INDUSTRIAL ENGINEERING

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HANCHEX HUANG, PhD
Professor and Chair
NADER JALILI, PhD
Professor and Associate Chair for Graduate Studies and Research

334 Snell Engineering Center
617.373.2740
617.373.2921 (fax)
Katherine Swan, Business Manager, k.swan@neu.edu

The Department of Mechanical and Industrial Engineering (MIE) offers MS and PhD degree programs in industrial engineering.

Doctor of Philosophy

REQUIREMENTS

The PhD is awarded to students who demonstrate high academic achievement and research competence in the fields of mechanical or industrial engineering. To earn a PhD, a student must complete an approved, rigorous program of advanced course work and submit and defend an original dissertation of independent research. The mechanical and industrial engineering (MIE) department expects all successful doctoral candidates to show depth of knowledge and research innovation in their chosen field of specialization.

The MIE department admits applicants to the PhD program either directly after earning a suitable bachelor’s degree or after earning a suitable master’s degree. 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 examinations (both written and oral area exams) as well as all the required course work.

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 faculty or affiliated member of the MIE department; otherwise, a petition must be filed and approved by the MIE graduate affairs committee. If the research advisor is outside the MIE department, a faculty member with 50 percent or more appointments in the MIE department must be chosen as co-advisor. Students are advised by the academic advisor of their discipline before they select their research advisor(s).

COURSE REQUIREMENTS AND PLAN OF STUDY

A typical program of study includes at least 48 semester hours of course work beyond the bachelor’s degree or 24 semester hours of course work beyond the master’s degree.

A minor field of study is also required, comprising at least 8 semester hours of course work in a discipline other than that in which the candidate is concentrating (and that may also be taken outside the MIE department). Doctoral candidates must attain a minimum 3.000 GPA in minor area course work.

All MIE PhD students, who have entered in or after the fall 2012 semester, must complete MEIE 6800 Technical Writing and MEIE 6850 Research Seminar in Mechanical and Industrial Engineering, preferably during their first year of full-time study. If appropriate, part-time students may petition the graduate affairs committee to waive these requirements.

All MIE graduate students are also required to complete a brief online session on Responsible Conduct of Research and Plagiarism in one of these courses. The outcome of the online session will be filed with the student’s record.

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

Students may petition the MIE graduate affairs committee to substitute no more than one (4-semester-hour) graduate-level course from outside the approved program. This may include independent study. 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 examinations (both a written preliminary exam and an oral area exam) as well as all the required course work.

DOCTORAL QUALIFYING EXAMINATIONS

The doctoral qualifying examinations consist of two parts: a written preliminary examination and an oral area examination.

Written Preliminary Examination

All doctoral students who hold a master’s degree must take the preliminary exam no later than the first time that it is offered after their first academic year of study. Those admitted directly with a bachelor’s degree must take the preliminary exam no later than the first time that it is offered after their first two years of study. The MIE department offers the written preliminary exam twice during each academic year, in the morning and afternoon of Thursday and Friday of the first week of each regular semester. The objective of this exam is to test the student’s fundamental knowledge of core subjects in a specific engineering discipline and to test skill in implementing the methods of inquiry in that field. Each student’s research advisor must approve the student’s list of selected exams. A complete list of these exams along with detailed policies and procedures of taking these exams are provided at the MIE department graduate website at: www.mie.neu.edu/mie/degrees-programs/graduate-studies. Students may find further guidance in the Doctoral Qualifying Examination Handbook, as prepared and distributed by the MIE graduate affairs committee and accessible from the above website. Students should also consult extensively with their research advisor regarding all
aspects of the qualifying exams. The MIE graduate affairs committee will review all students’ performance in the preliminary exam. Upon successful completion of the preliminary exam, the student is prepared to develop a research plan and literature survey. However, in some cases, the MIE graduate affairs committee may recommend additional course work in any subject(s) where the preliminary exam indicated some weakness.

These students, in consultation with their research advisor, must form a dissertation committee no later than six months after successfully passing their PhD preliminary exams. The dissertation committee must be comprised of at least three members, two or more of which must be full-time MIE faculty members.

If the student fails the preliminary exam, he or she will not be permitted to continue as a doctoral student in any of the programs offered by the MIE department. The student may continue to fulfill the requirements for an MS degree in industrial engineering (IE), mechanical engineering (ME), or operations research (OR). The student’s dissertation committee will invite any members.

The results of the preliminary exam and any recommended course work become part of the student’s record.

Appeal Procedure: The preliminary qualifying examination process provides a means for reevaluation for students who fail one or more exams on their first attempt. Only the student’s research advisor may request the MIE graduate affairs committee to re-evaluate a student’s failed exams using the appeal form provided on the MIE department graduate website.

Oral Area Examination
Students must take the area examination no more than 12 months after successfully completing the preliminary exam. The area exam, administered in a single session, is comprised of two parts: (i) an oral presentation by the student of a written literature survey and initial plan of research (independently developed results are not required at this stage); and (ii) an oral exam of the student covering topics specifically related to the student’s field of research.

The objective of the area exam is to assess the student’s potential to perform independent research in the chosen field of specialization. The student’s dissertation committee will invite any additional faculty deemed appropriate to that field; this area examining committee will then conduct the area exam. Each student’s dissertation committee must comprise at least three members; two of those three must be full-time MIE faculty members.

The area examining committee may either recommend passing or may allow the student a single additional opportunity to complete the area exam successfully. Students not passing after a second attempt at the area exam will not be permitted to continue as a doctoral student in any of the PhD programs offered by the MIE department. The student may continue to fulfill the requirements for an MS degree in industrial engineering (IE), mechanical engineering (ME), or operations research (OR). The committee’s recommendation, the literature survey, and the initial research plan are added to the student’s record upon admission to doctoral candidacy.

**DISSEYTATION COURSE REQUIREMENTS**
Upon successful completion of the doctoral qualifying examinations (both written preliminary and oral area exams) as well as all the required course work, the doctoral candidate, in consultation with his or her research advisor, must register in two consecutive semesters (excluding the summer term) for IE 9990 Dissertation. Upon completion of this sequence, the student must then register for IE 9996 Dissertation Continuation in every semester (excluding the summer term) until the dissertation is completed. Students may not register for IE 9996 until they fulfill the two-semester sequence. To meet the full-time registration requirement for PhD students who have completed the majority of their course work and not yet reached PhD candidacy, a zero-credit course, IE 8960 Doctoral Candidacy Preparation, can be taken if needed to fulfill full-time course registration. The course is an individual instruction course, billed at 1 semester hour, and graded S or U. There is no course content, and students must register in a section with their research or academic advisor as the “instructor.”

**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 in a form appropriate for formal presentation and after completion of all other requirements for the PhD, including all course work 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 themselves for an additional final oral exam.

**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 the dissertation.
PhD in Industrial Engineering—
Advanced Degree Entrance
Complete all courses and requirements listed below unless otherwise indicated.

MILESTONES
Qualifying exam and area exam
Annual review
Dissertation proposal
Dissertation committee
Dissertation defense

GENERAL REQUIREMENTS
Seminars
MEIE 6800  Technical Writing Seminar  0 SH
MEIE 6850  Research Seminar in Mechanical and Industrial Engineering  0 SH

Approved Course Work
Requires 24 semester hours. Consult your faculty advisor for acceptable courses.

DISSERTATION COURSES
Complete the following (repeatable) course twice:
IE 9990  Dissertation  0 SH

PROGRAM CREDIT/GPA REQUIREMENTS
24 total semester hours required
Minimum 3.000 GPA required

PhD in Industrial Engineering—
Bachelor's Degree Entrance
Complete all courses and requirements listed below unless otherwise indicated.

MILESTONES
Qualifying exam and area exam
Annual review
Dissertation proposal
Dissertation committee
Dissertation defense

GENERAL REQUIREMENTS
Seminars
MEIE 6800  Technical Writing Seminar  0 SH
MEIE 6850  Research Seminar in Mechanical and Industrial Engineering  0 SH

Approved Course Work
Requires 48 semester hours. Consult your faculty advisor for acceptable courses.

DISSERTATION COURSES
Complete the following (repeatable) course twice:
IE 9990  Dissertation  0 SH

PROGRAM CREDIT/GPA REQUIREMENTS
48 total semester hours required
Minimum 3.000 GPA required