

# MECHANICAL ENGINEERING: MODELING AND SIMULATION IN MECHANICAL ENGINEERING, MS

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

The Department of Mechanical Engineering MS named option Modeling and Simulation in Mechanical Engineering is an accelerated, coursework-only, on-campus degree program (completed in 12 months) with a stated objective of endowing the student with computational engineering literacy and a strong modeling and simulation skillset. This degree program prepares individuals who are interested in mastering the use of computers for the end goal of solving challenging engineering problems via simulation.

## ADMISSIONS

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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 or 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 (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 15
Spring Deadline	September 1
Summer Deadline	December 15
GRE (Graduate Record Examinations)	Not required.*
English Proficiency Test	Every applicant whose native language is not English, or whose undergraduate instruction was not exclusively in English, must provide an English proficiency test score earned within two years of the anticipated term of enrollment. Refer to the Graduate School: Minimum Requirements for Admission policy: <a href="https://policy.wisc.edu/library/UW-1241">https://policy.wisc.edu/library/UW-1241</a> ( <a href="https://policy.wisc.edu/library/UW-1241/">https://policy.wisc.edu/library/UW-1241/</a> ).
Other Test(s) (e.g., GMAT, MCAT)	n/a

Letters of Recommendation Required 3\*\*

\* Submitted scores will not be used in admission decisions.

\*\* Applicants earning a BS degree from UW-Madison are not required to obtain any letters of recommendations. Within the Graduate School application, in the letters of recommendation section, you will need to enter at least one contact.

### APPLICATION REQUIREMENTS AND PROCESS

All applicants must satisfy requirements that are set forth by the Graduate School (<https://grad.wisc.edu/apply/requirements/>). Admitted applicants without Mechanical Engineering Bachelor of Science degrees may be required to complete one or more courses in addition to degree requirements to satisfy any deficiencies (this requirement cannot be determined prior to admission).

#### Degree

Most applicants have a Bachelor of Science in Mechanical Engineering. Applicants with a Bachelor of Science in other engineering or physical and natural science disciplines will be considered for admission. International applicants must have a degree comparable to a regionally accredited US bachelor's degree.

#### GPA

The Department of Mechanical Engineering prefers a 3.2/4.0 GPA. The minimum GPA to be reviewed by the admission committee is 3.0/4.0.

### APPLICATION MATERIALS

Each application must include the following:

- Graduate School Application (<https://grad.wisc.edu/apply/>)
- Academic transcripts
- Statement of purpose
- Resume/CV
- Three letters of recommendation (**see below for exception**)
- English proficiency score (**if required**)
- Application fee

#### Academic Transcript

Within the online application, upload undergraduate transcript(s) and, if applicable, the previous graduate transcript. Unofficial copies of transcripts are required for review, but official copies are required for admitted applicants. Please do not send transcripts or any other application materials to the Graduate School or the Department of Mechanical Engineering unless requested. Please review the requirements set by the Graduate School (<https://grad.wisc.edu/apply/requirements/>) for additional information about degrees/transcripts.

#### Statement of Purpose

In this document, applicants should explain why they want to pursue further education in Mechanical Engineering (see the Graduate School for more advice on how to structure a personal statement (<https://grad.wisc.edu/apply/prepare/>)).

#### Resume

Upload your resume in your application.

### Three Letters of Recommendation

These letters are required from people who can accurately judge the applicant's academic and/or work performance. Letters of recommendation are submitted electronically to graduate programs through the online application. See the Graduate School for FAQs (<https://grad.wisc.edu/apply/>) regarding letters of recommendation. Letters of recommendation are due by the deadline listed above.

Applicants earning a BS degree from UW-Madison are not required to obtain any letters of recommendation. Within the Graduate School application, in the letters of recommendation section, you will need to enter at least one contact.

### English Proficiency Score

Every applicant whose native language is not English, or whose undergraduate instruction was not in English, must provide an English proficiency test score. The UW-Madison Graduate School accepts TOEFL, IELTS, or Duolingo English Test scores. Your score will not be accepted if it is more than two years old from the start of your admission term. Country of citizenship does not exempt applicants from this requirement. Language of instruction at the college or university level and how recent the language instruction was taken are the determining factors in meeting this requirement.

International degree-seeking applicants must prove English proficiency using the Graduate School's requirements (<https://grad.wisc.edu/apply/requirements/>).

### Application Fee

Submission must be accompanied by the one-time application fee. See the Graduate School for FAQs (<https://grad.wisc.edu/apply/>) for information on fees.

Fee grants are only available through the conditions outlined here by the Graduate School (<https://grad.wisc.edu/apply/fee-grant/>). The Department of Mechanical Engineering is unable to offer fee grants for applicants to this program.

### REENTRY ADMISSIONS

If previously enrolled as a graduate student in the Department of Mechanical Engineering, have not earned the degree, but have had a break in enrollment for a minimum of a fall or spring term, applicants must re-apply to resume studies. Please review the Graduate School requirements for previously enrolled students (<https://policy.wisc.edu/library/UW-1230/>). The previous faculty advisor (or another Mechanical Engineering faculty advisor) must be willing to supply advising support and should e-mail the Mechanical Engineering Graduate Student Services Coordinator regarding next steps in the process.

If previously enrolled in a UW-Madison graduate degree, completed that degree, have had a break in enrollment since earning the degree and would now like to apply for another UW-Madison program; applicants must submit a new student application through the UW-Madison Graduate School online application. For Mechanical Engineering graduate programs, applicants must follow the entire application process as described above.

### CURRENTLY ENROLLED GRADUATE STUDENT ADMISSIONS

Applicants currently enrolled as a graduate student at UW-Madison, whether in Mechanical Engineering or a non-Mechanical Engineering graduate program, wishing to apply to this degree program should contact the Mechanical Engineering Graduate Admissions Team to inquire about

the process and deadlines several months in advance of the anticipated enrollment term. Current students may apply to change or add programs for any term (fall, spring, or summer).

### QUESTIONS

If you have questions, contact [megradadmission@engr.wisc.edu](mailto:megradadmission@engr.wisc.edu).

## FUNDING

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#### 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 restrictions related to funding.

#### PROGRAM RESOURCES

Students enrolled in this program are not eligible to receive tuition remission from graduate assistantship appointments at this institution.

#### ADDITIONAL RESOURCES

##### Student 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. Private loans may also be available. Learn more about financial aid at the Financial Aid website (<https://financialaid.wisc.edu/>).

##### International Student Services Funding and Scholarships

For information on International Student Funding and Scholarships, visit the International Student Services 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/#policiesandrequirements>), 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	Yes

#### 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	18 credits
Minimum Graduate Coursework Requirement	15 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: <a href="https://policy.wisc.edu/library/UW-1244">https://policy.wisc.edu/library/UW-1244</a> ( <a href="https://policy.wisc.edu/library/UW-1244/">https://policy.wisc.edu/library/UW-1244/</a> ).
Overall Graduate GPA Requirement	3.00 GPA required. Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: <a href="https://policy.wisc.edu/library/UW-1203">https://policy.wisc.edu/library/UW-1203</a> ( <a href="https://policy.wisc.edu/library/UW-1203/">https://policy.wisc.edu/library/UW-1203/</a> ).
Other Grade Requirements	Students must earn a C or above in all formal coursework.
Assessments and Examinations	None.
Language Requirements	No language requirements.
	Students may not have more than two incompletes on their record at any one time.

## REQUIRED COURSES

A minimum of 24 formal course credits\* are required (minimum of 15 formal credits in Mechanical Engineering (M E ([http://guide.wisc.edu/courses/m\\_e/](http://guide.wisc.edu/courses/m_e/))) taken at UW-Madison). Requirements in the course list below must be completed as indicated.

\*Formal credits are any course offering that is not a seminar course, thesis research course, or independent study course.

Acceptable courses are numbered 400 and above.

No thesis/research credits are permitted. Up to 6 credits of independent study are permitted but not required. Up to 3 credits of seminar are permitted.

Code	Title	Credits
M E 903	Graduate Seminar (Two semesters are required and must be taken in the first two semesters.)	0

A minimum of 6 courses (18 credits total) must be taken from the courses listed:

M E 440	Intermediate Vibrations
M E/E C E 441	Kinematics, Dynamics, and Control of Robotic Manipulators
M E 451	Kinematics and Dynamics of Machine Systems
M E 459	Computing Concepts for Applications in Engineering
M E 460	Applied Thermal / Structural Finite Element Analysis
M E 468	Computer Modeling and Simulation of Autonomous Vehicles and Robots
M E 531	Digital Design and Manufacturing
M E/B M E 516	Finite Elements for Biological and Other Soft Materials
M E/COMP SCI/ E C E 532	Matrix Methods in Machine Learning
M E 535	Computer-Aided Geometric Design
M E 548	Introduction to Design Optimization
M E/COMP SCI/ I SY E 558	Introduction to Computational Geometry
M E 564	Heat Transfer
M E 573	Computational Fluid Dynamics
M E 601	Special Topics in Mechanical Engineering (Applied & Computational Math w/Engineering Apps)
M E 748	Optimum Design of Mechanical Elements and Systems
M E 751	Advanced Computational Dynamics
M E/COMP SCI/ E C E/E M A/ E P 759	High Performance Computing for Applications in Engineering
M E 764	Advanced Heat Transfer I- Conduction
M E 964	Special Advanced Topics in Mechanical Engineering (Topic: "Sci Computing for Apps in Eng")
E M A 521	Aerodynamics
E M A 522	Aerodynamics Lab

### Advisor Approval of Study Plan

The faculty advisor must always approve the courses a student takes in the MS program. Students should schedule an appointment with their advisor when selecting their courses. During the final semester, the faculty advisor will review the courses taken again and if approved, sign the warrant request form.

### Other Policy

Students in this program may not take courses outside the prescribed curriculum without faculty advisor and program director approval. Students in this program cannot enroll concurrently in other undergraduate or graduate degree programs.

## POLICIES

### 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

#### PRIOR COURSEWORK

##### Graduate Credits Earned at Other Institutions

With faculty advisor approval, students may transfer up to 12 credits of graduate coursework from other institutions toward the minimum 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 or more years prior to admission is not allowed to satisfy requirements.

##### Undergraduate Credits Earned at Other Institutions or UW-Madison

- **Undergraduate credits from UW-Madison:** With faculty advisor approval, students may transfer a maximum of 7 credits from a UW-Madison undergraduate degree toward the minimum credit requirement. Only coursework that is applicable to the degree curriculum is eligible. These credits are not allowed to count toward the minimum graduate coursework (50%) requirement unless taken in courses numbered 700 or above. No credits can be counted toward the minimum graduate residence credit requirement. Coursework earned ten or more years prior to admission is not allowed to satisfy requirements.
- **Undergraduate credits from other institutions:** Undergraduate credits from other institutions are not permitted to be used in this degree program.

##### Credits Earned as a Professional Student at UW-Madison (Law, Medicine, Pharmacy, and Veterinary careers)

Refer to the Graduate School: Transfer Credits for Prior Coursework (<https://policy.wisc.edu/library/UW-1216/>) policy.

##### Credits Earned as a University Special Student at UW-Madison

With faculty advisor approval, students may transfer up to 15 credits of coursework taken as a UW-Madison Special student. Only coursework that is applicable to the degree curriculum is eligible. UW-Madison coursework taken as a University Special student would not be allowed to count toward the minimum graduate coursework (50%) requirement unless taken in courses numbered 700 or above or are taken to meet the requirements of a capstone certificate and has the "Grad 50%" attribute. Coursework earned ten or more years prior to admission is not allowed to satisfy requirements.

### PROBATION

The Department of Mechanical Engineering graduate programs satisfactory academic progress policy may be reviewed in the Graduate Handbook (see Contact box for link).

### ADVISOR / COMMITTEE

All students will be assigned 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.

### CREDITS PER TERM ALLOWED

15 credits

### TIME LIMITS

Refer to the Graduate School: Time Limits (<https://policy.wisc.edu/library/UW-1221/>) policy.

### GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
  - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Dean of Students Office (<https://doso.students.wisc.edu/>) (for all students to seek grievance assistance and support)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employeeabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

### Mechanical Engineering Grievance Procedures

If a student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve the grievance. Students' concerns about unfair treatment are best handled directly with the person responsible for the objectionable action. If the student is uncomfortable making direct contact with the individual(s) involved, they should contact the advisor or the person in charge of the unit where the action occurred (program or department chair, section chair, lab manager, etc.). Many departments and schools/colleges have established

specific procedures for handling such situations; check their web pages and published handbooks for information. If such procedures exist at the local level, these should be investigated first. For more information see the Graduate School Academic Policies & Procedures: <https://grad.wisc.edu/acadpolicy/?policy=grievancesandappeals>. The Assistant Dean for Graduate Affairs ([enr-dean-graduateaffairs@enr.wisc.edu](mailto:enr-dean-graduateaffairs@enr.wisc.edu)) provides overall leadership for graduate education in the College of Engineering (CoE), and is a point of contact for graduate students who have concerns about education, mentoring, research, or other difficulties.

1. The student is encouraged to speak first with the person toward whom the grievance is directed to see if a situation can be resolved at this level.
2. Should a satisfactory resolution not be achieved, the student should contact the Associate Chair for Graduate Studies or the John Bollinger Chair of Mechanical Engineering (<https://engineering.wisc.edu/departments/mechanical-engineering/people/>) to discuss the grievance. The Associate Chair for Graduate Studies or Department Chair will facilitate problem resolution through informal channels and facilitate any complaints or issues of students. The first attempt is to help students informally address the grievance prior to any formal complaint. Students are also encouraged to talk with their faculty advisors regarding concerns or difficulties if necessary. University resources for sexual harassment, discrimination, disability accommodations, and other related concerns can be found on the UW Office of Compliance website (<https://compliance.wisc.edu/>). Other campus resources can be found above.
3. If the issue is not resolved to the student's satisfaction the student can submit the grievance to the Associate Chair for Graduate Studies in writing, within 60 calendar days of the alleged unfair treatment.
4. On receipt of a written complaint, a faculty committee will be convened by the Associate Chair for Graduate Studies to manage the grievance. The faculty committee will obtain a written response from the person toward whom the complaint is directed. This response will be shared with the person filing the grievance.
5. The faculty committee will determine a decision regarding the grievance. The Associate Chair for Graduate Studies will report on the action taken by the committee in writing to both the student and the party toward whom the complaint was directed within 15 working days from the date the complaint was received.
6. At this point, if either party (the student or the person toward whom the grievance is directed) is unsatisfied with the decision of the faculty committee, the party may file a written appeal. Either party has 10 working days to file a written appeal to the School/College.
7. Documentation of the grievance will be stored for at least 7 years. Significant grievances that set a precedent will be stored indefinitely.

The Graduate School has procedures for students wishing to appeal a grievance decision made at the school/college level. These policies are described in the Graduate School's Academic Policies & Procedures: <https://grad.wisc.edu/acadpolicy/?policy=grievancesandappeals>.

## OTHER

Students are strongly discouraged to pursue positions as Project Assistants, Teaching Assistants or Research Assistants during their time in this program, as the rigor and accelerated nature of this program may not accommodate those work time commitments. Students in this program will

not receive the tuition remission that is typically part of the compensation package for a graduate assistantship.

## PROFESSIONAL DEVELOPMENT

### 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

### PEOPLE PROFESSORS

Darryl Thelen (Chair)  
Peter Adamczyk  
Mark Anderson  
Riccardo Bonazza

Curt Bronkhorst

Wendy Crone  
Christian Franck  
Jaal Ghandhi  
Sage Kokjohn  
Dan Negrut  
Gregory F. Nellis  
Tim Osswald  
Frank Pfefferkorn  
Xiaoping Qian  
Douglas Reindl  
David Rothamer  
Scott T. Sanders  
Krishnan Suresh  
Mario F. Trujillo  
Lih-sheng Turng  
Fabian Waleffe

### ASSOCIATE PROFESSORS

Lianyi Chen  
Melih Eriten  
Katherine Fu  
Tom N. Krupenkin  
Ying Li  
Franklin Miller  
Sangkee Min  
Wenxiao Pan  
James Pikul  
Pavana Prabhakar  
Alejandro Roldan-Alzate  
Michael Zinn

### ASSISTANT PROFESSORS

Yunus Alapan  
Joseph Andrews  
Jennifer Franck  
Corinne Henak  
Eric Kazyak  
Allison Mahvi  
Luca Mastropasqua  
Jacob Notbohm  
Josh Roth  
Shiva Rudraraju

Eric Tervo  
Ramathasan Thevamaran  
Dakotah Thompson  
Michael Wagner  
Wei Wang  
Michael Wehner  
Jinlong Wu  
Xiaobin Xiong  
Xiangru Xu  
Lei Zhou

**See also Mechanical Engineering Faculty Directory**  
**(<https://directory.engr.wisc.edu/me/faculty/>).**