MECHANICAL ENGINEERING, PH.D.

The doctoral program in the Department of Mechanical Engineering prepares students to perform independent research in areas of faculty expertise within the department. The Ph.D. program in Mechanical Engineering is designed to train outstanding students for advanced work in industry, national labs, and academia through a combination of coursework and hands on research.

Ph.D. students are mentored by faculty to become world-class researchers. The Department of Mechanical Engineering has a long history of excellence in graduate education. The department is consistently ranked in the top 20 in the United States for graduate programs in mechanical engineering. The department offers research opportunities in a large number of established and emerging research specializations. Broad research themes within the department include: biomechanics, computational engineering, energy, manufacturing, and mechanics and controls. Excellent research facilities are available for specialized research within these broad areas for studies in: biomechanics, combustion, computational design, controls, cryogenics, dynamics and vibrations, fluid dynamics, fluid power, geometric modeling and prototyping, heat and mass transfer, internal combustion engines, laser diagnostics, manufacturing processes, mechanics, mechatronics, polymer and composites processing, powertrain control, robotics, solar energy, and more.

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

Please consult the table below for key information about this degree program’s admissions requirements. The program may have more detailed admissions requirements, which can be found below the table on the program’s website.

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

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
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<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 15</td>
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<tr>
<td>Spring Deadline</td>
<td>October 1</td>
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<tr>
<td>Summer Deadline</td>
<td>December 15</td>
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<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>Required.</td>
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English Proficiency Test

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 (https://grad.wisc.edu/apply/requirements/#english-proficiency).

Other Test(s) (e.g., GMAT, MCAT) n/a

Letters of Recommendation Required

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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 PhD degree website (https://www.engr.wisc.edu/department/mechanical-engineering/academics/master-phd-degrees-mechanical-engineering).

APPLICATION DEADLINE: OCTOBER 1

Applications are accepted for admission for the spring term.

APPLICATION DEADLINE: DECEMBER 15

Applications are accepted for admission for summer term and fall term.

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 Mechanical Engineering Ph.D. 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, and the number of continuing students receiving support. 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.

See the ME forms website (https://www.engr.wisc.edu/department/mechanical-engineering/contact/forms) for application forms for the positions of teaching assistant and grader. Please complete and return to the ME Department Office (3107 Mechanical Engineering Building).

### 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.

### MAJOR REQUIREMENTS

#### MODE OF INSTRUCTION

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<th>Mode of Instruction Definitions</th>
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<tr>
<td><strong>Face to Face</strong></td>
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<td><strong>Evening/Weekend</strong></td>
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<td><strong>Online</strong></td>
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<td><strong>Hybrid</strong></td>
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<td><strong>Accelerated</strong></td>
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<tr>
<th>Yes</th>
<th>No</th>
<th>No</th>
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Mode of Instruction Definitions:

- **Face to Face**: These programs are offered in an in person 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.

- **Evening/Weekend**: 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.

- **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.

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<th>Curricular Requirements</th>
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<tr>
<td><strong>Major</strong></td>
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<td><strong>Residence</strong></td>
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<td><strong>Credit Requirement</strong></td>
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<tr>
<th>Minimum</th>
<th>60 credits</th>
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<tr>
<td>Residence</td>
<td>32 credits</td>
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<td>Credit Requirement</td>
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<tr>
<th>Curricular Requirements</th>
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<tr>
<td><strong>Graduate GPA Requirement</strong></td>
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<td><strong>Other Grade Requirements</strong></td>
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<tr>
<td><strong>Assessments and Examinations</strong></td>
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<td><strong>Language Requirements</strong></td>
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<tr>
<td><strong>Doctoral</strong></td>
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<td><strong>Minor/Breadth</strong></td>
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<tr>
<td><strong>No language requirements.</strong></td>
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<th>Required Courses</th>
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<td><strong>Title</strong></td>
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<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>M E 601</td>
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**PRIOR COURSEWORK**

- M E 964  Special Advanced Topics in Mechanical Engineering (Topic "Computational Mathematics with Applications in Engineering")
- E M A/E P 547  Engineering Analysis I
- E M A/E P 548  Engineering Analysis II
- MATH 321  Applied Mathematical Analysis
- MATH 322  Applied Mathematical Analysis

400-level and above Math Department courses

Graduate "transfer credits" equivalent to the above

Acceptable courses for the remainder of the required 42 formal course credits (this total includes the courses taken for the PhD minor requirement) are those numbered 400 and above. Up to two 300-level courses in engineering, math, or the sciences taken at UW-Madison can also be used towards the formal course credit requirement. The 300-level courses can be from Mechanical Engineering if approved by the student’s advisor and the ME graduate committee.

Minimum of 18 thesis credits (M E 790 Master’s Research and Thesis, M E 890 PhD Research and Thesis, M E 990 Dissertator Research and Thesis) are required with an overall grade of S.

**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.

**MAJOR-SPECIFIC POLICIES**

**GRADUATE PROGRAM HANDBOOK**

The Graduate Program Handbook (https://www.engr.wisc.edu/app/uploads/2017/01/ME-Grad-handbook-Update-August-2017-Final.pdf) 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 up to 24 credits of graduate coursework from other institutions 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 ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

**UW–Madison Undergraduate**

Up to 7 credits numbered 400 or above can be counted toward the minimum graduate degree credit requirement. These credits may be counted toward the minimum graduate coursework (50%) requirement if they are from courses numbered 700 or above. No credits can be counted toward the minimum graduate residence credit requirement. Coursework earned ten years or more prior to admission to a doctoral 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 ten years or more prior to admission to a doctoral 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.

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 3.25 will result in the student being placed on academic probation. If a semester GPA of 3.25 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 department.

**ADVISOR / COMMITTEE**

All students must have a mechanical engineering faculty advisor who assists them in planning a course sequence that meets degree requirements, who helps guide them and mentor them in their research, and who will discuss career objectives with the student. A qualifying exam committee must include the student’s mechanical engineering faculty advisor and two other mechanical engineering faculty members. A preliminary committee must include the student’s mechanical engineering faculty advisor and at least three other members who will also serve on the final oral defense committee. A final oral defense committee must include the student's mechanical engineering faculty advisor and at least four other members, three other graduate faculty or former graduate faculty up to one year after resignation or retirement, and one of the following: another graduate faculty, a retired faculty member with emeritus status, or a UW–Madison research scientist with principal investigator status who has been approved by the ME executive committee. At least one faculty member on the committee must be from outside of the ME department.
CREDITS PER TERM ALLOWED
15 credits

TIME CONSTRAINTS
Students entering the PhD program without an MS or equivalent degree must take the qualifying exam no later than the second time it is offered after completion of 30 graduate credits regardless of whether the student chooses to complete an MS degree. Students completing 30 graduate credits in the fall semester must take the qualifying exam no later than the following August, and students completing 30 graduate credits in the spring semester or summer sessions must take the qualifying exam no later than the following January.

Students entering the PhD program immediately after earning an MS degree in Mechanical Engineering from UW–Madison must take the qualifying exam no later than the second time it is offered after completing their MS degree. Students graduating in the fall semester must take the qualifying exam no later than the following August, and students graduating in the spring or summer semesters must take the qualifying exam no later than the following January.

Students entering the PhD program with an MS degree either from another department or institution, or who are returning to UW-Madison with an MS degree after an absence, must take the qualifying exam before the start of their third semester, allowing students two full semesters (fall/spring) of classes before taking the exam. Students entering in the program in the summer session or fall semester need to take the qualifying exam no later than the following August, and students entering in the program in the spring semester need to take the qualifying exam no later than the following January.

Ph.D. students must complete their preliminary exam within five years of passing their qualifying exam.

The preliminary exam must be passed at least 9 months prior to the thesis defense.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination to be admitted to candidacy a second time.

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.

LEARNING OUTCOMES
1. Demonstrate an extraordinary, deep understanding of mathematical, scientific, and engineering principles in the field.
2. Demonstrate an ability to formulate, analyze, and independently solve advanced engineering problems.
3. Apply the relevant scientific and technological advancements, techniques, and engineering tools to address these problems.
4. Recognize and apply principles of ethical and professional conduct.
5. Demonstrate an ability to synthesize knowledge from a subset of the biological, physical, and/or social sciences to help frame problems critical to the future of their discipline.
6. Demonstrate an ability to conduct original research and communicate it to their peers.

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)