

# Mechanical Engineering, PhD

## Requirements

The PhD is awarded to students who demonstrate high academic achievement and research competence in the fields of mechanical engineering. To earn a PhD, a student must complete an approved, rigorous program of advanced coursework and submit and defend an original dissertation of independent research. The Department of Mechanical and Industrial Engineering expects all successful doctoral candidates to show depth of knowledge and research innovation in their chosen field of specialization.

The MIE department admits applicants into the PhD program either directly after earning a suitable bachelor's degree (i.e., direct entry) or after earning a suitable master's degree (i.e., advanced entry). Upon acceptance into the program, an applicant is designated as a doctoral student. This designation is changed to doctoral candidate upon successful completion of the doctoral qualifying requirements (both written and oral components) as well as all the required coursework.

## Academic and Research Advisors

PhD students must find a research advisor within their first year of study. The research advisor must be a full-time or jointly appointed faculty. If the research advisor is outside the MIE department, a faculty member with 51% or more appointments in the MIE department must be chosen as co-advisor, and a petition must be filed and approved by the co-advisor and the MIE Graduate Affairs Committee. Students are advised by the faculty advisor of their discipline before they select their research advisor(s). The research advisor and co-advisor (if applicable) must serve on the PhD student's oral examination, dissertation proposal, and dissertation defense committees.

## Change of Research Advisor

Students who wish to change their research advisor need to use the MIE petition form to make that request. The petition form must be signed by the student and by the student's current and future research advisor. The signed petition form should then be submitted to the MIE department for further processing.

## Course Requirements and Plan of Study

Each doctoral student, together with their research advisor, should develop an initial program during the first semester of study. The final program is also subject to the approval of the dissertation committee, who will add the program of study to the student's record upon admission to doctoral candidacy.

### DIRECT ENTRY

A typical program of study includes at least 40 semester hours of coursework beyond a bachelor's degree. Students who choose to get a master's degree along the way to a PhD must complete a total of 52 semester hours (32 semester hours to earn a master's degree and an additional 20 semester hours in order to earn a PhD). The 32 semester hours of coursework that apply toward the master's degree may include up to 8 semester hours of thesis or 4 semester hours of project or approved independent study coursework. Students may petition the MIE Graduate Affairs Committee to substitute up to 4 semester hours of (ME 7978) as part of their required coursework. An independent study must be approved by the research advisor. When thesis or project is selected, an independent study course cannot be taken.

### ADVANCED ENTRY

A typical program of study includes at least 20 semester hours of coursework beyond a master's degree. Students may petition the MIE Graduate Affairs Committee to substitute up to 4 semester hours of (ME 7978) as part of their required coursework. An independent study must be approved by the research advisor.

### PHD CANDIDACY

To qualify as a doctoral candidate, a doctoral student must successfully complete the doctoral qualifying requirements as well as all the required coursework.

## Doctoral Qualifying Requirements

### DOCTORAL QUALIFYING REQUIREMENTS FRAMEWORK

The goals of the Doctoral Qualifying Examination are to test a student's knowledge in fundamental topics; to gauge the student's potential to conduct independent research; and to provide opportunities for feedback to the student.

The Doctoral Qualifying Examination will be administered by a committee of at least three members, with a minimum of two who are full-time faculty members in the MIE department. The exam comprises both a written and an oral portion, with specifics determined by the faculty of each concentration. Complete details are provided to students in the PhD Qualifying Requirement Guidelines on the MIE department graduate website (<https://mie.northeastern.edu/academics/graduate-studies/>).

Upon successfully completing both the written and oral components in addition to all the necessary coursework, as specified by the student's concentration, the student will be designated as a PhD candidate.

## APPEAL PROCEDURE

The doctoral qualifying requirements process provides means for reevaluation for students who fail one or more components to appeal the Graduate Affairs Committee decision. All communications related to these should be coordinated through the student's research advisor. Only the student's research advisor may request the MIE Graduate Affairs Committee to reevaluate the student's performance.

## PhD Students Annual Review

All PhD students in the MIE department must complete the PhD Students Annual Review form with their research advisor(s) and submit any supporting documents. Annual reviews will be filed with the MIE Department of Graduate Affairs.

## PhD Students Changing Their Program

PhD students who, for any reason, decide to change their degree program (i.e., from PhD in ME to PhD in IE or vice versa) must satisfy the doctoral qualifying requirements (based on the student's new major research area (i.e., industrial engineering, materials, mechanics, mechatronics, or thermofluids).

## Interdisciplinary PhD Students with MIE as the Home Department

Students pursuing the College of Engineering interdisciplinary PhD program with the MIE department as their home department must satisfy the MIE doctoral qualifying requirements. Students dismissed from the ME or IE PhD programs in the MIE department cannot enroll in the PhD in Interdisciplinary Engineering program with MIE as the primary affiliation.

## Dissertation Proposal Preparation and Presentation Timing

Students must present their dissertation proposal no more than 18 months after successfully completing the oral exam. In addition, the presentation of the dissertation proposal and the actual dissertation defense (see below) shall be no less than 6 months apart. The student's dissertation committee will invite any additional faculty deemed appropriate to that field; this dissertation committee will then conduct the dissertation proposal session. Each student's dissertation committee must be comprised of at least three members, including the research advisor. At least two of those three members must be full-time MIE faculty members. At least three committee members should hold a PhD and at least two shall be Northeastern University faculty. The chair of the dissertation committee shall be a full-time tenured or tenure-track member of the faculty of Northeastern and will hold a PhD or an appropriate terminal degree for the discipline. Exceptions to this policy will be considered and, if appropriate, approved by the provost or their designee.

## Dissertation Course Requirements

Upon successful completion of the doctoral qualifying requirements as well as all the required coursework, the doctoral candidate, in consultation with their research advisor, must register in two consecutive semesters (may include full summer term) for Dissertation Term 1 (ME 9990) and Dissertation Term 2 (ME 9991). Upon completion of this sequence, the student must then register for Dissertation Continuation (ME 9996) in every semester (in each fall and spring term and also in the summer term if summer is the student's last semester) until the dissertation is completed. Students may not register for Dissertation Continuation (ME 9996) until they fulfill the two-semester sequence of Dissertation Term 1 (ME 9990) and Dissertation Term 2 (ME 9991).

PhD students who have completed the majority of their coursework and not yet reached PhD candidacy should register for Candidacy Preparation—Doctoral (ME 8960), in a section for which their research or academic advisor is listed as the instructor in the online registration system.

## Final Oral (Dissertation Defense) Examination

All doctoral candidates must pass a final oral exam. This exam will be scheduled once the dissertation committee agrees that the candidate's research is at a stage where it is appropriate for formal presentation and after completion of all other PhD requirements, including all the coursework approved in the final program of study. The objective of the exam is for the candidate to present and defend the results of the dissertation research and to demonstrate depth of knowledge and significant expertise in the area of that research under questioning from the dissertation committee and other attendees.

The exam shall be publicly advertised **at least one week in advance** and all faculty members may attend and participate. At the conclusion of the presentation and subsequent questions period, the dissertation committee will convene to determine the outcome. The committee may recommend that the candidate be awarded the PhD or may require additional research and/or modifications of the dissertation. In some cases, candidates may be asked to present an additional final oral dissertation defense.

## Residency Requirement

After achieving PhD candidacy, the university residency requirement is satisfied by two semesters of full-time graduate registration or four semesters of part-time graduate registration. Students must be continually enrolled during the pursuit of dissertation.

## Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

## Milestones

Doctoral qualifying exams (both written comprehensive and oral area exams)

Annual review

Dissertation committee formation

Dissertation proposal

Dissertation defense

## Core Requirements

Code	Title	Hours
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### Recommended Courses

Note: Semester hours can be counted toward coursework component with advisor approval.

MEIE 6830	Graduate Traineeship 1, Technical Writing and Communications	
MEIE 6860	Graduate Traineeship 2, Research Ethics and Professional Development	

### Approved Coursework

Requires 40 semester hours of coursework, including up to 4 semester hours of Independent Study (ME 7978). Students who apply to earn an MS degree along the way to a PhD must complete a total of 52 semester hours (32 semester hours toward the sought MS degree and 20 semester hours beyond the earned MS degree). The 32 semester hours applied toward the master's degree may include up to 8 semester hours of MS Thesis or 4 semester hours of MS Project or approved independent study coursework. Please consult your faculty advisor for acceptable courses. 40

## Dissertation

Code	Title	Hours
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Complete the following two courses (must register in two consecutive semesters, which may include full summer term):

ME 9990	Dissertation Term 1	
ME 9991	Dissertation Term 2	

## Program Credit/GPA Requirements

40 total semester hours required

Minimum 3.000 GPA required

## Advanced Entry Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

## Milestones

Doctoral qualifying exams (both written comprehensive and oral area exams)

Annual review

Dissertation committee formation

Dissertation proposal

Dissertation defense

## Core Requirements

Code	Title	Hours
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### Recommended Courses (semester hours can be counted toward coursework component with advisor approval)

MEIE 6830	Graduate Traineeship 1, Technical Writing and Communications	
MEIE 6860	Graduate Traineeship 2, Research Ethics and Professional Development	

### Approved Course Work

Requires 20 semester hours of coursework, including up to 4 semester hours of Independent Study (ME 7978). Please consult your faculty adviser for acceptable courses. 20

## Dissertation

Code	Title	Hours
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Complete the following two courses. Must register in two consecutive semesters (may include full summer term):

ME 9990	Dissertation Term 1	
ME 9991	Dissertation Term 2	

## Program Credit/GPA Requirements

20 total semester hours required

Minimum 3.000 GPA required