursework numbered 300 or above taken as a UW–Madison special student toward the Minimum Graduate Residence Credit Requirement, and the Minimum Graduate Degree Credit Requirement; those courses numbered 500 or above may be applied toward the Minimum Graduate Coursework (50%) Requirement.

Coursework earned five or more years prior to admission to a master's degree 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.

ADVISOR / COMMITTEE

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

An M.S. thesis committee must include the student's mechanical engineering faculty advisor and at least two other members: one other graduate faculty or former graduate faculty up to one year after resignation or retirement, and one of the following: a third graduate faculty member, a retired faculty member with emeritus status, or a UW–Madison research scientist with principal investigator status who has been approved by the M E executive committee.

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

n/a

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES

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

PEOPLE

Faculty (who may serve as graduate advisor):

Professors: Ghandhi (chair), Negrut, Nellis, Osswald, Pfotenhauer, Qian, Rutland, Sanders, Suresh, Shapiro, Thelen, Turng

Associate Professors: Eriten, C. Franck, Krupenkin, Miller, Pfefferkorn, Rothamer, Trujillo, Zinn

Assistant Professors: Adamczyk, M. Anderson, Henak, Kokjohn, Min, Pan, Roldan, Rudraraju, Rudykh

Faculty Affiliates: M. Allen, Bonazza, J. Franck, Holloway, Notbohm, Reindl, Sarlioglu, Scarlat, Schauer, Serverson, Shinners, Thevamaran, Witzenburg
To see all ME Faculty please visit the directory here. (https://directory.engr.wisc.edu/display.php/faculty?page=me&search=faculty)