

MECHANICAL ENGINEERING, PHD

The Ph.D. in Mechanical Engineering program, focused on cutting-edge research and advanced education, serves the broad UW–Milwaukee mission for discovery, research, and education and supports the generation of new knowledge for the development and betterment of society and research collaborations with local industries.

Current research areas of strength of the Ph.D. in Mechanical Engineering include:

- Renewable Energy
- Power Storage
- Tribology
- Optics
- Robotics and Control
- Rehabilitation Engineering and Biomechanics
- Sensor Development
- Structural Health Monitoring
- Water Filtration

The Ph.D. in Mechanical Engineering requires a minimum of 66 graduate credits beyond the bachelor's degree, comprised of a minimum credit distribution of 21 credits in the major area; 9 credits in an approved minor area; 6 credits in mathematics and/or quantitative methods; 9 credits of approved electives; 3 credits of CEAS Graduate Seminar (Ethics and Engineering Communication); and 18 credits of doctoral thesis. A minimum of 26 credits, excluding dissertation, must be at the 700 level or higher. The student must also satisfy a residence requirement. Many of the courses leading toward graduate degrees in CEAS are offered in the late afternoon or evening. So, students can complete much of their coursework on a part-time basis.

Each student will develop their program of study in consultation with their major professor. The program of study will be tailored to each student based on their area of dissertation research and their prior academic background.

Student Learning Program Outcomes

The student learning outcomes include the ability to:

1. Apply advanced knowledge of mathematics, science, and engineering to solve complex problems.
2. Use modern tools or techniques to solve complex problems, conduct research, and analyze and interpret data.
3. Demonstrate proficiency and competency in the area of specialization.
4. Identify, formulate, and solve complex problems with an original and/or significant contribution to the field.
5. Demonstrate familiarity with research in a related or complementary discipline.
6. Use quantitative methods appropriate to the field of research.
7. Understand academic, professional, and ethical responsibility.
8. Communicate effectively via technical writing and oral presentations.

Admission Requirements Application Deadlines

Application deadlines vary by program, please review the application deadline chart (<http://uwm.edu/graduateschool/program-deadlines/>) for specific programs. Other important dates and deadlines can be found by using the One Stop calendars (<https://uwm.edu/onestop/dates-and-deadlines/>).

Admission

An applicant must meet Graduate School requirements (<http://uwm.edu/graduateschool/admission/>) plus these College requirements to be considered for admission to the program:

1. A bachelor's or master's degree:
 - a. Applicants holding a BS or MS degree in engineering or computer science, depending on the major area selected will generally be admitted without deficiencies.
 - b. Applicants holding BS or MS degrees from domains outside of engineering or computer science may be admitted with specific program-defined course deficiencies, provided that the deficiencies amount to no more than two courses. The student is expected to satisfy deficiency requirements within three enrolled semesters. No course credits earned in making up deficiencies may be counted as program credits required for the degree. For the Engineering major areas, the BS or MS preparation generally must include mathematics equivalent to ELECENG 234 or MATH 234. For the Computer Science major area, the mathematics preparation must generally include mathematics equivalent to MATH 232. Otherwise, the made-up deficiencies must be sufficient to assure the Graduate Program Subcommittee that the applicant is able to proceed with advanced work directed toward the doctoral degree.
2. A minimum grade point average of 3.0 on the basis of 4.0, in the highest degree granted. An applicant with a master's degree in engineering or computer science having a GPA of less than 3.0, but at least equal to 2.75, may be admitted if substantial evidence can be submitted demonstrating that the applicant has the capacity to perform satisfactory doctoral work.
3. All applicants are required to submit a brief (1 or 2 page) statement describing their professional goals and at least two letters of reference.
4. The Graduate Record Examination (GRE) is required for all international and domestic applicants.
5. International students require proof of English language proficiency. Complete information is available at the UWM Center for International Education (<http://www.uwm.edu/Dept/CIE/>).
6. Applicants with a relevant master's degree who intend to complete an additional master's in engineering at UWM should announce their plans at the time of admission, and not later than the start of their second year into the PhD program.
7. Applicants are required to submit an academic CV. The CV should list academic experience, professional work experience, research work experience, technical expertise and skills, publications (journals, conferences, posters, patents, etc.), and at least three references.

Reapplication

A student who receives a master's degree at UWM must formally apply for admission to the Graduate School as a doctoral student before

continuing studies that will be credited toward the Doctor of Philosophy in Engineering.

Credits and Courses

The minimum degree requirement is 66 graduate credits beyond the bachelor's degree. The minimum credit distribution of coursework to be undertaken must be as follows, depending on the option selected.

Code	Title	Credits
Select 21 credits in the major area of concentration		21
Select 9 credits in an approved minor area		9
Select 6 credits in mathematics and/or quantitative methods		6
Select 9 credits of approved electives		9
Select 3 credits of:		3
MECHENG 700	CEAS Graduate Seminar	
Select 18 credits of:		18
MECHENG 998	Doctoral Thesis	
Total Credits		66

The 6-credit requirement in mathematics and/or quantitative methods may be met by satisfactorily completing certain courses specified by the GPSC or by taking the minor in mathematics. When such courses also count for either the major area or the minor area, the remaining credits may be taken as approved electives.

The department of Mechanical Engineering offers a PhD in Mechanical Engineering. The student must achieve a 3.0 GPA separately in each of the following areas: the Mechanical Engineering major area, the minor area, and the quantitative methods area.

The minor is normally taken in one of the other major areas of the PhD in Engineering or in the physical sciences or mathematics or in business management. Consideration of any other area as a minor requires the prior approval of the thesis adviser and the chairperson of the Mechanical Engineering Department.

A minimum of 33 credits, including doctoral thesis, must be completed while enrolled at UWM in the PhD degree program. For students entering with a relevant master's degree who intend to complete a second master's and a PhD in Mechanical Engineering at UWM, a minimum of 27 credits, including doctoral thesis, must be completed while enrolled in the doctoral program.

Students entering the program without a prior applicable master's degree are limited to a total maximum transfer of 9 credits for courses taken elsewhere. Independent study courses (699 and 999) may be included in the minimum course credit requirements provided GPSC approval has been obtained prior to registration in such course. Typically no more than six credits of independent study are allowed in the PhD program. Guidelines on acceptable independent study courses are available in the CEAS Graduate Studies Office.

The GPSC or the major department may require candidates to complete certain courses as part of the requirement for the specific major or to meet the mathematics and/or quantitative methods requirement.

Additional Requirements

Major Professor as Advisor

The Graduate School requires that the student must have a major professor to advise, supervise, and approve the program of study

before registering for courses. The GPSC or its delegates will assign the incoming student to an initial Program Advisor at the time of admission. Prior to the completion of 12 credits (9 credits for part-time students), the student must select a major professor who will be the student's thesis advisor. The student, in consultation with the major professor, develops a proposed program of studies which is submitted to the Graduate Program Subcommittee for approval. For subsequent changes, the student must file a revised program of study for approval.

Foreign Language

There is no foreign language requirement for the degree.

Residence

The program residence requirement is satisfied either by completing 8 or more graduate credits in two consecutive semesters, exclusive of summer sessions, or by completing 6 or more graduate credits in each of three consecutive semesters, exclusive of summer sessions.

Qualifying Examination

Each student in the program must take and pass a Qualifying Examination (QE) to demonstrate that the student is qualified for doctoral-level work. The Qualifying Examination is a written open-book exam. The examination is offered twice a year during the regular academic year. The content of the examination varies among the major areas of the PhD in Engineering program.

Students entering with only a bachelor's degree or with a master's degree in an area unrelated to their major area may take the Qualifying Examination for the first time after earning 18 credits of graduate work at UWM and must successfully pass the exam before earning 30 credits of graduate work at UWM. Students admitted to the Ph.D. program after completion of an appropriate Master's degree must take the QE by the 3rd Semester.

A student who fails the qualifying exam twice is subject to dismissal from the PhD in Engineering program. A student may appeal the failure and dismissal within 30 days of being notified of the failure. If the student does not appeal or the appeal is not granted, the College will recommend to the Graduate School that the student be dismissed. A student who is dismissed from the PhD in Engineering program because of failing the qualifying exam may not be enrolled in the PhD in Engineering program for a complete calendar year. This does not preclude the student from being enrolled in any other degree program offered by the University. A student who wishes to re-enroll in the program after a calendar year has passed must apply as any other student would, including payment of fees. A student readmitted after having failed the qualifying exam twice must take the qualifying exam in the first semester of matriculation and this will count as the student's first attempt at the exam. The student may appeal this requirement prior to the first scheduled day of classes. If the student fails the qualifying exam on this first attempt, the student is permitted the customary second attempt as described above. All appeals must be in writing and directed to the CEAS Associate Dean for Academic Affairs.

Doctoral Program Committee

The Doctoral Program Committee is proposed by the major professor in consultation with the student and the department. The Committee must include at least five graduate faculty (three from major area, one from minor area, and one from any area, including the major and minor areas). The last member may be a person from outside the University (such as another university, a research laboratory, or a relevant industrial partner), provided that person meets Graduate School requirements. The

Committee may have more than five members, provided that the majority of the Committee members are from the student's major field.

Doctoral Preliminary Examination

The student must pass doctoral preliminary examinations (PE) within five years of initial doctoral program enrollment. The preliminary exam consists of a written component and an oral presentation.

1. **Written Component:** Accomplish **one of the two** following:
 - a. Publish preliminary research results (as a first author) in a Quartiles 1 or 2 (Q1/Q2) journal; **OR**
 - b. Prepare a manuscript in a style appropriate for technical journal/conference proceedings publication presenting preliminary work and results to date. This work is to be submitted to the three-member Preliminary Exam (PE) Committee to examine the quality/advancement of the research work.
2. **Oral Presentation:**
The student will present their research work to a three-member PE Committee as part of the preliminary examination process. The advisor will form the committee according to the Prelim Committee Guidelines. The committee will evaluate the presentation based on various criteria, including Problem Definition, Literature Review and Previous Work, Critical Analysis of Literature Review, Research Aims, Impact of the Proposed Research, Proposed Solutions, Contributions/Novelty of the proposed research, Expected Results/Deliverables, and Quality of Oral Communication. The student will receive a Pass/Fail score based on the committee's evaluation. In the event that a student fails the Preliminary Exam, they will be given another chance to revise their manuscript and presentation based on the committee's suggestions. They must redo the manuscript and presentation by the end of the following Semester.

Proposal Hearing

Students must complete a proposal in accordance with the graduate school guidelines that will be composed of a presentation of original research on the path to their PhD Advisor and committee members may request written components that may include technical publications or draft portions of a thesis. Students must submit the Prelim proposal draft to the PhD Program committee at least 14 days before the hearing date. Mechanical Engineering Graduate Program Committee (MEGPC) will monitor the time frame and approve the preliminary proposal hearing date.

Dissertation and Dissertator Status

The student must carry out a creative effort in the major area under the supervision of the major professor and report the results in an acceptable dissertation. The effort of the student and the major professor to produce the dissertation is reflected in the PhD in Mechanical Engineering program requirement that the student complete at least 18 credits of doctoral thesis.

After the student has successfully completed all degree requirements except the dissertation, the student may enter Dissertator Status. Achieving Dissertator Status requires successful completion of the Proposal Hearing and prior approval of the student's advisor, the Doctoral Program Committee, and the GPSC of a dissertation proposal that outlines the scope of the project, the research method, and the goals to be achieved. Any proposal that may involve a financial commitment by the University also must be approved by the Office of the Dean. After having achieved Dissertator Status, the student must continue to register

for 3 credits of doctoral thesis per semester during the academic year until the dissertation is completed.

PhD Dissertation Review Period

Students must submit the dissertation draft to the PhD Program committee **at least 14 days before** the scheduled defense date.

Dissertation Defense

The final examination, which is oral, consists of a defense of the dissertation project. The doctoral defense examination may only be taken after all coursework and other requirements have been completed. The student must have Dissertator Status at the time of the defense.

Time Limit

All degree requirements must be completed within ten years from the date of initial enrollment in the doctoral program.

For additional information see the Graduate School PhD requirements (<https://uwm.edu/graduateschool/students/academic-policies-and-procedures/doctoral-resources/doctoral-requirements/>).